ISRA 009, Area II
LOX Debris Pile (Radionuclides < LUT)
Soil Sampling for Radionuclides and Waste Certification

Introduction

This data package provides the laboratory results of the six samples taken at the LOX site debris pile in Area II. Soil sample results were compared to the draft provisional DTSC look-up table (LUT) values in order to determine if soil exceeds background as required for the NASA/DTSC Administrative Order on Consent (AOC)[1].

Methodology

Samples were analyzed for the EPA Priority 1 set of radionuclides[2] using an off-site certified laboratory. These include Ac-228, Bi-212, Bi-214, Cs-137, Co-60, Eu-152, Pb-212, Pb-214, Tl-208, Th-234 (gamma spectroscopy); U-238, U-235, U-234, Th-230 and Pu-239/240 (alpha spectroscopy), Ni-59 and Sr-90. Minimum detectable concentrations (MDC) for cesium-137 and strontium-90 were 0.019 pCi/g and 0.045 pCi/g respectively. All radionuclide MDCs are less than their respective LUTs.

NASA and DTSC have signed an AOC that requires soils on Area II and portions of Area I to be cleaned up to background[3]. The USEPA has characterized local radionuclide background[4] in soil and has published preliminary radiological trigger levels (RTL) based on the higher of background threshold values (BTV) or minimum detectable concentrations (MDC)[5].

On August 23, 2012, DTSC sent NASA a letter regarding excavation of ISRA soil[6]. In the letter, DTSC stated,

> *"DTSC agrees with using the December 2011 USEPA RTLs for all radionuclides as the values for disposal of the ISRA soils. DTSC has concluded that use of the RTLs will not be inconsistent with SSFL radiological Lookup Table values."*

[1] "Administrative Order on Consent for Remedial Action (AOC)", December 6, 2010, signed by the National Aeronautics and Space Administration (NASA) and the Department of Toxic Substances Control (DTSC).

[2] EPA, "Final Technical Memorandum - Look-up Table Recommendations - Santa Susana Field Laboratory - Area IV Radiological Study", November 27, 2012. Section 4 and Table 1. *"USEPA recommends focusing the list of radionuclides analyzed by the laboratory to those that have been detected at concentrations above the respective RRCs in the Area IV Radiological Study (Priority One radionuclides)."*

[3] Page 5, Section 2.1 of the AOC states, *"The cleanup of soils at the Site [Area II and portions of Area I] shall result in the end state of the Site after cleanup to be consistent with "background." That is, at the completion of the cleanup, no contaminants shall remain in the soil above local background levels, with the exception of the exercise of the exemptions that are specifically expressed in the AIP. All response actions taken pursuant to this Order shall be performed so as to accomplish this objective, in full compliance with the terms and conditions detailed in the AIP, and in accordance with workplans that have been submitted to and approved by DTSC. Similarly, to the extent any radiological materials are determined to be present at this portion of the Site, the cleanup of soils at the Site contaminated with radiological materials shall result in no radiological contaminants remaining in the soil above local background levels, with the exception of the exercise of the same exemptions expressed in the AIP."*

[4] USEPA, "Final Radiological Background Study Report, Santa Susana Field Laboratory, Ventura County, California", October 2011.

[5] USEPA, "Technical Memorandum, Radiological Trigger Levels, Santa Susana Field Laboratory Site, Area IV Radiological Study", December 12, 2011.

[6] DTSC, "Management and Disposal of Radionuclide-impacted Soil Excavated for Interim Source Removal Actions on NASA Property, Santa Susana Field Laboratory, Ventura County, California", August 23, 2012

"ISRA radiological soil sample results that exceed the RTLs and that have not been re-sampled may be re-sampled to evaluate the initial RTL exceedance. Soil at locations characterized by initial and re-sample radiological results exceeding their respective RTLs will be removed and disposed of at a LLRW disposal facility, per Section 2.10 of the AOC."

"Validated radiological sample concentrations below the sample MDC can be treated as "non-detects" and the associated soil is not subject to the Section 2.10, AOC soil disposal conditions."

USEPA issued revised RTLs[7] in December 2012 which were, in general, higher than the original RTLs. USEPA also issued laboratory specific radiological reference concentrations (RRC) in December 2012[8]. Subsequently, DTSC issued draft provisional LUTs[9] for 16 radionuclides in January 2013, which in general matched the revised RTLs for those radionuclides whose RTLs were derived from BTVs[10] (for example cesium-137 and uranium-238). The draft provisional LUTs subset also matched exactly the lower of the two lab-specific RRCs. Consistent with DTSC's intent in issuing draft provisional LUTs for interim remedial action implementation, LOX data is compared to draft provisional LUTs and sample MDCs to determine compliance with the DTSC/NASA AOC.

Results

Appendix 1 shows the soil radionuclide data for the samples taken at the LOX debris pile compared to the draft provisional LUTs and sample MDCs. Appendix 2 contains the laboratory report. All concentrations are below the draft provisional LUTs and/or less than the sample MDC and therefore comply with the NASA/DTSC AOC. The LOX debris pile is therefore not contaminated above background.

Conclusions

The LOX debris pile from the LOX area is released for disposal with no radiological restrictions. .

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[7] USEPA, "Attachment A – Original and Corrected Radiological Trigger Levels - Development and Use of Radiological Reference Concentrations", Appendix K of "Final Radiological Characterization of Soils - Area IV and Northern Buffer Zone", December 21, 2012.

[8] USEPA, "Attachment B - Radiological Reference Concentrations - Development and Use of Radiological Reference Concentrations", Appendix K of "Final Radiological Characterization of Soils - Area IV and Northern Buffer Zone", December 21, 2012.

[9] DTSC, "Development of the Draft Provisional Radiological Look-Up Table", DTSC Public Meeting, Chatsworth, California, January 30, 2013.

[10] A notable exception was strontium-90 with a BTV of 0.075 pCi/g, an original RTL of 0.485 pCi/g, a revised RTL of 0.645 pCi/g, lab specific RRCs of 1.07 and 0.117 pCi/g and a draft provisional LUT of 0.117 pCi/g.

Appendix 1

LOX Debris Pile (Below LUT) Radionuclide Results

LOX Debris Pile Soil Data
Radionuclides < LUT (pCi/g)

Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Media Type	Isotope	Activity	Error (+/-)	MDC	DTSC LUT	LUT Source	Activity > LUT ?	Activity > MDC ?	Detected Activity	Detected Activity > LUT ?	Non-detect Activity	Non-detect Activity > LUT ?	MDC > LUT ?	Ratio of MDC to LUT	Units	Error Type	Analysis Protocol	Analysis Organization	Comments	Document	Status
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Actinium-228	1.28	0.141	0.134	2.68	BTV	-	YES	1.28	-	-	-	-	0.05	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Actinium-228	0.885	0.0967	0.0892	2.68	BTV	-	YES	0.885	-	-	-	-	0.03	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Actinium-228	1.06	0.0807	0.078	2.68	BTV	-	YES	1.06	-	-	-	-	0.03	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Actinium-228	1.19	0.136	0.128	2.68	BTV	-	YES	1.19	-	-	-	-	0.05	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Actinium-228	1.11	0.11	0.101	2.68	BTV	-	YES	1.11	-	-	-	-	0.04	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Actinium-228	1	0.126	0.118	2.68	BTV	-	YES	1	-	-	-	-	0.04	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Bismuth-212	0.895	0.206	0.19	2.38	BTV	-	YES	0.895	-	-	-	-	0.08	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Bismuth-212	0.688	0.114	0.111	2.38	BTV	-	YES	0.688	-	-	-	-	0.05	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Bismuth-212	0.672	0.116	0.103	2.38	BTV	-	YES	0.672	-	-	-	-	0.04	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Bismuth-212	0.837	0.18	0.175	2.38	BTV	-	YES	0.837	-	-	-	-	0.07	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Bismuth-212	0.857	0.143	0.132	2.38	BTV	-	YES	0.857	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Bismuth-212	0.879	0.168	0.154	2.38	BTV	-	YES	0.879	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Bismuth-214	0.907	0.059	0.0473	1.83	BTV	-	YES	0.907	-	-	-	-	0.03	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Bismuth-214	0.785	0.0435	0.0274	1.83	BTV	-	YES	0.785	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Bismuth-214	0.713	0.0386	0.0259	1.83	BTV	-	YES	0.713	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Bismuth-214	0.838	0.056	0.039	1.83	BTV	-	YES	0.838	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Bismuth-214	0.78	0.0496	0.0319	1.83	BTV	-	YES	0.78	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Bismuth-214	0.698	0.0547	0.0388	1.83	BTV	-	YES	0.698	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Cesium-137	-0.0103	0.0145	0.0254	0.225	BTV	-	-	-	-	-0.0103	-	-	0.11	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Cesium-137	0.0173	0.0119	0.0144	0.225	BTV	-	YES	0.0173	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Cesium-137	0.0192	0.0119	0.0137	0.225	BTV	-	YES	0.0192	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Cesium-137	0.0116	0.0111	0.0233	0.225	BTV	-	-	-	-	0.0116	-	-	0.10	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Cesium-137	0.0281	0.019	0.0151	0.225	BTV	-	YES	0.0281	-	-	-	-	0.07	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Cesium-137	0.0309	0.0174	0.0215	0.225	BTV	-	YES	0.0309	-	-	-	-	0.10	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Cobalt-60	0.00147	0.0142	0.0246	0.0363	MDC	-	-	-	-	0.00147	-	-	0.68	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Cobalt-60	0.0132	0.0091	0.0169	0.0363	MDC	-	-	-	-	0.0132	-	-	0.47	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Cobalt-60	-0.0024	0.00831	0.0141	0.0363	MDC	-	-	-	-	-0.0024	-	-	0.39	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Cobalt-60	0.00663	0.0137	0.0252	0.0363	MDC	-	-	-	-	0.00663	-	-	0.69	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Cobalt-60	-0.00275	0.0108	0.0188	0.0363	MDC	-	-	-	-	-0.00275	-	-	0.52	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Cobalt-60	-0.00181	0.0118	0.0208	0.0363	MDC	-	-	-	-	-0.00181	-	-	0.57	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Europium-152	0.0155	0.0416	0.0622	0.0739	MDC	-	-	-	-	0.0155	-	-	0.84	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Europium-152	-0.00217	0.0236	0.041	0.0739	MDC	-	-	-	-	-0.00217	-	-	0.55	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Europium-152	-0.0396	0.0267	0.0353	0.0739	MDC	-	-	-	-	-0.0396	-	-	0.48	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Europium-152	-0.0271	0.0264	0.0462	0.0739	MDC	-	-	-	-	-0.0271	-	-	0.63	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Europium-152	-0.0263	0.0234	0.0421	0.0739	MDC	-	-	-	-	-0.0263	-	-	0.57	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Europium-152	-0.012	0.0305	0.0513	0.0739	MDC	-	-	-	-	-0.012	-	-	0.69	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Lead-212	1.66	0.0484	0.0362	3.11	BTV	-	YES	1.66	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Lead-212	1.16	0.0372	0.0253	3.11	BTV	-	YES	1.16	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Lead-212	1.3	0.0317	0.0225	3.11	BTV	-	YES	1.3	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Lead-212	1.38	0.0372	0.0269	3.11	BTV	-	YES	1.38	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Lead-212	1.37	0.0381	0.0261	3.11	BTV	-	YES	1.37	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Lead-212	1.38	0.0456	0.0296	3.11	BTV	-	YES	1.38	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Lead-214	1.1	0.053	0.0448	1.96	BTV	-	YES	1.1	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Lead-214	0.887	0.0513	0.0291	1.96	BTV	-	YES	0.887	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Lead-214	0.891	0.0417	0.0266	1.96	BTV	-	YES	0.891	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Lead-214	0.944	0.0518	0.0346	1.96	BTV	-	YES	0.944	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Lead-214	0.926	0.0509	0.0324	1.96	BTV	-	YES	0.926	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Lead-214	0.847	0.0589	0.0371	1.96	BTV	-	YES	0.847	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Nickel-59	0	0.829	0.278	0.875	MDC	-	-	-	-	0	-	-	0.32	pCi/g	2 sigma	DOE RESL Ni-1	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Nickel-59	-4.19	0.442	0.589	0.875	MDC	-	-	-	-	-4.19	-	-	0.67	pCi/g	2 sigma	DOE RESL Ni-1	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Nickel-59	-0.303	0.653	0.604	0.875	MDC	-	-	-	-	-0.303	-	-	0.69	pCi/g	2 sigma	DOE RESL Ni-1	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Nickel-59	0.0162	0.346	0.59	0.875	MDC	-	-	-	-	0.0162	-	-	0.67	pCi/g	2 sigma	DOE RESL Ni-1	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Nickel-59	-0.312	0.482	0.753	0.875	MDC	-	-	-	-	-0.312	-	-	0.86	pCi/g	2 sigma	DOE RESL Ni-1	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Nickel-59	0.38	0.626	0.691	0.875	MDC	-	-	-	-	0.38	-	-	0.79	pCi/g	2 sigma	DOE RESL Ni-1	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Plutonium-239/240	0.00554	0.0156	0.0166	0.023	MDC	-	-	-	-	0.00554	-	-	0.72	pCi/g	2 sigma	DOE EML HASL-300, Pu-11-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Plutonium-239/240	0	0.0114	0.017	0.023	MDC	-	-	-	-	0	-	-	0.74	pCi/g	2 sigma	DOE EML HASL-300, Pu-11-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Plutonium-239/240	0	0.0104	0.0155	0.023	MDC	-	-	-	-	0	-	-	0.67	pCi/g	2 sigma	DOE EML HASL-300, Pu-11-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Plutonium-239/240	0	0.00877	0.013	0.023	MDC	-	-	-	-	0	-	-	0.57	pCi/g	2 sigma	DOE EML HASL-300, Pu-11-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Plutonium-239/240	0	0.00805	0.00999	0.023	MDC	-	-	-	-	0	-	-	0.43	pCi/g	2 sigma	DOE EML HASL-300, Pu-11-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Plutonium-239/240	0	0.0118	0.0175	0.023	MDC	-	-	-	-	0	-	-	0.76	pCi/g	2 sigma	DOE EML HASL-300, Pu-11-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Strontium-90	0.0283	0.0272	0.045	0.117	MDC	-	-	-	-	0.0283	-	-	0.38	pCi/g	2 sigma	EPA 905.0 Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Strontium-90	0.0196	0.0273	0.0467	0.117	MDC	-	-	-	-	0.0196	-	-	0.40	pCi/g	2 sigma	EPA 905.0 Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Strontium-90	0.028	0.0276	0.0458	0.117	MDC	-	-	-	-	0.028	-	-	0.39	pCi/g	2 sigma	EPA 905.0 Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Strontium-90	0.0172	0.0263	0.0456	0.117	MDC	-	-	-	-	0.0172	-	-	0.39	pCi/g	2 sigma	EPA 905.0 Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Strontium-90	0.0106	0.0246	0.0438	0.117	MDC	-	-	-	-	0.0106	-	-	0.37	pCi/g	2 sigma	EPA 905.0 Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Strontium-90	0.0274	0.0266	0.0435	0.117	MDC	-	-	-	-	0.0274	-	-	0.37	pCi/g	2 sigma	EPA 905.0 Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Thallium-208	0.417	0.0323	0.0229	1.07	BTV	-	YES	0.417	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Thallium-208	0.328	0.025	0.0145	1.07	BTV	-	YES	0.328	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Thallium-208	0.356	0.0201	0.013	1.07	BTV	-	YES	0.356	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Thallium-208	0.396	0.0243	0.0198	1.07	BTV	-	YES	0.396	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Thallium-208	0.369	0.0254	0.0161	1.07	BTV	-	YES	0.369	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Thallium-208	0.362	0.0296	0.0196	1.07	BTV	-	YES	0.362	-	-	-	-	0.02	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Thorium-230	0.923	0.675	0.885	2.38	BTV	-	YES	0.923	-	-	-	-	0.37	pCi/g	2 sigma	DOE EML HASL-300, Th-01-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Thorium-230	0.623	0.684	0.934	2.38	BTV	-	-	-	-	0.623	-	-	0.39	pCi/g	2 sigma	DOE EML HASL-300, Th-01-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Thorium-230	1.51	0.765	0.711	2.38	BTV	-	YES	1.51	-	-	-	-	0.30	pCi/g	2 sigma	DOE EML HASL-300, Th-01-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Thorium-230	1.84	0.924	0.888	2.38	BTV	-	YES	1.84	-	-	-	-	0.37	pCi/g	2 sigma	DOE EML HASL-300, Th-01-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Thorium-230	0.268	0.43	0.701	2.38	BTV	-	-	-	-	0.268	-	-	0.29	pCi/g	2 sigma	DOE EML HASL-300, Th-01-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Thorium-230	1.39	0.725	0.713	2.38	BTV	-	YES	1.39	-	-	-	-	0.30	pCi/g	2 sigma	DOE EML HASL-300, Th-01-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Thorium-234	1.49	0.307	0.224	3.54	BTV	-	YES	1.49	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Thorium-234	1.43	0.254	0.206	3.54	BTV	-	YES	1.43	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Thorium-234	1.8	0.248	0.197	3.54	BTV	-	YES	1.8	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Thorium-234	1.95	0.191	0.155	3.54	BTV	-	YES	1.95	-	-	-	-	0.04	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste

LOX Debris Pile Soil Data
Radionuclides < LUT (pCi/g)

Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Media Type	Isotope	Activity	Error (+/-)	MDC	DTSC LUT	LUT Source	Activity > LUT ?	Activity > MDC ?	Detected Activity	Detected Activity > LUT ?	Non-detect Activity	Non-detect Activity > LUT ?	MDC > LUT ?	Ratio of MDC to LUT	Units	Error Type	Analysis Protocol	Analysis Organization	Comments	Document	Status
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Thorium-234	1.53	0.245	0.205	3.54	BTV	-	YES	1.53	-	-	-	-	0.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Thorium-234	1.33	0.273	0.181	3.54	BTV	-	YES	1.33	-	-	-	-	0.05	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Uranium-233/234	0.956	0.209	0.115	2.18	BTV	-	YES	0.956	-	-	-	-	0.05	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Uranium-233/234	0.875	0.151	0.0478	2.18	BTV	-	YES	0.875	-	-	-	-	0.02	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Uranium-233/234	0.833	0.176	0.0937	2.18	BTV	-	YES	0.833	-	-	-	-	0.04	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Uranium-233/234	0.763	0.21	0.114	2.18	BTV	-	YES	0.763	-	-	-	-	0.05	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Uranium-233/234	0.961	0.267	0.135	2.18	BTV	-	YES	0.961	-	-	-	-	0.06	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Uranium-233/234	0.81	0.198	0.106	2.18	BTV	-	YES	0.81	-	-	-	-	0.05	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Uranium-235/236	-0.0244	0.0493	0.124	0.152	BTV	-	-	-	-	-0.0244	-	-	0.82	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Uranium-235/236	0.0244	0.0349	0.0244	0.152	BTV	-	-	-	-	0.0244	-	-	0.16	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Uranium-235/236	0.111	0.075	0.0334	0.152	BTV	-	YES	0.111	-	-	-	-	0.22	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Uranium-235/236	0.0133	0.0497	0.0837	0.152	BTV	-	-	-	-	0.0133	-	-	0.55	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Uranium-235/236	0.0398	0.0782	0.108	0.152	BTV	-	-	-	-	0.0398	-	-	0.71	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Uranium-235/236	0.0579	0.0682	0.0434	0.152	BTV	-	YES	0.0579	-	-	-	-	0.29	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S1	SOIL	Uranium-238	0.953	0.205	0.0805	1.96	BTV	-	YES	0.953	-	-	-	-	0.04	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S2	SOIL	Uranium-238	0.943	0.159	0.0758	1.96	BTV	-	YES	0.943	-	-	-	-	0.04	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S3	SOIL	Uranium-238	0.805	0.172	0.0815	1.96	BTV	-	YES	0.805	-	-	-	-	0.04	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S4	SOIL	Uranium-238	0.833	0.214	0.0424	1.96	BTV	-	YES	0.833	-	-	-	-	0.02	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S5	SOIL	Uranium-238	1.04	0.273	0.0549	1.96	BTV	-	YES	1.04	-	-	-	-	0.03	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste
8/1/2013	LOX	LOXDRS_S	LOXDRS_S6	SOIL	Uranium-238	0.88	0.206	0.106	1.96	BTV	-	YES	0.88	-	-	-	-	0.05	pCi/g	2 sigma	DOE EML HASL-300, U-02-RC Modified	GEL		330816	Waste

Appendix 2

LOX Debris Pile Laboratory Report

GEL Laboratories LLC

a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407

P 843.556.8171 F 843.766.1178

www.gel.com

August 09, 2013

Ms. Sarah Von Raesfeld, MWH
MWH Americas, Inc.
2121 N California Blvd
Suite 600
Walnut Creek, California 94596

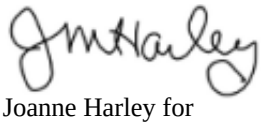
Re: ISRA Waste Characterization, Outfall 009 LOX - RAD
Work Order: 330816

Dear Ms. MWH:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 02, 2013. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4505.

Sincerely,



Joanne Harley for
Heather Shaffer
Project Manager

Purchase Order:
Chain of Custody:
Project Number: ~PROJECT_NUMBER~
Enclosures

Case Narrative

Case Narrative
for
Boeing - SSFL (MWH)
Work Order: 330816
SDG: 330816

August 09, 2013

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample Receipt

The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 02, 2013 for analysis.

The laboratory received the following samples:

Laboratory Identification	Sample Description
330816001	LOXDRS_S1
330816002	LOXDRS_S2
330816003	LOXDRS_S3
330816004	LOXDRS_S4
330816005	LOXDRS_S5
330816006	LOXDRS_S6

Data Package

Items of Note

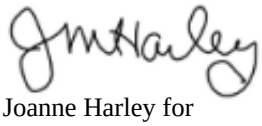
Case Narrative

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

Data Package:

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

I certify that this data package is in compliance with the terms and conditions of the subcontract and task order, both technically and for the completeness, for other than the conditions detailed in the attached case narratives.



Joanne Harley for
Heather Shaffer
Project Manager

Chain of Custody and Supporting Documentation

Page: 1 of 1
Project #:
GEL Quote #:
COC Number (1):
PO Number: Direct Bill to Boeing

GEL Chain of Custody and Analytical Request

See www.gel.com for GEL's Sample Acceptance SOP

GEL Work Order Number: 330816 330817

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: The Boeing Company - SSFL Phone #:

Project/Site Name: ISRA Waste Characterization / LOX Fax #:

Address: 5800 Woolsey Canyon Road, Canoga Park CA 91304

Collected by: Send Results To: Sarah Von Raesfeld and Jade Neff

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive	Should this sample be considered: TSCA Regulated	Total number of containers	EPA Priority 1 Radionuclides	SVOCs by 8270C	TPH by 8015B	Title 22 Metals by 6010B/7471A	PCBs by 8082	<-- Preservative Type (6)
LOXDRS_S1	8/1/2013	1355			SO				X	X	X	X	X	
LOXDRS_S2	8/1/2013	1400			SO				X	X	X	X	X	
LOXDRS_S3	8/1/2013	1405			SO				X	X	X	X	X	
LOXDRS_S4	8/1/2013	1410			SO				X	X	X	X	X	
LOXDRS_S5	8/1/2013	1350			SO				X	X	X	X	X	
LOXDRS_S6	8/1/2013	1415			SO				X	X	X	X	X	

Comments
Note: extra sample is required for sample specific QC

Requested: Normal: Rush: **5 day TAT** Specify: (Subject to Surch Fax Results: Yes / No

Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: See "Laboratory CRMDC" file dated 07/29/2013 for list of EPA Priority 1 Radionuclides and required MDCs (emailed 7/31/13).
Log chem and radchem into separate SDGs
Provide Level II pdf, bedms format EDD for chem, and SSFLRad format EDD for radchem

Sample Collection Time Zone
Eastern Pacific
Central Other _____
Mountain

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	[signature]	8/1/13	1530	[signature]	8/2/13	0900
2						
3						

Sample Shipping and Delivery Details

GEL PM: Heather Shaffer
Method of Shipment: FedEx Date Shipped: 8/1/13
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite
3.) Field Filtered: For liquid matrices, indicate with a - **Y** - for yes the sample was field filtered or - **N** - for sample was not field filtered.
4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, ML=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B**, **6010B/7470A**) and number of containers provided for each (i.e. *8260B* - **3**, *6010B/7470A* - **1**).
6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? *YES* *NO*
Cooler Temp: *C*

WHITE = LABORATORY **YELLOW = FILE** **PINK = CLIENT**

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: SFC	**SDG/AR/COC/Work Order:** 330816 330817
Received By: L. Taylor	**Date Received:** 080213

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
COC/Samples marked as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts):
Classified Radioactive II or III by RSO?		✓	If yes, Were swipes taken of sample contatiners < action levels? OCPM
COC/Samples marked containing PCBs?		✓	
Package, COC, and/or Samples marked as beryllium or asbestos containing?		✓	If yes, samples are to be segregeated as Safety Controlled Samples, and opened by the GEL Safety Group.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
Samples identified as Foreign Soil?		✓	

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	✓			Preservation Method: Ice bags Blue ice Dry ice None Other (describe) 2 *all temperatures are recorded in Celsius
2a	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: 310500004 Secondary Temperature Device Serial # (If Applicable):
3	Chain of custody documents included with shipment?	✓			
4	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
5	Samples requiring chemical preservation at proper pH?		✓		Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6	VOA vials free of headspace (defined as < 6mm bubble)?		✓		Sample ID's and containers affected:
7	Are Encore containers present?			✓	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			
14	Carrier and tracking number.				Circle Applicable: FedEx Air FedEx Ground UPS Field Services Courier Other 7963 7644 2587

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials CP Date 8-5-13 Page 1 of 1

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

Certificate of Analysis Report
for

SSFL001 Boeing − SSFL (MWH)

Client SDG: 330816 GEL Work Order: 330816

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

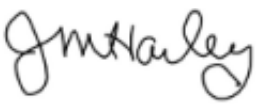
U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

UI Gamma Spectroscopy−−Uncertain identification

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Heather Shaffer.

Reviewed by 

DATA EXCEPTION REPORT

Mo.Day Yr.	**Division:**	**Quality Criteria:**	**Type:**
08−AUG−13	Radiochemistry	SOP	Process
Instrument Type:	**Test / Method:**	**Matrix Type:**	**Client Code:**
ALPHA SPECTROMETER	DOE EML HASL−300, Pu−11−RC Modified	Solid	SSFL
Batch ID:	**Sample Numbers:**		
1320150	See Below		

Potentially affected work order(s)(SDG): 330816

Application Issues:

Other

Specification and Requirements Exception Description:	**DER Disposition:**
1. Sample 1202921724 does not meet the resolution requirement of having a full width half maximum of 100 keV or less for the Pu−242 tracer.	1. The sample does meet the tracer yield requirement, the spiked recovery requirement, and its tracer peak is within the Pu−242 region of interest. Reporting results.

Originator's Name:

Melanie Aycock 08−AUG−13

Data Validator/Group Leader:

Jessica Downey 08−AUG−13

Laboratory Certifications

List of current GEL Certifications as of 09 August 2013

State	Certification
Alaska	UST−110
Arkansas	88−0651
CLIA	42D0904046
California NELAP	01151CA
Colorado	SC00012
Connecticut	PH−0169
Delaware	SC00012
DoD ELAP A2LA ISO 17025	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−12−00283, P330−12−00284
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA130005
Maryland	270
Massachusetts	M−SC012
Nevada	SC000122011−1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
Oklahoma	9904
Pennsylvania NELAP	68−00485
Plant Material Permit	PDEP−12−00260
South Carolina Chemistry	10120001
South Carolina Radiochemi	10120002
Tennessee	TN 02934
Texas NELAP	T104704235−13−8
Utah NELAP	SC000122013−8
Vermont	VT87156
Virginia NELAP	460202
Washington	C780−12
Wisconsin	999887790

GEL LABORATORIES LLC

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Certificate of Analysis

Company : MWH Americas, Inc.
Address : 2121 N California Blvd
Suite 600
Walnut Creek, California 94596

Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH
Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S1
Sample ID: 330816001
Matrix: Soil
Collect Date: 01-AUG-13
Receive Date: 02-AUG-13
Collector: Client
Moisture: 5.99%

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
Rad Alpha Spec Analysis													
Alphaspec Pu, Solid required MDCs "As Received"													
Plutonium-239/240	U	0.00554	+/-0.0156	0.0166	+/-0.0156	0.020	pCi/g		MXS2	08/07/13	0940	1320150	1
Alphaspec Th, Solid required MDCs "As Received"													
Thorium-230		0.923	+/-0.675	0.885	+/-0.698	1.00	pCi/g		MXS2	08/07/13	2024	1320154	2
Alphaspec U, Solid required MDCs "As Received"													
Uranium-233/234		0.956	+/-0.209	0.115	+/-0.254	1.00	pCi/g		MXS2	08/07/13	2315	1320166	3
Uranium-235/236	U	-0.0244	+/-0.0493	0.124	+/-0.0493	0.100	pCi/g						
Uranium-238		0.953	+/-0.205	0.0805	+/-0.251	1.00	pCi/g						
Rad Gamma Spec Analysis													
Gamma Ni59, Solid required MDCs "As Received"													
Nickel-59	UI	0.00	+/-0.829	0.278	+/-0.831	0.800	pCi/g		TYJ1	08/07/13	1332	1319943	4
Gammaspec, Gamma, solid required MDCs "As Received"													
Actinium-228		1.28	+/-0.141	0.134	+/-0.197	1.00	pCi/g		MXR1	08/05/13	1634	1319845	5
Bismuth-212		0.895	+/-0.206	0.190	+/-0.219	1.00	pCi/g						
Bismuth-214		0.907	+/-0.059	0.0473	+/-0.0966	1.00	pCi/g						
Cesium-137	U	-0.0103	+/-0.0145	0.0254	+/-0.0152	0.050	pCi/g						
Cobalt-60	U	0.00147	+/-0.0142	0.0246	+/-0.0142	0.0363	pCi/g						
Europium-152	U	0.0155	+/-0.0416	0.0622	+/-0.0422	0.0739	pCi/g						
Lead-212		1.66	+/-0.0484	0.0362	+/-0.169	1.00	pCi/g						
Lead-214		1.10	+/-0.053	0.0448	+/-0.113	1.00	pCi/g						
Thallium-208		0.417	+/-0.0323	0.0229	+/-0.0482	0.500	pCi/g						
Thorium-234		1.49	+/-0.307	0.224	+/-0.342	1.00	pCi/g						
Rad Gas Flow Proportional Counting													
GFPC, Sr90, solid required MDCs "As Received"													
Strontium-90	U	0.0283	+/-0.0272	0.045	+/-0.0276	0.050	pCi/g		JXR1	08/07/13	1221	1320004	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	DRS1	08/02/13	1911	1319818
GEL Prep Method	Wet Soil Prep GL-RAD-A-026				1319821

The following Analytical Methods were performed

Method	Description
1	DOE EML HASL-300, Pu-11-RC Modified
2	DOE EML HASL-300, Th-01-RC Modified
3	DOE EML HASL-300, U-02-RC Modified
4	DOE RESL Ni-1

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Certificate of Analysis

Company : MWH Americas, Inc.
Address : 2121 N California Blvd
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Walnut Creek, California 94596

Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH

Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S1
Sample ID: 330816001

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
5	DOE HASL 300, 4.5.2.3/Ga-01-R												
6	EPA 905.0 Modified												

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Plutonium-242 Tracer	Alphaspec Pu, Solid required MDCs "As Received"	1320150	64.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Solid required MDCs "As Received"	1320154	77.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid required MDCs "As Received"	1320166	33.1	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid required MDCs "As Received"	1319943	55.3	(25%-125%)
Strontium Carrier	GFPC, Sr90, solid required MDCs "As Received"	1320004	58.6	(25%-125%)

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

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Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH
Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S2
Sample ID: 330816002
Matrix: Soil
Collect Date: 01-AUG-13
Receive Date: 02-AUG-13
Collector: Client
Moisture: 11.4%

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
Rad Alpha Spec Analysis													
Alphaspec Pu, Solid required MDCs "As Received"													
Plutonium-239/240	U	0.00	+/-0.0114	0.017	+/-0.0115	0.020	pCi/g		MXS2	08/07/13	0940	1320150	1
Alphaspec Th, Solid required MDCs "As Received"													
Thorium-230	U	0.623	+/-0.684	0.934	+/-0.700	1.00	pCi/g		MXS2	08/07/13	2024	1320154	2
Alphaspec U, Solid required MDCs "As Received"													
Uranium-233/234		0.875	+/-0.151	0.0478	+/-0.193	1.00	pCi/g		MXS2	08/07/13	2315	1320166	3
Uranium-235/236		0.0244	+/-0.0349	0.0244	+/-0.035	0.100	pCi/g						
Uranium-238		0.943	+/-0.159	0.0758	+/-0.205	1.00	pCi/g						
Rad Gamma Spec Analysis													
Gamma Ni59, Solid required MDCs "As Received"													
Nickel-59	U	-4.19	+/-0.442	0.589	+/-1.98	0.800	pCi/g		TYJ1	08/07/13	1453	1319943	4
Gammaspec, Gamma, solid required MDCs "As Received"													
Actinium-228		0.885	+/-0.0967	0.0892	+/-0.157	1.00	pCi/g		MXR1	08/05/13	1635	1319845	5
Bismuth-212		0.688	+/-0.114	0.111	+/-0.131	1.00	pCi/g						
Bismuth-214		0.785	+/-0.0435	0.0274	+/-0.0773	1.00	pCi/g						
Cesium-137		0.0173	+/-0.0119	0.0144	+/-0.012	0.050	pCi/g						
Cobalt-60	U	0.0132	+/-0.0091	0.0169	+/-0.0109	0.0363	pCi/g						
Europium-152	U	-0.00217	+/-0.0236	0.041	+/-0.0236	0.0739	pCi/g						
Lead-212		1.16	+/-0.0372	0.0253	+/-0.112	1.00	pCi/g						
Lead-214		0.887	+/-0.0513	0.0291	+/-0.0926	1.00	pCi/g						
Thallium-208		0.328	+/-0.025	0.0145	+/-0.0366	0.500	pCi/g						
Thorium-234		1.43	+/-0.254	0.206	+/-0.285	1.00	pCi/g						
Rad Gas Flow Proportional Counting													
GFPC, Sr90, solid required MDCs "As Received"													
Strontium-90	U	0.0196	+/-0.0273	0.0467	+/-0.0275	0.050	pCi/g		JXR1	08/07/13	1544	1320004	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	DRS1	08/02/13	1911	1319818
GEL Prep Method	Wet Soil Prep GL-RAD-A-026				1319821

The following Analytical Methods were performed

Method	Description
1	DOE EML HASL-300, Pu-11-RC Modified
2	DOE EML HASL-300, Th-01-RC Modified
3	DOE EML HASL-300, U-02-RC Modified
4	DOE RESL Ni-1
5	DOE HASL 300, 4.5.2.3/Ga-01-R

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Certificate of Analysis

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Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH
Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S2
Sample ID: 330816002

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
6 EPA 905.0 Modified													

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Plutonium-242 Tracer	Alphaspec Pu, Solid required MDCs "As Received"	1320150	56.8	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Solid required MDCs "As Received"	1320154	49.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid required MDCs "As Received"	1320166	51.5	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid required MDCs "As Received"	1319943	60.6	(25%-125%)
Strontium Carrier	GFPC, Sr90, solid required MDCs "As Received"	1320004	70.7	(25%-125%)

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

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Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH

Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S3
Sample ID: 330816003
Matrix: Soil
Collect Date: 01-AUG-13
Receive Date: 02-AUG-13
Collector: Client
Moisture: 6.75%

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
Rad Alpha Spec Analysis													
Alphaspec Pu, Solid required MDCs "As Received"													
Plutonium-239/240	U	0.00	+/-0.0104	0.0155	+/-0.0105	0.020	pCi/g		MXS2	08/07/13	0940	1320150	1
Alphaspec Th, Solid required MDCs "As Received"													
Thorium-230		1.51	+/-0.765	0.711	+/-0.812	1.00	pCi/g		MXS2	08/07/13	2024	1320154	2
Alphaspec U, Solid required MDCs "As Received"													
Uranium-233/234		0.833	+/-0.176	0.0937	+/-0.213	1.00	pCi/g		MXS2	08/07/13	2315	1320166	3
Uranium-235/236		0.111	+/-0.075	0.0334	+/-0.0768	0.100	pCi/g						
Uranium-238		0.805	+/-0.172	0.0815	+/-0.207	1.00	pCi/g						
Rad Gamma Spec Analysis													
Gamma Ni59, Solid required MDCs "As Received"													
Nickel-59	U	-0.303	+/-0.653	0.604	+/-0.668	0.800	pCi/g		TYJ1	08/07/13	1453	1319943	4
Gammaspec, Gamma, solid required MDCs "As Received"													
Actinium-228		1.06	+/-0.0807	0.078	+/-0.199	1.00	pCi/g		MXR1	08/05/13	1636	1319845	5
Bismuth-212		0.672	+/-0.116	0.103	+/-0.133	1.00	pCi/g						
Bismuth-214		0.713	+/-0.0386	0.0259	+/-0.0694	1.00	pCi/g						
Cesium-137		0.0192	+/-0.0119	0.0137	+/-0.012	0.050	pCi/g						
Cobalt-60	U	-0.0024	+/-0.00831	0.0141	+/-0.00838	0.0363	pCi/g						
Europium-152	U	-0.0396	+/-0.0267	0.0353	+/-0.0323	0.0739	pCi/g						
Lead-212		1.30	+/-0.0317	0.0225	+/-0.111	1.00	pCi/g						
Lead-214		0.891	+/-0.0417	0.0266	+/-0.0828	1.00	pCi/g						
Thallium-208		0.356	+/-0.0201	0.013	+/-0.0351	0.500	pCi/g						
Thorium-234		1.80	+/-0.248	0.197	+/-0.295	1.00	pCi/g						
Rad Gas Flow Proportional Counting													
GFPC, Sr90, solid required MDCs "As Received"													
Strontium-90	U	0.028	+/-0.0276	0.0458	+/-0.028	0.050	pCi/g		JXR1	08/07/13	1222	1320004	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	DRS1	08/02/13	1911	1319818
GEL Prep Method	Wet Soil Prep GL-RAD-A-026				1319821

The following Analytical Methods were performed

Method	Description
1	DOE EML HASL-300, Pu-11-RC Modified
2	DOE EML HASL-300, Th-01-RC Modified
3	DOE EML HASL-300, U-02-RC Modified
4	DOE RESL Ni-1
5	DOE HASL 300, 4.5.2.3/Ga-01-R

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Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH

Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S3
Sample ID: 330816003

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
6 EPA 905.0 Modified													

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Plutonium-242 Tracer	Alphaspec Pu, Solid required MDCs "As Received"	1320150	66.9	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Solid required MDCs "As Received"	1320154	78.2	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid required MDCs "As Received"	1320166	40.1	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid required MDCs "As Received"	1319943	65.4	(25%-125%)
Strontium Carrier	GFPC, Sr90, solid required MDCs "As Received"	1320004	70.7	(25%-125%)

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

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Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH

Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S4
Sample ID: 330816004
Matrix: Soil
Collect Date: 01-AUG-13
Receive Date: 02-AUG-13
Collector: Client
Moisture: 7.02%

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
Rad Alpha Spec Analysis													
Alphaspec Pu, Solid required MDCs "As Received"													
Plutonium-239/240	U	0.00	+/-0.00877	0.013	+/-0.00879	0.020	pCi/g		MXS2	08/07/13	0940	1320150	1
Alphaspec Th, Solid required MDCs "As Received"													
Thorium-230		1.84	+/-0.924	0.888	+/-0.986	1.00	pCi/g		MXS2	08/07/13	2024	1320154	2
Alphaspec U, Solid required MDCs "As Received"													
Uranium-233/234		0.763	+/-0.210	0.114	+/-0.243	1.00	pCi/g		MXS2	08/07/13	1453	1320166	3
Uranium-235/236	U	0.0133	+/-0.0497	0.0837	+/-0.0498	0.100	pCi/g						
Uranium-238		0.833	+/-0.214	0.0424	+/-0.253	1.00	pCi/g						
Rad Gamma Spec Analysis													
Gamma Ni59, Solid required MDCs "As Received"													
Nickel-59	U	0.0162	+/-0.346	0.590	+/-0.347	0.800	pCi/g		TYJ1	08/07/13	1436	1319943	4
Gammaspec, Gamma, solid required MDCs "As Received"													
Actinium-228		1.19	+/-0.136	0.128	+/-0.204	1.00	pCi/g		MXR1	08/05/13	1637	1319845	5
Bismuth-212		0.837	+/-0.180	0.175	+/-0.195	1.00	pCi/g						
Bismuth-214		0.838	+/-0.056	0.039	+/-0.0898	1.00	pCi/g						
Cesium-137	U	0.0116	+/-0.0111	0.0233	+/-0.0112	0.050	pCi/g						
Cobalt-60	U	0.00663	+/-0.0137	0.0252	+/-0.014	0.0363	pCi/g						
Europium-152	U	-0.0271	+/-0.0264	0.0462	+/-0.0292	0.0739	pCi/g						
Lead-212		1.38	+/-0.0372	0.0269	+/-0.131	1.00	pCi/g						
Lead-214		0.944	+/-0.0518	0.0346	+/-0.096	1.00	pCi/g						
Thallium-208		0.396	+/-0.0243	0.0198	+/-0.0416	0.500	pCi/g						
Thorium-234		1.95	+/-0.191	0.155	+/-0.266	1.00	pCi/g						
Rad Gas Flow Proportional Counting													
GFPC, Sr90, solid required MDCs "As Received"													
Strontium-90	U	0.0172	+/-0.0263	0.0456	+/-0.0265	0.050	pCi/g		JXR1	08/07/13	1222	1320004	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	DRS1	08/02/13	1911	1319818
GEL Prep Method	Wet Soil Prep GL-RAD-A-026				1319821

The following Analytical Methods were performed

Method	Description
1	DOE EML HASL-300, Pu-11-RC Modified
2	DOE EML HASL-300, Th-01-RC Modified
3	DOE EML HASL-300, U-02-RC Modified
4	DOE RESL Ni-1
5	DOE HASL 300, 4.5.2.3/Ga-01-R

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Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH
Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S4
Sample ID: 330816004

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
6 EPA 905.0 Modified													

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Plutonium-242 Tracer	Alphaspec Pu, Solid required MDCs "As Received"	1320150	77.1	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Solid required MDCs "As Received"	1320154	66.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid required MDCs "As Received"	1320166	94.5	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid required MDCs "As Received"	1319943	60.6	(25%-125%)
Strontium Carrier	GFPC, Sr90, solid required MDCs "As Received"	1320004	54.1	(25%-125%)

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : MWH Americas, Inc.
Address : 2121 N California Blvd
Suite 600
Walnut Creek, California 94596

Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH

Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S5
Sample ID: 330816005
Matrix: Soil
Collect Date: 01-AUG-13
Receive Date: 02-AUG-13
Collector: Client
Moisture: 7.98%

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
Rad Alpha Spec Analysis													
Alphaspec Pu, Solid required MDCs "As Received"													
Plutonium-239/240	U	0.00	+/-0.00805	0.00999	+/-0.00806	0.020	pCi/g		MXS2	08/07/13	1631	1320150	1
Alphaspec Th, Solid required MDCs "As Received"													
Thorium-230	U	0.268	+/-0.430	0.701	+/-0.437	1.00	pCi/g		MXS2	08/07/13	2024	1320154	2
Alphaspec U, Solid required MDCs "As Received"													
Uranium-233/234		0.961	+/-0.267	0.135	+/-0.315	1.00	pCi/g		MXS2	08/07/13	0942	1320166	3
Uranium-235/236	U	0.0398	+/-0.0782	0.108	+/-0.0785	0.100	pCi/g						
Uranium-238		1.04	+/-0.273	0.0549	+/-0.328	1.00	pCi/g						
Rad Gamma Spec Analysis													
Gamma Ni59, Solid required MDCs "As Received"													
Nickel-59	U	-0.312	+/-0.482	0.753	+/-0.503	0.800	pCi/g		TYJ1	08/07/13	1454	1319943	4
Gammaspec, Gamma, solid required MDCs "As Received"													
Actinium-228		1.11	+/-0.110	0.101	+/-0.208	1.00	pCi/g		MXR1	08/05/13	1637	1319845	5
Bismuth-212		0.857	+/-0.143	0.132	+/-0.166	1.00	pCi/g						
Bismuth-214		0.780	+/-0.0496	0.0319	+/-0.0823	1.00	pCi/g						
Cesium-137		0.0281	+/-0.019	0.0151	+/-0.0192	0.050	pCi/g						
Cobalt-60	U	-0.00275	+/-0.0108	0.0188	+/-0.0109	0.0363	pCi/g						
Europium-152	U	-0.0263	+/-0.0234	0.0421	+/-0.0263	0.0739	pCi/g						
Lead-212		1.37	+/-0.0381	0.0261	+/-0.145	1.00	pCi/g						
Lead-214		0.926	+/-0.0509	0.0324	+/-0.102	1.00	pCi/g						
Thallium-208		0.369	+/-0.0254	0.0161	+/-0.0401	0.500	pCi/g						
Thorium-234		1.53	+/-0.245	0.205	+/-0.290	1.00	pCi/g						
Rad Gas Flow Proportional Counting													
GFPC, Sr90, solid required MDCs "As Received"													
Strontium-90	U	0.0106	+/-0.0246	0.0438	+/-0.0247	0.050	pCi/g		JXR1	08/07/13	1222	1320004	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	DRS1	08/02/13	1911	1319818
GEL Prep Method	Wet Soil Prep GL-RAD-A-026				1319821

The following Analytical Methods were performed

Method	Description
1	DOE EML HASL-300, Pu-11-RC Modified
2	DOE EML HASL-300, Th-01-RC Modified
3	DOE EML HASL-300, U-02-RC Modified
4	DOE RESL Ni-1
5	DOE HASL 300, 4.5.2.3/Ga-01-R

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Certificate of Analysis

Company : MWH Americas, Inc.
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Walnut Creek, California 94596

Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH
Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S5
Sample ID: 330816005

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
6	EPA 905.0 Modified												

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Plutonium-242 Tracer	Alphaspec Pu, Solid required MDCs "As Received"	1320150	34.3	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Solid required MDCs "As Received"	1320154	77.3	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid required MDCs "As Received"	1320166	57.5	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid required MDCs "As Received"	1319943	63.2	(25%-125%)
Strontium Carrier	GFPC, Sr90, solid required MDCs "As Received"	1320004	60.8	(25%-125%)

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

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Certificate of Analysis

Company : MWH Americas, Inc.
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Walnut Creek, California 94596

Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH

Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S6
Sample ID: 330816006
Matrix: Soil
Collect Date: 01-AUG-13
Receive Date: 02-AUG-13
Collector: Client
Moisture: 11.3%

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
Rad Alpha Spec Analysis													
Alphaspec Pu, Solid required MDCs "As Received"													
Plutonium-239/240	U	0.00	+/-0.0118	0.0175	+/-0.0118	0.020	pCi/g		MXS2	08/07/13	0941	1320150	1
Alphaspec Th, Solid required MDCs "As Received"													
Thorium-230		1.39	+/-0.725	0.713	+/-0.768	1.00	pCi/g		MXS2	08/07/13	2024	1320154	2
Alphaspec U, Solid required MDCs "As Received"													
Uranium-233/234		0.810	+/-0.198	0.106	+/-0.234	1.00	pCi/g		MXS2	08/07/13	2315	1320166	3
Uranium-235/236		0.0579	+/-0.0682	0.0434	+/-0.0688	0.100	pCi/g						
Uranium-238		0.880	+/-0.206	0.106	+/-0.247	1.00	pCi/g						
Rad Gamma Spec Analysis													
Gamma Ni59, Solid required MDCs "As Received"													
Nickel-59	U	0.380	+/-0.626	0.691	+/-0.627	0.800	pCi/g		TYJ1	08/08/13	1001	1319943	4
Gammaspec, Gamma, solid required MDCs "As Received"													
Actinium-228		1.00	+/-0.126	0.118	+/-0.167	1.00	pCi/g		MXR1	08/05/13	1638	1319845	5
Bismuth-212		0.879	+/-0.168	0.154	+/-0.185	1.00	pCi/g						
Bismuth-214		0.698	+/-0.0547	0.0388	+/-0.0793	1.00	pCi/g						
Cesium-137		0.0309	+/-0.0174	0.0215	+/-0.0176	0.050	pCi/g						
Cobalt-60	U	-0.00181	+/-0.0118	0.0208	+/-0.0118	0.0363	pCi/g						
Europium-152	U	-0.012	+/-0.0305	0.0513	+/-0.031	0.0739	pCi/g						
Lead-212		1.38	+/-0.0456	0.0296	+/-0.131	1.00	pCi/g						
Lead-214		0.847	+/-0.0589	0.0371	+/-0.0917	1.00	pCi/g						
Thallium-208		0.362	+/-0.0296	0.0196	+/-0.0422	0.500	pCi/g						
Thorium-234		1.33	+/-0.273	0.181	+/-0.301	1.00	pCi/g						
Rad Gas Flow Proportional Counting													
GFPC, Sr90, solid required MDCs "As Received"													
Strontium-90	U	0.0274	+/-0.0266	0.0435	+/-0.0271	0.050	pCi/g		JXR1	08/07/13	1222	1320004	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	DRS1	08/02/13	1911	1319818
GEL Prep Method	Wet Soil Prep GL-RAD-A-026				1319821

The following Analytical Methods were performed

Method	Description
1	DOE EML HASL-300, Pu-11-RC Modified
2	DOE EML HASL-300, Th-01-RC Modified
3	DOE EML HASL-300, U-02-RC Modified
4	DOE RESL Ni-1
5	DOE HASL 300, 4.5.2.3/Ga-01-R

GEL LABORATORIES LLC

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Certificate of Analysis

Company : MWH Americas, Inc.
Address : 2121 N California Blvd
Suite 600
Walnut Creek, California 94596

Report Date: August 9, 2013

Contact: Ms. Sarah Von Raesfeld, MWH
Project: ISRA Waste Characterization, Outfall 009

Client Sample ID: LOXDRS_S6
Sample ID: 330816006

Project: SSFL00112
Client ID: SSFL001

Parameter	Qualifier	Result	Uncertainty	MDC	TPU	RL	Units	DF	Analyst	Date	Time	Batch	Mtd.
6	EPA 905.0 Modified												

Surrogate/Tracer Recovery	Test	Batch ID	Recovery%	Acceptable Limits
Plutonium-242 Tracer	Alphaspec Pu, Solid required MDCs "As Received"	1320150	56.8	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Solid required MDCs "As Received"	1320154	76.0	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid required MDCs "As Received"	1320166	30.3	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid required MDCs "As Received"	1319943	48.7	(25%-125%)
Strontium Carrier	GFPC, Sr90, solid required MDCs "As Received"	1320004	50.8	(25%-125%)

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 9, 2013

Client : **MWH Americas, Inc.**
2121 N California Blvd
Suite 600
Walnut Creek, California

Contact: **Ms. Sarah Von Raesfeld, MWH**

Workorder: **330816**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1320150										
QC1202921723 330816001 DUP										
Plutonium-239/240	U	0.00554	U	0.00	pCi/g	0		N/A	MXS2	08/07/1309:41
	Uncert:	+/-0.0156		+/-0.0111						
	TPU:	+/-0.0156		+/-0.0111						
QC1202921724 LCS										
Plutonium-239/240	0.870			0.961	pCi/g		110	(75%-125%)	MXS2	08/07/1309:41
	Uncert:			+/-0.153						
	TPU:			+/-0.229						
QC1202921722 MB										
Plutonium-239/240			U	0.00	pCi/g				MXS2	08/07/1309:41
	Uncert:			+/-0.00963						
	TPU:			+/-0.00966						
Batch 1320154										
QC1202921726 330816001 DUP										
Thorium-230		0.923		0.844	pCi/g	8.86		(0% - 100%)	MXS2	08/07/1320:24
	Uncert:	+/-0.675		+/-0.587						
	TPU:	+/-0.698		+/-0.608						
QC1202921727 LCS										
Thorium-230	17.7			16.0	pCi/g		90.2	(75%-125%)	MXS2	08/07/1320:24
	Uncert:			+/-2.34						
	TPU:			+/-3.59						
QC1202921725 MB										
Thorium-230			U	0.113	pCi/g				MXS2	08/07/1320:24
	Uncert:			+/-0.389						
	TPU:			+/-0.392						
Batch 1320166										
QC1202921761 330816001 DUP										
Uranium-233/234		0.956		1.05	pCi/g	9.51		(0%-20%)	MXS2	08/07/1323:15
	Uncert:	+/-0.209		+/-0.211						
	TPU:	+/-0.254		+/-0.263						
Uranium-235/236	U	-0.0244		0.0918	pCi/g	29.6		(0% - 100%)		
	Uncert:	+/-0.0493		+/-0.0762						
	TPU:	+/-0.0493		+/-0.0774						
Uranium-238		0.953		1.33	pCi/g	32.7*		(0%-20%)		
	Uncert:	+/-0.205		+/-0.234						
	TPU:	+/-0.251		+/-0.307						
QC1202921762 LCS										
Uranium-233/234				4.47	pCi/g				MXS2	08/07/1309:42
	Uncert:			+/-0.449						
	TPU:			+/-0.829						
Uranium-235/236				0.434	pCi/g					
	Uncert:			+/-0.158						
	TPU:			+/-0.172						

QC Summary

Workorder: **330816**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1320166										
Uranium-238	4.75			4.90	pCi/g		103	(75%-125%)		
	Uncert:			+/-0.471						
	TPU:			+/-0.898						
QC1202921760 MB										
Uranium-233/234			U	0.0294	pCi/g				MXS2	08/07/1309:42
	Uncert:			+/-0.0467						
	TPU:			+/-0.0469						
Uranium-235/236			U	0.00	pCi/g					
	Uncert:			+/-0.0291						
	TPU:			+/-0.0292						
Uranium-238			U	0.00607	pCi/g					
	Uncert:			+/-0.0337						
	TPU:			+/-0.0338						
Rad Gamma Spec										
Batch 1319845										
QC1202920961 330816001 DUP										
Actinium-228		1.28		1.14	pCi/g	11.6		(0%-20%)	MXR1	08/06/1318:36
	Uncert:	+/-0.141		+/-0.117						
	TPU:	+/-0.197		+/-0.197						
Bismuth-212		0.895		0.859	pCi/g	4.08		(0%-20%)		
	Uncert:	+/-0.206		+/-0.139						
	TPU:	+/-0.219		+/-0.161						
Bismuth-214		0.907		0.875	pCi/g	3.62		(0%-20%)		
	Uncert:	+/-0.059		+/-0.0561						
	TPU:	+/-0.0966		+/-0.0906						
Cesium-137	U	-0.0103	U	0.00848	pCi/g	0		N/A		
	Uncert:	+/-0.0145		+/-0.0126						
	TPU:	+/-0.0152		+/-0.0132						
Cobalt-60	U	0.00147	U	-0.00164	pCi/g	0		N/A		
	Uncert:	+/-0.0142		+/-0.0113						
	TPU:	+/-0.0142		+/-0.0113						
Europium-152	U	0.0155	U	-0.00848	pCi/g	0		N/A		
	Uncert:	+/-0.0416		+/-0.0275						
	TPU:	+/-0.0422		+/-0.0278						
Lead-212		1.66		1.52	pCi/g	8.43		(0%-20%)		
	Uncert:	+/-0.0484		+/-0.0448						
	TPU:	+/-0.169		+/-0.145						
Lead-214		1.10		1.03	pCi/g	6.4		(0%-20%)		
	Uncert:	+/-0.053		+/-0.0485						
	TPU:	+/-0.113		+/-0.102						
Thallium-208		0.417		0.388	pCi/g	7.18		(0%-20%)		
	Uncert:	+/-0.0323		+/-0.0256						
	TPU:	+/-0.0482		+/-0.0407						
Thorium-234		1.49		1.76	pCi/g	16.7		(0%-20%)		
	Uncert:	+/-0.307		+/-0.337						
	TPU:	+/-0.342		+/-0.373						
QC1202920962 LCS										
Actinium-228			U	1.73	pCi/g				MXR1	08/06/1309:19

QC Summary

Workorder: **330816**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1319845										
	Uncert:			+/-5.30						
	TPU:			+/-5.36						
Americium-241	492			536	pCi/g		109	(75%-125%)		
	Uncert:			+/-2.77						
	TPU:			+/-49.1						
Bismuth-212			U	-0.636	pCi/g					
	Uncert:			+/-4.35						
	TPU:			+/-4.36						
Bismuth-214			U	0.702	pCi/g					
	Uncert:			+/-0.929						
	TPU:			+/-0.983						
Cesium-137	193			194	pCi/g		101	(75%-125%)		
	Uncert:			+/-2.07						
	TPU:			+/-15.6						
Cobalt-60	243			238	pCi/g		97.7	(75%-125%)		
	Uncert:			+/-2.72						
	TPU:			+/-19.4						
Europium-152			U	0.229	pCi/g					
	Uncert:			+/-1.11						
	TPU:			+/-1.12						
Lead-212			U	0.0713	pCi/g					
	Uncert:			+/-0.554						
	TPU:			+/-0.555						
Lead-214			U	0.0246	pCi/g					
	Uncert:			+/-0.822						
	TPU:			+/-0.822						
Thallium-208			U	-0.24	pCi/g					
	Uncert:			+/-0.480						
	TPU:			+/-0.492						
Thorium-234			U	-0.268	pCi/g					
	Uncert:			+/-3.01						
	TPU:			+/-3.01						
QC1202920960 MB										
Actinium-228			U	0.0368	pCi/g				MXR1	08/06/1314:46
	Uncert:			+/-0.094						
	TPU:			+/-0.0955						
Bismuth-212			U	-0.00838	pCi/g					
	Uncert:			+/-0.0696						
	TPU:			+/-0.0697						
Bismuth-214			U	0.00603	pCi/g					
	Uncert:			+/-0.0418						
	TPU:			+/-0.0419						
Cesium-137			U	-0.00587	pCi/g					
	Uncert:			+/-0.00879						
	TPU:			+/-0.00919						
Cobalt-60			U	-0.00271	pCi/g					
	Uncert:			+/-0.00868						
	TPU:			+/-0.00877						
Europium-152			U	0.00345	pCi/g					

QC Summary

Workorder: **330816**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1319845										
	Uncert:			+/-0.0237						
	TPU:			+/-0.0237						
Lead-212			U	0.000177	pCi/g					
	Uncert:			+/-0.0218						
	TPU:			+/-0.0218						
Lead-214			U	-0.00666	pCi/g					
	Uncert:			+/-0.0283						
	TPU:			+/-0.0284						
Thallium-208			U	-0.017	pCi/g					
	Uncert:			+/-0.016						
	TPU:			+/-0.0178						
Thorium-234			U	0.0138	pCi/g					
	Uncert:			+/-0.259						
	TPU:			+/-0.259						
Batch 1319943										
QC1202921180 330816001 DUP										
Nickel-59	UI	0.00	U	0.311	pCi/g	0		N/A	TYJ1	08/08/1311:23
	Uncert:	+/-0.829		+/-0.370						
	TPU:	+/-0.831		+/-0.397						
QC1202921181 LCS										
Nickel-59	50.9			45.4	pCi/g		89.1	(75%-125%)	TYJ1	08/07/1318:16
	Uncert:			+/-4.23						
	TPU:			+/-6.10						
QC1202921179 MB										
Nickel-59			U	-0.0507	pCi/g				TYJ1	08/08/1314:28
	Uncert:			+/-0.103						
	TPU:			+/-0.105						
Rad Gas Flow										
Batch 1320004										
QC1202921314 330816005 DUP										
Strontium-90	U	0.0106	U	-0.0141	pCi/g	0		N/A	JXR1	08/08/1310:19
	Uncert:	+/-0.0246		+/-0.0271						
	TPU:	+/-0.0247		+/-0.0271						
QC1202921316 LCS										
Strontium-90	2.09			2.45	pCi/g		117	(75%-125%)	JXR1	08/07/1312:33
	Uncert:			+/-0.154						
	TPU:			+/-0.466						
QC1202921313 MB										
Strontium-90			U	-0.0962	pCi/g				JXR1	08/07/1312:22
	Uncert:			+/-0.016						
	TPU:			+/-0.016						
QC1202921315 330816005 MS										
Strontium-90	9.99 U	0.0106		11.3	pCi/g		113	(75%-125%)	JXR1	08/07/1312:33
	Uncert:	+/-0.0246		+/-0.715						
	TPU:	+/-0.0247		+/-2.16						

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

QC Summary

Workorder: **330816**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.
** Indicates analyte is a surrogate/tracer compound.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptence criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.