ISRA 009 – IEL-1.
Soil Sampling for Radionuclides.
Results and Statistical Analysis.
Waste Certification.

This data package provides the laboratory results and statistical analysis of the 4 samples taken at the ISRA Outfall 009, IEL-1 area. This analysis and data interpretation complies with the procedure approved by the California Department of Public Health[1].

Samples taken for waste disposal characterization were analyzed for strontium-90, tritium and gamma emitting radionuclides by gamma spectroscopy, using an off-site laboratory. Minimum detectable activity (MDA) for cesium-137 and strontium-90 averaged ~0.032 pCi/g and ~0.038 pCi/g respectively. Minimum detectable activity for tritium averaged ~0.79 pCi/g. The gamma spectroscopy library also included the following contaminants-of-concern: Na-22, K-40, Mn-54, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Th-228, Th-232, U-235, U-238 and Am-241.

Statistical evaluation of sample analytical results to determine whether or not the sampled waste contains Cs-137 or Sr-90 activity elevated above local background was conducted using the Wilcoxon Rank Sum Test using protocols described in NUREG-1505[2] and DTSC guidance[3] (See Appendix 1). Appendix 2 shows the complete analytical results for all radionuclides. Complete laboratory data packages are available on request.

Local background data for cesium-137 and strontium-90 was taken from Table 20 of the 1995 McLaren/Hart report[4]. Background for tritium in soil is not well established, and is not reported in the 1995 McLaren/Hart report, therefore tritium background in soil is conservatively assumed to be zero. Tritium data is therefore compared to the MDA of the analysis and the EPA preliminary remediation goal (PRG)[5] for residential 10^{-6} risk.

Conclusions

Cesium-137 - Based on the results of the statistical analysis of Appendix 1, soil to be excavated from IEL-1 does not exceed the local background for Cs-137. The incremental dose from Cs-137 above background is therefore zero mrem/y. The highest Cs-137 result is 0.03 pCi/g which is less than the highest background result of 0.21 pCi/g. The highest non-background subtracted Cs-137 result is equivalent to an effective dose of 0.021 mrem/y[6].

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[1] Boeing, “Northern Drainage Waste Sampling for Radionuclides.” Revision 9, November 5, 2007. (Attachment 3 to Northern Drainage Work Plan) and “ISRA Waste Sampling for Radionuclides”, Attachment A to the ISRA Soil Management Plan.

[2] NUREG-1505, Nuclear Regulatory Commission, “A Non-parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys.” January 1998. http://www.philrutherford.com/Radiation_Cleanup_Standards/NUREG-1505.pdf

[3] DTSC, “Selecting Inorganic Constituents as Chemicals of Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities.” February 1997.

[4] McLaren/Hart, "Additional Soil and Water Sampling at the Brandeis-Bardin Institute and Santa Monica Mountains Conservancy." Jan 19, 1995. http://www.etec.energy.gov/Health-and-Safety/Documents/BrandeisBardin/AddSoilandWaterSamp.pdf

[5] EPA preliminary remediation goals for radionuclides - http://epa-prgs.ornl.gov/radionuclides/.

Strontium-90 - Based on the results of the statistical analysis of Appendix 1, soil to be excavated from IEL-1 does not exceed the local background for Sr-90, and indeed are all non-detect. The incremental dose from Sr-90 above background is therefore zero mrem/y. The highest Sr-90 result is 0.03 pCi/g which is non-detect and less than the highest background result of 0.13 pCi/g. The highest non-background subtracted, non-detect Sr-90 result is equivalent to an effective dose of 0.009 mrem/y[6].

Tritium - All tritium results are non-detect, the average tritium result is -0.344 pCi/g and the highest tritium result is -0.132 pCi/g. The highest non-detected, non-background subtracted tritium result is equivalent to an effective dose of 0.0 mrem/y[6].

This waste is certified to be "radiologically" acceptable for shipment to, and disposal at, any waste disposal facility. The waste requires no further radiological controls.

This waste meets the requirements of disposal facility permits[7,8] and complies with the California Health & Safety Code[9].

The Governor's Executive Order D-62-02 prohibits the *"disposal of decommissioned materials to Class III landfills or unclassified management units."* The soil from IEL-1 is not decommissioned material, and does not originate from the proximity of any radiological facility. The sampling in this certification has therefore been conducted as a best management practice that complies with the requirements of D-62-02. Verification sampling and/or approval by the California Department of Public Health (CDPH) Radiologic Health Branch (RHB) are not required for the off-site disposal of decommissioned material or of the subject material[10].

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[6] EPA dose compliance concentrations for radionuclides - http://epa-dccs.ornl.gov/.
Soil concentrations that meet the 10^{-6} residential risk PRG are < 0.1 mrem/y. The Cs-137 residential PRG of 0.0597 pCi/g is equivalent to 0.042 mrem/y. The Sr-90 residential PRG of 0.231 pCi/g is equivalent to 0.071 mrem/y. The tritium residential PRG of 2.28 pCi/g is equivalent to 0.032 mrem/y.

[7] This waste is exempt from regulation and licensing or is expressly authorized for disposal under the Radiation Control Law (Division 104, Part 9, Chapter 8 of the California Health & Safety Code).

[8] This waste is not prohibited from disposal by any government agency with jurisdictional authority over this waste.

[9] Division 104, Part 9, Chapter 5, Article 1, Section 114715, "No person shall bury, throw away, or in any manner dispose of radioactive wastes within the state except in a manner and at locations as will result in no significant radioactive contamination of the environment." For the purposes of this requirement, "significant" is defined in Section 114710 as amounts of radioactive materials that are likely to expose persons to ionizing radiation greater than the guide levels published by the Federal Radiation Council (FRC). The FRC no longer exists, but the applicable guide level last published by the FRC was 500 mrem per year to a member of the public. Because the regulatory dose limit to members of the public has since been lowered to 100 mrem per year, CDPH/RHB conservatively utilizes the lower dose for purposes of defining "significant" radioactive contamination in this Article of the California Health and Safety Code.
http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=114001-115000&file=114705-114780

[10] The California Department of Public Health (CDPH) Radiologic Health Branch (RHB) has stated in a November 9, 2007 email to Phil Rutherford (Boeing) … *"The Governor's Executive Order D-62-02, does not specifically require the Department of Health Services (now the Department of*

Phil Rutherford
Manager, Health, Safety & Radiation Services

Public Health) to perform verification sampling of decommissioned material or to provide approval for disposal of specific decommissioned material shipped offsite (e.g., to Class I or II landfills). The California DPH has not imposed a requirement that Boeing or the Department of Energy (DOE) seek DPH verification sampling or approval of all decommissioned material destined for Class I or II landfills in compliance with the Governor's Executive Order."

Appendix 1

Wilcoxon Rank Sum Statistical Test for Cesium-137 and Strontium-90

Wilcoxon Rank Sum Test -- (Cesium-137)

General Information:
The WRS tests whether or not measurements of samples from a survey area (S)
tend to be consistently larger than those from a background reference area (R) by more than the DCGL.

The null hypothesis, Ho, is: Survey sample concentrations exceed those in the background
The alternative hypothesis, Ha, is: Survey sample concentrations do not exceed those in the background

Instruction on how to use this template:
1) Enter analysis results in pCi/gram
2) Enter number of samples for background and survey data sets, m and n.
3) The WRS test is calculated using the method prescribed in
NUREG-1505, Nuclear Regulatory Commission, "A Non-parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys." January 1998.

DCGL (pCi/g)	0.00
Type I Error Rate, Alpha:	0.05
Type II Error Rate, Beta:	0.05
Number of Background Samples, m:	51
Number of Survey Samples, n:	4
Z-value for Alpha	1.645
Critical Value	1479
Sum of Reference Ranks	1514

If the sum of the reference ranks is larger than the critical value, there is enough evidence to reject the null hypothesis and accept the alterrnative hypothesis. Otherwise the null hypothesis is accepted.

Test Result:
Survey sample concentrations do not exceed those in the background by more than the DCGL

	Bkgd Ref (R)	Survey (S)
Mean	0.087	0.009
Max	0.213	0.030
Min	0.015	-0.003
σ	0.062	0.015
m-1.96*σ	-0.035	-0.020
m+1.96*σ	0.210	0.039

No.	Soil ID	Cs-137	Adjusted Cs-137	Area	Ranks	Reference Ranks
1		0.092	0.092	R	32	32
2		0.020	0.020	R	10	10
3		0.020	0.020	R	10	10
4		0.100	0.100	R	36.5	36.5
5		0.020	0.020	R	10	10
6		0.158	0.158	R	47.5	47.5
7		0.175	0.175	R	49	49
8		0.209	0.209	R	54	54
9		0.180	0.180	R	50	50
10		0.030	0.030	R	18	18
11		0.213	0.213	R	55	55
12		0.025	0.025	R	15	15
13		0.020	0.020	R	10	10
14		0.020	0.020	R	10	10
15		0.074	0.074	R	28	28
16		0.147	0.147	R	43	43
17		0.100	0.100	R	36.5	36.5

No.	Soil ID	Cs-137	Adjusted Cs-137	Area	Ranks	Reference Ranks
18		0.067	0.067	R	26.5	26.5
19		0.099	0.099	R	35	35
20		0.101	0.101	R	38	38
21		0.148	0.148	R	44	44
22		0.153	0.153	R	46	46
23		0.025	0.025	R	15	15
24		0.188	0.188	R	51	51
25		0.198	0.198	R	53	53
26		0.030	0.030	R	18	18
27		0.079	0.079	R	29	29
28		0.158	0.158	R	47.5	47.5
29		0.109	0.109	R	39	39
30		0.059	0.059	R	25	25
31		0.067	0.067	R	26.5	26.5
32		0.113	0.113	R	40	40
33		0.015	0.015	R	5	5
34		0.031	0.031	R	21	21
35		0.042	0.042	R	24	24
36		0.097	0.097	R	33.5	33.5
37		0.015	0.015	R	5	5
38		0.020	0.020	R	10	10
39		0.085	0.085	R	31	31
40		0.080	0.080	R	30	30
41		0.015	0.015	R	5	5
42		0.020	0.020	R	10	10
43		0.035	0.035	R	22.5	22.5
44		0.035	0.035	R	22.5	22.5
45		0.025	0.025	R	15	15
46		0.150	0.150	R	45	45
47		0.140	0.140	R	41.5	41.5
48		0.190	0.190	R	52	52
49		0.097	0.097	R	33.5	33.5
50		0.030	0.030	R	18	18
51		0.140	0.140	R	41.5	41.5
52	ILWC0001S001	-0.001	-0.001	S	2	0
53	ILWC0002S001	-0.003	-0.003	S	1	0
54	ILWC0003S001	0.011	0.011	S	3	0
55	ILWC0004S001	0.030	0.030	S	20	0
				Sum	1540	1514

Wilcoxon Rank Sum Test -- (Strontium-90)

General Information:
The WRS tests whether or not measurements of samples from a survey area (S)
tend to be consistently larger than those from a background reference area (R) by more than the DCGL..

The null hypothesis, Ho, is: Survey sample concentrations exceed those in the background
The alternative hypothesis, Ha, is: Survey sample concentrations do not exceed those in the background

Instruction on how to use this template:
1) Enter analysis results in pCi/gram
2) Enter number of samples for background and survey data sets, m and n.
3) The WRS test is calculated using the method prescribed in
NUREG-1505, Nuclear Regulatory Commission, "A Non-parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys." January 1998.

DCGL (pCi/g)	0.00
Type I Error Rate, Alpha:	0.05
Type II Error Rate, Beta:	0.05
Number of Background Samples, m:	51
Number of Survey Samples, n:	4
Z-value for Alpha	1.645
Critical Value	1479
Sum of Reference Ranks	1506

If the sum of the reference ranks is larger than the critical value, there is enough evidence to reject the null hypothesis and accept the alterrnative hypothesis. Otherwise the null hypothesis is accepted.

Test Result:
Survey sample concentrations do not exceed those in the background by more than the DCGL

	Bkgd Ref (R)	Survey (S)
Mean	0.051	0.021
Max	0.130	0.030
Min	0.005	0.006
σ	0.030	0.011
m-1.96*σ	-0.008	0.000
m+1.96*σ	0.109	0.041

No.	Soil ID	Sr-90	Adjusted Sr-90	Area	Ranks	Reference Ranks
1		0.030	0.030	R	16	16
2		0.010	0.010	R	3.5	3.5
3		0.045	0.045	R	30.5	30.5
4		0.045	0.045	R	30.5	30.5
5		0.050	0.050	R	40	40
6		0.040	0.040	R	22	22
7		0.035	0.035	R	18.5	18.5
8		0.050	0.050	R	40	40
9		0.050	0.050	R	40	40
10		0.130	0.130	R	54.5	54.5
11		0.120	0.120	R	53	53
12		0.040	0.040	R	22	22
13		0.045	0.045	R	30.5	30.5
14		0.130	0.130	R	54.5	54.5
15		0.050	0.050	R	40	40
16		0.088	0.088	R	48	48
17		0.080	0.080	R	45	45
18		0.100	0.100	R	52	52
19		0.069	0.069	R	44	44
20		0.097	0.097	R	50	50

No.	Soil ID	Sr-90	Adjusted Sr-90	Area	Ranks	Reference Ranks
21		0.084	0.084	R	47	47
22		0.098	0.098	R	51	51
23		0.045	0.045	R	30.5	30.5
24		0.045	0.045	R	30.5	30.5
25		0.020	0.020	R	8	8
26		0.045	0.045	R	30.5	30.5
27		0.089	0.089	R	49	49
28		0.050	0.050	R	40	40
29		0.045	0.045	R	30.5	30.5
30		0.050	0.050	R	40	40
31		0.045	0.045	R	30.5	30.5
32		0.040	0.040	R	22	22
33		0.045	0.045	R	30.5	30.5
34		0.045	0.045	R	30.5	30.5
35		0.045	0.045	R	30.5	30.5
36		0.025	0.025	R	11.5	11.5
37		0.082	0.082	R	46	46
38		0.045	0.045	R	30.5	30.5
39		0.040	0.040	R	22	22
40		0.035	0.035	R	18.5	18.5
41		0.025	0.025	R	11.5	11.5
42		0.005	0.005	R	1	1
43		0.020	0.020	R	8	8
44		0.010	0.010	R	3.5	3.5
45		0.020	0.020	R	8	8
46		0.020	0.020	R	8	8
47		0.050	0.050	R	40	40
48		0.030	0.030	R	16	16
49		0.030	0.030	R	16	16
50		0.020	0.020	R	8	8
51		0.040	0.040	R	22	22
52	ILWC0001S001	0.027	0.027	S	13	0
53	ILWC0002S001	0.030	0.030	S	14	0
54	ILWC0003S001	0.019	0.019	S	5	0
55	ILWC0004S001	0.006	0.006	S	2	0
				Sum	1540	1506

Soil Data from ISRA 009 - IEL-1

No.	Sample ID	Stockpile ID	Sampling Date	Laboratory Batch	Cesium-137 (pCi/g)				Strontium-90 (pCi/g)				Tritium (pCi/g)			
					Activity	+/- 2σ Error	MDA	Non-detect?	Activity	+/- 2σ Error	MDA	Non-detect?	Activity	+/- 2σ Error	MDA	Non-detect?
1	ILWC0001S001	N/A	4/30/2010	252092	-0.000656	0.018	0.0316	NDA	0.0272	0.0217	0.0333	NDA	-0.227	0.453	0.796	NDA
2	ILWC0002S001	N/A	4/30/2010	252092	-0.00295	0.0156	0.0272	NDA	0.0297	0.0258	0.0414	NDA	-0.132	0.453	0.792	NDA
3	ILWC0003S001	N/A	4/30/2010	252092	0.0109	0.0228	0.0394	NDA	0.0188	0.0235	0.0399	NDA	-0.389	0.448	0.798	NDA
4	ILWC0004S001	N/A	4/30/2010	252092	0.0301	0.0212	0.0279		0.00632	0.0203	0.0377	NDA	-0.628	0.434	0.788	NDA

	Cesium-137 (pCi/g)				Strontium-90 (pCi/g)				Tritium (pCi/g)			
	Activity		MDA	Non-detect?	Activity		MDA	Non-detect?	Activity		MDA	Non-detect?
Average	0.009		0.032		0.021		0.038		-0.344		0.794	
Maximum	0.030		0.039		0.030		0.041		-0.132		0.798	
Minimum	-0.003		0.027		0.006		0.033		-0.628		0.788	
Count				4				4				4
Number of Non-Detects				3				4				4
% Non-Detects				75%				100%				100%

Appendix 2

Radionuclide Results

ISRA Outfall 009 - IEL-1

Project Name	Sampling Organization	Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Media Type	Isotope	Value	Error (+/-)	MDA	Non-Detect?	Units	Error Type	Analysis Protocol	Analysis Organization	Document	Status
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Americium-241	-0.0884	0.0796	0.142	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Americium-241	-0.119	0.0954	0.172	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Americium-241	0.019	0.0289	0.05	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Americium-241	0.0516	0.0478	0.0844	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Cesium-134	0	0.0399	0.0492	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Cesium-134	0	0.0265	0.0399	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Cesium-134	0	0.0324	0.055	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Cesium-134	0	0.0251	0.0366	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Cesium-137	-0.000656	0.018	0.0316	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Cesium-137	-0.00295	0.0156	0.0272	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Cesium-137	0.0109	0.0228	0.0394	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Cesium-137	0.0301	0.0212	0.0279		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Cobalt-60	-0.00878	0.0188	0.0313	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Cobalt-60	0.000758	0.0177	0.0304	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Cobalt-60	-0.00617	0.0212	0.0357	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Cobalt-60	0.00829	0.0145	0.0253	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Europium-152	-0.00187	0.0584	0.0838	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Europium-152	-0.0231	0.0448	0.0716	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Europium-152	-0.0101	0.0491	0.0804	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Europium-152	-0.0312	0.0427	0.0606	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Europium-154	-0.0259	0.0573	0.0901	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Europium-154	-0.00441	0.0547	0.0938	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Europium-154	-0.00316	0.0729	0.121	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Europium-154	0.00921	0.0485	0.0826	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Manganese-54	0.0122	0.0195	0.0346	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Manganese-54	-0.00292	0.0165	0.0281	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Manganese-54	0.0354	0.0301	0.0373	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Manganese-54	0.0229	0.0171	0.0242	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Potassium-40	17.4	1.71	0.294		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Potassium-40	20.1	2.03	0.228		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Potassium-40	19.2	1.91	0.278		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Potassium-40	21.3	1.94	0.184		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Sodium-22	-0.00853	0.0201	0.0318	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Sodium-22	0.000322	0.0192	0.0331	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Sodium-22	0.000263	0.0255	0.0424	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Sodium-22	0.00102	0.0171	0.0289	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Strontium-90	0.0272	0.0217	0.0333	NDA	pCi/g	2 sigma	EPA 905.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Strontium-90	0.0297	0.0258	0.0414	NDA	pCi/g	2 sigma	EPA 905.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Strontium-90	0.0188	0.0235	0.0399	NDA	pCi/g	2 sigma	EPA 905.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Strontium-90	0.00632	0.0203	0.0377	NDA	pCi/g	2 sigma	EPA 905.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Thorium-228	1.57	0.168	0.0495		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Thorium-228	1.2	0.136	0.0411		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Thorium-228	1.23	0.136	0.0444		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Thorium-228	1.31	0.145	0.0378		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Thorium-232	1.55	0.238	0.114		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Thorium-232	1.21	0.213	0.101		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Thorium-232	1.25	0.232	0.131		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Thorium-232	1.35	0.211	0.0813		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Tritium	-0.227	0.453	0.796	NDA	pCi/g	2 sigma	EPA 906.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Tritium	-0.132	0.453	0.792	NDA	pCi/g	2 sigma	EPA 906.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Tritium	-0.389	0.448	0.798	NDA	pCi/g	2 sigma	EPA 906.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Tritium	-0.628	0.434	0.788	NDA	pCi/g	2 sigma	EPA 906.0 Modified	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Uranium-235	0.0234	0.106	0.182	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Uranium-235	0.0393	0.0928	0.154	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Uranium-235	0.15	0.137	0.164	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Uranium-235	0.0694	0.0828	0.145	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0001	ILWC0001S001	Soil	Uranium-238	0.973	0.758	1.34	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0002	ILWC0002S001	Soil	Uranium-238	0.765	0.839	1.47	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0003	ILWC0003S001	Soil	Uranium-238	1.43	0.555	0.5		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste
2010 ISRA Waste Characterization	MWH	4/30/2010	IEL-1	ILWC0004	ILWC0004S001	Soil	Uranium-238	0.993	0.598	0.76		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	252092	Waste

Outfall 009
Waste Characterization
Sample Locations for IEL-1

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Report Group Boundary
- NPDES Outfall
- A/C Paving
- Drainage
- Non Jurisdictional Surface Water Pathway
- Surface Water Divide
- Elevation Contour

Base Map Legend

- ISRA Excavation Boundary
- Waste Characterization Sample Location

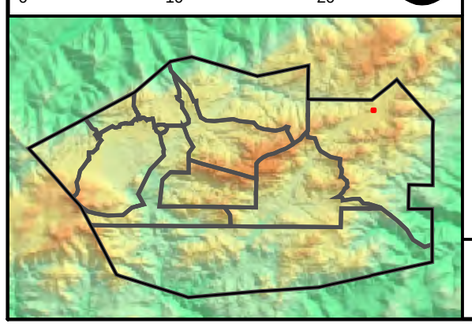
Note:

1. Sample locations and depths were randomly selected. The 3ft x 3ft grid used in the sample location selection process is shown.
2. Aerial imagery from Google Earth, 2010.
3. Topographic contours from Lidar data, 2008.

Document: ISRA_Plots_SP_IEL-1_SampleLocations_062110_WC.mxd Date: Jun 21, 2010

1 inch = 10 feet

0 10 20 Feet



MWH

S A N T A S U S A N A F I E L D L A B O R A T O R Y

FIGURE 1