

Hematite Decommissioning Project	Procedure: HDP-PR-FSS-701, Final Status Survey Plan Development		
		Revision: 10	Appendix P-4 Page 1 of 1

**APPENDIX P-4**  
**FSS SAMPLE & MEASUREMENT LOCATIONS & COORDINATES**

<b>Survey Area:</b>	LSA 08	<b>Description:</b>	Technetium SEA Open Land Area
<b>Survey Unit:</b>	12	<b>Description:</b>	Central Open Land Area
<b>Survey Type:</b>	FSS	<b>Classification:</b>	Class 1

Measurement or Sample ID	Surface or CSM	Type	Start Elevation	End Elevation	Northing (Y Axis) *	Easting (X Axis) *	Remarks / Notes
L08-12-01-T-E-S-00	Deep	S	427.9	427.4	864779	827383	Excavation 6-inch grab
L08-12-02-T-E-S-00	Deep	S	428.7	428.2	864744	827323	Excavation 6-inch grab
L08-12-03-T-E-S-00	Deep	S	428.5	428.0	864744	827363	Excavation 6-inch grab
L08-12-04-T-R-S-00	Root	S	429.2	428.9	864744	827403	Root 9-inch composite
L08-12-05-T-E-S-00	Deep	S	428.9	428.4	864744	827403	Excavation 6-inch grab
L08-12-06-T-E-S-00	Deep	S	426.5	426.0	864744	827443	Excavation 6-inch grab
L08-12-07-T-R-S-00	Root	S	430.0	427.6	864709	827303	Root 9-inch composite
L08-12-08-T-E-S-00	Deep	S	427.6	427.1	864709	827303	Excavation 6-inch grab
L08-12-09-T-R-S-00	Root	S	428.7	428.0	864709	827343	Root 9-inch composite
L08-12-10-T-E-S-00	Deep	S	428.0	427.5	864709	827343	Excavation 6-inch grab
L08-12-11-T-E-S-00	Deep	S	427.6	427.2	864709	827383	Excavation 6-inch grab
L08-12-12-T-R-S-00	Root	S	432.3	429.0	864709	827423	Root 9-inch composite
L08-12-13-T-E-S-00	Deep	S	429.0	428.6	864709	827423	Excavation 6-inch grab
L08-12-14-T-R-S-00	Root	S	428.0	427.9	864674	827323	Root 9-inch composite
L08-12-15-T-E-S-00	Deep	S	427.9	427.4	864674	827323	Excavation 6-inch grab
L08-12-16-T-R-S-00	Root	S	429.7	428.7	864674	827363	Root 9-inch composite
L08-12-17-T-E-S-00	Deep	S	428.7	428.2	864674	827363	Excavation 6-inch grab
L08-12-15-T-E-Q-00	Deep	Q	427.9	427.4	864674	827323	Excavation 6-inch grab
L08-12-21-T-R-Q-00	Root	Q	429.3	428.8	864686	827374	Excavation 6-inch grab
L08-12-18-T-E-B-00	Deep	B	423.1	422.6	864703	827285	Sidewall Sample
L08-12-19-T-R-B-00	Root	B	430.5	430.0	864647	827338	Bias 6-inch grab
L08-12-20-T-R-B-00	Root	B	431.2	430.7	864672	827371	Bias 6-inch grab
L08-12-21-T-R-B-00	Root	B	429.3	428.8	864686	827374	Bias 6-inch grab
L08-12-22-T-R-B-00	Root	B	430.6	430.1	864710	827427	Bias 6-inch grab
L08-12-23-T-R-B-00	Root	B	430.1	429.6	864714	827428	Bias 6-inch grab
L08-12-24-T-E-B-00	Deep	B	428.5	428.0	864771	827368	Bias 6-inch grab
L08-12-25-T-E-B-00	Deep	B	428.7	428.2	864775	827363	Bias 6-inch grab
L08-12-26-T-R-B-00	Root	B	430.4	429.9	864675	827391	Bias 6-inch grab
L08-12-27-T-R-B-00	Root	B	431.3	430.8	864716	827428	Bias 6-inch grab

Green shaded samples are the samples at each sample location, for use in WRS test.

\*Elevations are in feet above mean sea level.

\*\* Missouri - East State Plane Coordinates [North American Datum (NAD) 1983] (Open Land Area) OR

Distance in feet from lower left corner of the surface (Structures); each surface has it's own (X,Y) = (0,0); OR

For piping the distance from the beginning of the survey unit.

Surface: Floor = F; Wall = W; Ceiling = C; Roof = R

CSM: Three-Layer (Surface-Root-Deep) or Uniform

Type: Systematic = S, Biased = B; QC =Q; Investigation = I

Quality Record

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Steps 8.3 Preliminary Data Review and 8.4 Calculation of the Sum-of-Fractions (SOF)

Sample ID	Sample Start Depth (ft)	Type (Systematic, Bias, QC)	TestAmerica Analytical Results Step 8.3.2																								Sample ID	Sample Depth (ft)	Type (Systematic, Bias, QC)			Root Stratum SOF Verification (unexcavated/not backfilled only) Step 8.4.4a.1		root count	excavation count	surface count	MDC SOF Step 8.1.1.c					
			Ra-226						Tc-99				Th-232				Inferred U-234				U-235				U-238					Enr.	SOF Step 8.4.3	Is Sample In the Root Stratum?	Is ROOT Sample SOF $\geq$ 0.5?									
			Result	Uncertainty	MDC	Qualifier	Net Result*	Corrected Result	Result	Corrected Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC	Qualifier	Net Result**	Corrected Result	Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC												Qualifier	Result	Uncertainty	MDC	Qualifier
L08-12-01-T-E-S-00	5.00	S	1.350	0.183	0.077	N/A	0.280	0.280	3.340	3.340	0.383	0.220	N/A	1.280	0.196	0.147	N/A	0.280	0.280	9.632	NA	NA	NA	0.532	0.192	0.220	N/A	1.750	0.601	0.893	N/A	L08-12-01-T-E-S-00	5.00	S	4.6	0.17	EXCAVATION	good		1		0.05
L08-12-02-T-E-S-00	5.00	S	1.260	0.166	0.067	N/A	0.190	0.190	3.360	3.360	0.317	0.226	N/A	1.280	0.175	0.124	N/A	0.280	0.280	11.912	NA	NA	NA	0.658	0.191	0.219	N/A	2.270	0.697	0.825	N/A	L08-12-02-T-E-S-00	5.00	S	4.4	0.16	EXCAVATION	good		1		0.05
L08-12-03-T-E-S-00	5.00	S	1.170	0.155	0.052	N/A	0.100	0.100	5.280	5.280	0.616	0.225	N/A	1.140	0.162	0.093	N/A	0.140	0.140	5.752	NA	NA	NA	0.315	0.141	0.194	N/A	1.820	0.622	0.789	N/A	L08-12-03-T-E-S-00	5.00	S	2.7	0.13	EXCAVATION	good		1		0.04
L08-12-04-T-R-S-00	4.00	S	1.310	0.196	0.085	N/A	0.240	0.240	1.500	1.500	0.488	0.238	N/A	1.330	0.222	0.117	N/A	0.330	0.330	5.498	NA	NA	NA	0.303	0.157	0.227	N/A	1.340	0.351	0.889	N/A	L08-12-04-T-R-S-00	4.00	S	3.4	0.36	ROOT	good	1			0.13
L08-12-05-T-E-S-00	5.00	S	1.120	0.151	0.063	N/A	0.050	0.050	1.400	1.400	0.172	0.241	N/A	1.040	0.176	0.094	N/A	0.040	0.040	1.776	NA	NA	NA	0.092	0.166	0.244	U	1.240	0.511	0.780	N/A	L08-12-05-T-E-S-00	5.00	S	1.2	0.04	EXCAVATION	good		1		0.04
L08-12-06-T-E-S-00	5.00	S	1.210	0.169	0.063	N/A	0.140	0.140	2.260	2.260	0.300	0.258	N/A	1.040	0.162	0.126	N/A	0.040	0.040	4.094	NA	NA	NA	0.225	0.136	0.196	N/A	1.160	0.521	0.799	N/A	L08-12-06-T-E-S-00	5.00	S	3.0	0.07	EXCAVATION	good		1		0.05
L08-12-07-T-R-S-00	4.00	S	1.360	0.183	0.074	N/A	0.290	0.290	1.920	1.920	0.198	0.233	N/A	1.370	0.198	0.115	N/A	0.370	0.370	7.685	NA	NA	NA	0.423	0.178	0.210	N/A	2.050	0.565	0.795	N/A	L08-12-07-T-R-S-00	4.00	S	3.2	0.44	ROOT	good	1			0.12
L08-12-08-T-E-S-00	5.00	S	1.370	0.207	0.081	N/A	0.300	0.300	3.440	3.440	0.339	0.234	N/A	1.170	0.206	0.150	N/A	0.170	0.170	3.059	NA	NA	NA	0.167	0.192	0.301	U	1.050	0.386	1.060	U	L08-12-08-T-E-S-00	5.00	S	2.5	0.14	EXCAVATION	good		1		0.06
L08-12-09-T-R-S-00	4.00	S	1.190	0.163	0.069	N/A	0.120	0.120	2.580	2.580	0.245	0.204	N/A	1.110	0.169	0.084	N/A	0.110	0.110	6.357	NA	NA	NA	0.351	0.153	0.180	N/A	1.350	0.317	0.808	N/A	L08-12-09-T-R-S-00	4.00	S	3.9	0.24	ROOT	good	1			0.10
L08-12-10-T-E-S-00	5.00	S	1.290	0.181	0.080	N/A	0.220	0.220	2.230	2.230	0.366	0.243	N/A	1.140	0.179	0.136	N/A	0.140	0.140	2.372	NA	NA	NA	0.121	0.132	0.213	U	1.720	0.609	0.899	N/A	L08-12-10-T-E-S-00	5.00	S	1.1	0.10	EXCAVATION	good		1		0.05
L08-12-11-T-E-S-00	5.00	S	1.510	0.199	0.074	N/A	0.440	0.440	0.733	0.733	0.112	0.235	N/A	1.380	0.220	0.096	N/A	0.380	0.380	2.144	NA	NA	NA	0.108	0.163	0.268	U	1.830	0.821	0.963	N/A	L08-12-11-T-E-S-00	5.00	S	1.0	0.17	EXCAVATION	good		1		0.04
L08-12-12-T-R-S-00	4.00	S	1.270	0.180	0.079	N/A	0.200	0.200	0.762	0.762	0.140	0.229	N/A	1.330	0.208	0.102	N/A	0.330	0.330	1.646	NA	NA	NA	0.084	0.137	0.252	U	1.280	0.561	0.864	N/A	L08-12-12-T-R-S-00	4.00	S	1.1	0.30	ROOT	good	1			0.13
L08-12-13-T-E-S-00	5.00	S	1.280	0.191	0.065	N/A	0.210	0.210	7.600	7.600	0.813	0.222	N/A	0.931	0.183	0.213	N/A	-0.069	0.000	4.065	NA	NA	NA	0.220	0.180	0.303	U	1.620	0.656	0.987	N/A	L08-12-13-T-E-S-00	5.00	S	2.1	0.15	EXCAVATION	good		1		0.07
L08-12-14-T-R-S-00	4.00	S	1.240	0.168	0.069	N/A	0.170	0.170	4.690	4.690	0.548	0.239	N/A	1.130	0.174	0.114	N/A	0.130	0.130	7.698	NA	NA	NA	0.424	0.123	0.166	N/A	1.960	0.597	0.862	N/A	L08-12-14-T-R-S-00	4.00	S	3.3	0.35	ROOT	good	1			0.12
L08-12-15-T-E-S-00	5.00	S	1.420	0.196	0.081	N/A	0.350	0.350	2.110	2.110	0.244	0.234	N/A	1.150	0.183	0.120	N/A	0.150	0.150	1.917	NA	NA	NA	0.104	0.141	0.241	U	0.738	0.293	0.840	U	L08-12-15-T-E-S-00	5.00	S	2.2	0.13	EXCAVATION	good		1		0.05
L08-12-16-T-R-S-00	4.00	S	1.260	0.179	0.080	N/A	0.190	0.190	2.240	2.240	0.213	0.241	N/A	1.130	0.169	0.103	N/A	0.130	0.130	2.919	NA	NA	NA	0.157	0.151	0.238	U	1.310	0.551	0.846	N/A	L08-12-16-T-R-S-00	4.00	S	1.9	0.25	ROOT	good	1			0.12
L08-12-17-T-E-S-00	5.00	S	1.470	0.196	0.065	N/A	0.400	0.400	1.060	1.060	0.186	0.239	N/A	1.130	0.197	0.160	N/A	0.130	0.130	2.243	NA	NA	NA	0.122	0.115	0.180	U	0.809	0.305	0.860	U	L08-12-17-T-E-S-00	5.00	S	2.3	0.12	EXCAVATION	good		1		0.05
L08-12-15-T-E-Q-00	5.00	Q	1.270	0.169	0.072	N/A	0.200	0.200	1.680	1.680	0.163	0.233	N/A	1.230	0.189	0.104	N/A	0.230	0.230	1.329	NA	NA	NA	0.066	0.160	0.253	U	1.240	0.668	0.835	N/A	L08-12-15-T-E-Q-00	5.00	Q	0.9	0.11	EXCAVATION	good				0.04
L08-12-21-T-R-Q-00	4.70	Q	0.838	0.129	0.059	N/A	-0.232	0.000	20.800	20.800	1.930	0.216	N/A	0.572	0.132	0.112	N/A	-0.428	0.000	18.295	NA	NA	NA	1.010	0.209	0.204	N/A	3.050	0.626	0.745	N/A	L08-12-21-T-R-Q-00	4.70	Q	4.9	0.80	ROOT	FLAG				0.11
L08-12-18-T-E-B-00	10.90	B	1.380	0.193	0.086	N/A	0.310	0.310	1.330	1.330	0.195	0.244	N/A	1.400	0.220	0.117	N/A	0.400	0.400	2.231	NA	NA	NA	0.120	0.180	0.283	U	0.986	0.385	1.040	U	L08-12-18-T-E-B-00	10.90	B	1.9	0.16	EXCAVATION	good				0.05
L08-12-19-T-R-B-00	3.50	B	1.260	0.170	0.062	N/A	0.190	0.190	1.970	1.970	0.212	0.226	N/A	1.180	0.190	0.103	N/A	0.180	0.180	20.023	NA	NA	NA	1.070	0.239	0.246	N/A	1.380	0.582	0.893	N/A	L08-12-19-T-R-B-00	3.50	B	10.8	0.36	ROOT	good				0.12
L08-12-20-T-R-B-00	2.80	B	1.110	0.170	0.075	N/A	0.040	0.040	35.200	35.200	3.300	0.210	N/A	0.581	0.145	0.380	N/A	-0.419	0.000	75.402	NA	NA	NA	4.150	0.566	0.354	N/A	10.400	1.470	1.280	N/A	L08-12-20-T-R-B-00	2.80	B	5.9	1.63	ROOT	FLAG				0.27
L08-12-21-T-R-B-00	4.70	B	0.758	0.103	0.031	N/A	-0.312	0.000	23.300	23.300	2.220	0.200	N/A	0.452	0.077	0.045	N/A	-0.548	0.000	17.423	NA	NA	NA	0.962	0.175	0.149	N/A	3.030	0.541	0.593	N/A	L08-12-21-T-R-B-00	4.70	B	4.8	0.88	ROOT	FLAG				0.06
L08-12-22-T-R-B-00	3.40	B	0.874	0.126	0.059	N/A	-0.196	0.000	3.390	3.390	0.317	0.225	N/A	0.903	0.134	0.091	N/A	-0.097	0.000	15.569	NA	NA	NA	0.857	0.208	0.215	N/A	4.140	0.887	0.876	N/A	L08-12-22-T-R-B-00	3.40	B	3.2	0.21	ROOT	good				0.11
L08-12-23-T-R-B-00	2.90	B	0.918	0.131	0.063	N/A	-0.152	0.000	6.260	6.260	0.588	0.211	N/A	1.250	0.169	0.112	N/A	0.250	0.250	77.985	NA	NA	NA	4.270	0.515	0.263	N/A	8.950	1.420	1.210	N/A	L08-12-23-T-R-B-00	2.90	B	7.0	0.78	ROOT	FLAG				0.12
L08-12-24-T-E-B-00	5.50	B	1.260	0.172	0.073	N/A	0.190	0.190	3.000	3.000	0.309	0.229	N/A	1.110	0.174	0.121	N/A	0.110	0.110	190.639	NA	NA	NA	9.010	0.979	0.392	N/A	3.720	0.870	1.180	N/A	L08-12-24-T-E-B-00	5.50	B	27.4	0.37	EXCAVATION	good				0.05
L08-12-25-T-E-B-00	5.30	B	1.130	0.196	0.111	N/A	0.060	0.060	0.967	0.967	0.159	0.220	N/A	1.010	0.198	0.193	N/A	0.010	0.010	119.988	NA	NA	NA	5.630	0.670	0.335	N/A	2.210	0.572	1.290	N/A	L08-12-25-T-E-B-00	5.30	B	28.4	0.19	EXCAVATION	good				0.07
L08-12-26-T-R-B-00	3.60	B	0.941	0.132	0.060	N/A	-0.129	0.000	15.700	15.700	1.510	0.210	N/A	0.901	0.140	0.075	N/A	-0.099	0.000	4.484	NA	NA	NA	0.247	0.139	0.170	N/A	1.160	0.318	0.776	N/A	L08-12-26-T-R-B-00	3.6									

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Steps 8.3 Preliminary Data Review and 8.4 Calculation of the Sum-of-Fractions (SOF)

Use corrected net results for all DE calcs 721 Sec. 8.4.2

Step 8.4.1

DCLG <sub>W</sub> , Measure Tc-99, All SEAs			
	Surface	Root	Excavation
U-234	508.5	235.6	872.4
U-235	102.3	64.1	208.1
U-238	297.6	183.3	551.1
Tc-99	151	30.1	74
Th-232	4.7	2	5.2
Ra-226	5	2.1	5.4

Infer U234 Step 8.3.4			
U-238/U235	U-234/U235	U-234	%
3.3	18.1	9.6	4.6
3.4	18.1	11.9	4.4
5.8	18.3	5.8	2.7
4.4	18.1	5.5	3.4
13.5	19.4	1.8	1.2
5.2	18.2	4.1	3.0
4.8	18.2	7.7	3.2
6.3	18.3	3.1	2.5
3.8	18.1	6.4	3.9
14.2	19.6	2.4	1.1
16.9	19.9	2.1	1.0
15.2	19.6	1.6	1.1
7.4	18.5	4.1	2.1
4.6	18.2	7.7	3.3
7.1	18.4	1.9	2.2
8.3	18.6	2.9	1.9
6.6	18.4	2.2	2.3
18.8	20.2	1.3	0.9
3.0	18.1	18.3	4.9
8.2	18.6	2.2	1.9
1.3	18.7	20.0	10.8
2.5	18.2	75.4	5.9
3.1	18.1	17.4	4.8
4.8	18.2	15.6	3.2
2.1	18.3	78.0	7.0
0.4	21.2	190.6	27.4
0.4	21.3	120.0	28.4
4.7	18.2	4.5	3.3
2.3	18.2	39.7	6.4
Average Enrichment (%)			3.18

Infer U-234 MDC using U-235 MDC \* ratio of U-234:U-235 @ that sample's enrichment

3.98
3.96
3.54
4.12
4.73
3.57
3.82
5.51
3.26
4.17
5.32
4.94
5.60
3.01
4.44
4.43
3.31
5.10
3.70
5.26
4.60
6.43
2.70
3.91
4.80
8.29
7.14
3.09
4.50

Step 8.4.5b

weighted SOF <sub>MEAN</sub>	0.30		
	SS	RS	ES
fractions	0	0.545454545	1

Step 8.6 EMC Dose

0.14

Step 8.4.5e SOF<sub>MEAN</sub> Groundwater

0.16

Step 8.4.5g (<=1)

SOF<sub>MEAN, SU</sub> 0.60 PASS

Step 8.4.6 Calculate the dose contribution for the SU by multiplying SOF <sub>MEAN, SU</sub> (including contribution from Re-use backfill and Groundwater) by 25
mrem
15.0 mrem

[illegible]

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Step 8.6 Investigations

Elevated Measurement Comparison

Sample ID Step	Sample Depth (ft)	Type Systematic, Bias, QC	TestAmerica Analytical Results																								SOF					
			Ra-226						Tc-99					Th-232					U-234				U-235					U-238				
			Result	Uncertainty	MDC	Qualifier	Net Result*	Corrected Result	Result	Corrected Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC	Qualifier	Net Result**	Corrected Result	Result	Uncertainty	MDC	Qualifier	Result	Uncertainty	MDC		Qualifier	Result	Uncertainty	MDC	Qualifier
L08-12-20-T-R-B-00	2.8	B	1.11	0.17	0.0745	N/A	0.04	0.04	35.2	35.2	3.3	0.21	N/A	0.581	0.145	0.38	N/A	-0.419	0	75.4	NA	NA	NA	4.15	0.566	0.354	N/A	10.4	1.47	1.28	N/A	1.63
With ingrowth, use Ra226 bkg =			1.07						Th232 bkg =					1.0																		

NOTES:

Gross results in units of pCi/g

\* Background with ingrowth (1.07 pCi/g) subtracted from gross result

\*\*Background (1.0 pCi/g) subtracted from gross result

U qualifier: A normal, non-detected result (result less than MDC).

All uncertainty values are reported at the 2-sigma confidence level.

Step 8.6.7.c.

DCGL-EMC	
Ra-226	7.7563
Tc-99	273.82
Th-232	5.7649
U-234	2018
U-235	144.31
U-238	633.46

Step 8.6.7.e. "clean" systematic samples  $\delta_i$

0.229
2.736
0.185
4.751
0.259
1.488

Step 8.6.7.f.1)

$\tau_i$
0.04
35.20
0.00
75.40
4.15
10.40

$\tau_i - \delta_i$

-0.189
32.464
-0.185
70.651
3.891
8.912

Step 8.6.7.f.2)

$f_{lev}$
-0.024
0.119
-0.032
0.035
0.027
0.014

Step 8.6.7.f.3)  $f_{EMC} = 0.138$

Step 8.6.7.g. Summed elevated radioactivity fractions for the SU = 0.14 = EMC SOF

Step 8.6.7.h. Total SOF for the SU = 0.60 PASS

Step 8.6.7.i.

weighted SOF <sub>MEAN</sub>	0.30
SOF <sub>MEAN</sub> Re-use Backfill Material (used off-site BF)	0
SOF <sub>MEAN</sub> Groundwater	0.16

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Step 8.6 Investigations

Step 8.6.6	Bounding samples:
Step 8.6.7b	
Need area from GIS.	113.1 m <sup>2</sup>
	Confirm area

Step 8.6.7.a. DCLG<sub>W</sub>, Root, Measure Tc-99, All SEAs

	Root
U-234	235.6
U-235	64.1
U-238	183.3
Tc-99	30.1
Th-232	2
Ra-226	2.1

Step 8.6.7b

Root Stratum

Radionuclide	Elevated Measurement Area (m <sup>2</sup> )									
	153,375	10,000	3,000	1,000	300	100	30	10	3	1
U-234	1.0	1.2	1.3	1.3	4.0	9.3	19.6	34.3	70.5	132.8
U-235	1.0	1.1	1.1	1.1	1.9	2.5	3.3	4.7	9.6	20.5
U-238	1.0	1.1	1.3	1.3	2.5	3.6	5.0	7.2	14.9	31.6
Tc-99	1.0	1.0	1.0	1.0	3.4	10.3	34.3	102.9	342.7	1,027
Th-232	1.0	1.0	1.0	1.0	2.1	3.0	4.2	6.1	12.9	28.9
Ra-226	1.0	1.1	1.1	1.1	2.5	4.1	6.1	9.1	19.3	43.4

Interpolated results:

113.1
8.6
2.3
3.5
9.1
2.9
3.7

Step 8.6.7.e.  $\delta_i$  = average concentration of systematic "clean" samples for each "elevated" nuclide

(Use corrected net results.)

Step 8.6.7.f.1)  $\tau_i$  = average concentration of elevated sample(s) for each ROC

Step 8.6.7.f.2)  $f_{elev}$  = elevated radioactivity fraction

$$\frac{\tau_i - \delta_i}{DCLG_{EMC}}$$

Step 8.6.7.f.3) Sum all  $f_{elev}$  (all ROCs in the elevated area) if applicable

Step 8.6.7.g. Sum all  $f_{EMC}$  (all elevated areas in the SU) if applicable

Step 8.6.7.h. Sum Step 8.6.7.g. and Step 8.4.5.g. ( $SOF_{MEAN,SU}$  use total SOF SU (including GW, BF, etc.)

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Step 8.6.7b. Area Factor Interpolation

The following equation is from "Decommissioning Health Physics: A Handbook for MARSSIM Users," p. 277, Abelquist, 2001, for interpolating Area Factors (AF) from the first existing AF under (smaller) than the desired area and the first existing AF over (larger) the desired area.

$$e^{\left[\frac{(\ln(actual\ area)-\ln(under\ area))(\ln(over\ AF)-\ln(under\ AF))}{\ln(over\ area)-\ln(under\ area)}+\ln(under\ AF)\right]}$$

Ra-226 Excavation Area Factors		
	Area (m²)	AF
Under	30	4.0
Over	100	2.0
Interpolated	40	3.39

Tc-99 Excavation Area Factors		
	Area (m²)	AF
Under	30	6.7
Over	100	2.0
Interpolated	40	5.02

Th-232 Excavation Area Factors		
	Area (m²)	AF
Under	30	3.0
Over	100	1.9
Interpolated	40	2.7

U-234 Excavation Area Factors		
	Area (m²)	AF
Under	30	6.7
Over	100	2.0
Interpolated	40	5.0

U-235 Excavation Area Factors		
	Area (m²)	AF
Under	30	2.0
Over	100	1.3
Interpolated	40	1.8

U-238 Excavation Area Factors		
	Area (m²)	AF
Under	30	3.0
Over	100	1.9
Interpolated	40	2.7

Ra-226 Root Area Factors		
	Area (m²)	AF
Under	100	3.9
Over	300	2.4
Interpolated	113	3.7

Tc-99 Root Area Factors		
	Area (m²)	AF
Under	100	10
Over	300	3.4
Interpolated	113	9.1

Th-232 Root Area Factors		
	Area (m²)	AF
Under	100	3.0
Over	300	2.1
Interpolated	113	2.9

U-234 Root Area Factors		
	Area (m²)	AF
Under	100	9.4
Over	300	4.1
Interpolated	113	8.6

U-235 Root Area Factors		
	Area (m²)	AF
Under	100	2.3
Over	300	1.9
Interpolated	113	2.3

U-238 Root Area Factors		
	Area (m²)	AF
Under	100	3.6
Over	300	2.5
Interpolated	113	3.5

Enter the appropriate AF from tables in HDP-PR-FSS-721 Appendix E:

- 1. Choose appropriate stratum
- 2. Choose elevated ROC
- 3. Enter appropriate Elevated Measurement Areas (m², Over and Under)
- 4. Enter area (m²) of elevated area to be Interpolated
- 5. Use Interpolated AF in Investigation worksheet

From HDP-PR-FSS-721, Appendix E Area Factors for Soil Contamination

Surface Stratum										
Elevated Measurement Area (m²)										
Radionuclide	153,375	10,000	3,000	1,000	300	100	30	10	3	1
U-234	1.0	1.5	2.2	2.6	7.8	19.3	41.7	67.3	96.0	119.5
U-235	1.0	1.1	1.2	1.2	1.3	1.5	1.8	2.6	5.4	12.1
U-238	1.0	1.2	1.5	1.6	2.2	2.6	3.4	4.9	10.2	22.3
Tc-99	1.0	1.0	1.0	1.0	3.4	10.3	34.2	102.2	338.5	1,009
Th-232	1.0	1.0	1.1	1.1	1.4	1.7	2.3	3.5	7.3	16.9
Ra-226	1.0	1.1	1.2	1.2	1.8	2.2	3.0	4.5	9.6	22.4

Root Stratum										
Elevated Measurement Area (m²)										
Radionuclide	153,375	10,000	3,000	1,000	300	100	30	10	3	1
U-234	1.0	1.2	1.3	1.4	4.1	9.4	19.2	33.0	67.9	130.4
U-235	1.0	1.0	1.1	1.1	1.9	2.3	2.9	4.1	8.3	17.9
U-238	1.0	1.1	1.3	1.3	2.5	3.6	5.0	7.2	14.8	31.5
Tc-99	1.0	1.0	1.0	1.0	3.4	10.3	34.3	103.0	343.3	1,029
Th-232	1.0	1.0	1.0	1.0	2.1	3.0	4.2	6.0	12.8	28.4
Ra-226	1.0	1.0	1.1	1.1	2.4	3.9	5.8	8.7	18.5	41.6

Excavation Stratum										
Elevated Measurement Area (m²)										
Radionuclide					148	100	30	10	3	1
U-234					1.0	2.0	6.7	19	35	65
U-235					1.0	1.3	2	2	4	7
U-238					1.0	1.9	3	4	7	13
Tc-99					1.0	2.0	6.7	20	67	200
Th-232					1.0	1.9	3	4	7	14
Ra-226					1.0	2.0	4	5	10	20

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Step 8.6.7b. Area Factor Interpolation

Ra-226 Surface Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	4.5
Over	30	3.0
Interpolated	13	4.08

Tc-99 Surface Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	102.2
Over	30	34.2
Interpolated	13	78.69

Th-232 Surface Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	3.5
Over	30	2.3
Interpolated	13	3.2

U-234 Surface Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	67.3
Over	30	41.7
Interpolated	13	60.0

U-235 Surface Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	2.6
Over	30	1.8
Interpolated	13	2.4

U-238 Surface Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	4.9
Over	30	3.4
Interpolated	13	4.5

Ra-226 Uniform Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	9.1
Over	30	6.1
Interpolated	26	6.4

Tc-99 Uniform Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	103
Over	30	34.3
Interpolated	26	39.0

Th-232 Uniform Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	6.1
Over	30	4.2
Interpolated	26	4.4

U-234 Uniform Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	34.3
Over	30	19.6
Interpolated	26	20.9

U-235 Uniform Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	4.7
Over	30	3.3
Interpolated	26	3.4

U-238 Uniform Area Factors		
	Area (m <sup>2</sup> )	AF
Under	10	7.2
Over	30	5.0
Interpolated	26	5.2

Uniform Stratum										
Elevated Measurement Area (m <sup>2</sup> )										
Radionuclide	153,375	10,000	3,000	1,000	300	100	30	10	3	1
U-234	1.0	1.2	1.3	1.3	4.0	9.3	19.6	34.3	70.5	132.8
U-235	1.0	1.1	1.1	1.1	1.9	2.5	3.3	4.7	9.6	20.5
U-238	1.0	1.1	1.3	1.3	2.5	3.6	5.0	7.2	14.9	31.6
Tc-99	1.0	1.0	1.0	1.0	3.4	10.3	34.3	102.9	342.7	1,027
Th-232	1.0	1.0	1.0	1.0	2.1	3.0	4.2	6.1	12.9	28.9
Ra-226	1.0	1.1	1.1	1.1	2.5	4.1	6.1	9.1	19.3	43.4

Change area if it is incorrect. Make sure "over" and "under" correlate for all six nuclides.



**HDP-PR-FSS-721 Final Status Survey Data Evaluation**  
**Step 8.5 Performance of Statistical Tests**

WRS TEST					
SAMPLE ID	AREA (Reference, Survey Unit)	Gross SOF ( $X_{i,ref}$ , $Y_{i,su}$ ) Step 8.5.3a	ADJUSTED SOF ( $Z_i$ ) Step 8.5.3b	RANKS Step 8.5.3d	REFERENCE AREA RANKS
9574-SS-140910-01-01	Reference	1.13	2.130	41	41
9574-SS-140910-01-02	Reference	0.72	1.721	19	19
9574-SS-140910-01-03	Reference	0.97	1.970	28	28
9574-SS-140910-01-04	Reference	0.97	1.967	27	27
9574-SS-140910-01-05	Reference	0.95	1.952	25	25
9574-SS-140910-01-07	Reference	0.83	1.829	21	21
9574-SS-140910-01-08	Reference	0.99	1.987	31	31
9574-SS-140910-01-09	Reference	0.90	1.904	23	23
9574-SS-140910-01-10	Reference	1.14	2.144	42	42
9574-SS-140910-01-11	Reference	0.96	1.958	26	26
9574-SS-140910-01-12	Reference	1.16	2.160	44	44
9574-SS-140910-01-13	Reference	0.98	1.9826	30	30
9574-SS-140910-01-14	Reference	0.95	1.9513	24	24
9574-SS-140910-01-15	Reference	0.82	1.824	20	20
9574-SS-140910-01-16	Reference	1.17	2.171	45	45
9574-SS-140910-01-17	Reference	1.12	2.124	39	39
9574-SS-140910-01-18	Reference	1.24	2.241	47	47
9574-SS-140910-01-20	Reference	1.11	2.115	38	38
9574-SS-140910-01-21	Reference	1.01	2.009	33	33
9574-SS-140910-01-22	Reference	1.05	2.053	34	34
9574-SS-140910-01-23	Reference	1.23	2.234	46	46
9574-SS-140910-01-24	Reference	1.28	2.277	48	48
9574-SS-140910-01-25	Reference	1.09	2.091	36	36
9574-SS-140910-01-26	Reference	1.13	2.127	40	40
9574-SS-140910-01-27	Reference	1.16	2.160	43	43
9574-SS-140910-01-28	Reference	1.31	2.314	49	49
9574-SS-140910-01-29	Reference	1.00	1.999	32	32
9574-SS-140910-01-30	Reference	0.89	1.891	22	22
9574-SS-140910-01-31	Reference	1.06	2.064	35	35
9574-SS-140910-01-32	Reference	1.10	2.097	37	37
9574-SS-140910-01-33	Reference	0.98	1.975	29	29
9574-SS-140910-01-34	Reference	0.41	1.411	14	14
L08-12-01-T-E-S-00	Survey Unit	1.45	1.453	17	0
L08-12-02-T-E-S-00	Survey Unit	1.42	1.425	15	0
L08-12-03-T-E-S-00	Survey Unit	1.34	1.342	9	0
L08-12-04-T-R-S-00	Survey Unit	1.37	1.374	13	0
L08-12-05-T-E-S-00	Survey Unit	1.12	1.116	1	0
L08-12-06-T-E-S-00	Survey Unit	1.20	1.198	2	0
L08-12-07-T-R-S-00	Survey Unit	1.45	1.447	16	0
L08-12-08-T-E-S-00	Survey Unit	1.37	1.373	12	0
L08-12-09-T-R-S-00	Survey Unit	1.25	1.247	3	0
L08-12-10-T-E-S-00	Survey Unit	1.28	1.280	5	0
L08-12-11-T-E-S-00	Survey Unit	1.45	1.454	18	0
L08-12-12-T-R-S-00	Survey Unit	1.31	1.310	6	0
L08-12-13-T-E-S-00	Survey Unit	1.36	1.357	10	0
L08-12-14-T-R-S-00	Survey Unit	1.36	1.361	11	0
L08-12-15-T-E-S-00	Survey Unit	1.34	1.335	8	0
L08-12-16-T-R-S-00	Survey Unit	1.26	1.261	4	0
L08-12-17-T-E-S-00	Survey Unit	1.32	1.316	7	0
Rank Sums				1225	1068
# Reference Area Measurements				m	32
# Survey Unit Measurements				n	17
Total Number of Measurements Step 8.5.3c				N	49
$\alpha$ percentile of a standard normal distribution (MARSSIM Pg. I-10)				z	1.645
WRS Critical Value (MARSSIM Pg. I-10, Eq. I.1)				CV	879

Step 8.5.1

Min adjusted bkg SOF:

1.41

Stratum

Perform WRS test	EXCAVATION
Perform WRS test	EXCAVATION
No WRS test necessary	EXCAVATION
No WRS test necessary	ROOT
No WRS test necessary	EXCAVATION
No WRS test necessary	EXCAVATION
Perform WRS test	ROOT
No WRS test necessary	EXCAVATION
No WRS test necessary	ROOT
No WRS test necessary	EXCAVATION
Perform WRS test	EXCAVATION
No WRS test necessary	ROOT
No WRS test necessary	EXCAVATION
No WRS test necessary	ROOT
No WRS test necessary	EXCAVATION
No WRS test necessary	ROOT
No WRS test necessary	EXCAVATION

$W_r$  Step 8.5.3e

$\alpha = 0.05$

TEST: **PASS**

Step 8.5.3f

HDP-PR-FSS-721 Final Status Survey Data Evaluation  
Performance of Statistical Tests

Background Soil Locations - Surface and Sub-Surface Soil - Statistical and Analytical Sample Results  
Surface and Sub-Surface - Background Soil - Analytical Results

Sample ID	Ra-226 w/ 21-Day Ingrowth			Th-232			U-234*			U-235*			U-238*			SOF
	(pCi/g)			(pCi/g)			(pCi/g)			(pCi/g)			(pCi/g)			
	Conc.	Error	MDC	Conc.	Error	MDC	Conc.	Error	MDC	Conc.	Error	MDC	Conc.	Error	MDC	
9574-SS-140910-01-01	1.150	0.164	0.068	1.150	0.178	0.133	0.671	0.181	0.050	0.022	0.040	0.071	0.724	0.189	0.050	1.13
9574-SS-140910-01-02	0.719	0.103	0.045	0.749	0.120	0.090	0.353	0.129	0.051	0.011	0.028	0.063	0.379	0.135	0.068	0.72
9574-SS-140910-01-03	1.040	0.166	0.077	0.936	0.183	0.145	0.518	0.164	0.062	0.015	0.030	0.044	0.723	0.195	0.036	0.97
9574-SS-140910-01-04	1.010	0.138	0.051	0.962	0.171	0.090	0.390	0.138	0.034	0.014	0.029	0.043	0.591	0.172	0.060	0.97
9574-SS-140910-01-05	0.995	0.160	0.085	0.948	0.178	0.091	0.345	0.163	0.083	0.000	0.009	0.068	0.421	0.179	0.055	0.95
9574-SS-140910-01-07	0.858	0.133	0.064	0.831	0.150	0.110	0.512	0.160	0.035	0.038	0.051	0.075	0.453	0.150	0.035	0.83
9574-SS-140910-01-08	1.030	0.143	0.064	0.979	0.139	0.087	0.832	0.210	0.075	0.000	0.005	0.043	0.632	0.179	0.053	0.99
9574-SS-140910-01-09	1.080	0.169	0.070	0.768	0.188	0.184	0.484	0.159	0.055	0.043	0.053	0.069	0.493	0.161	0.063	0.90
9574-SS-140910-01-10	1.170	0.174	0.077	1.160	0.191	0.143	0.571	0.169	0.064	0.034	0.050	0.080	0.757	0.196	0.034	1.14
9574-SS-140910-01-11	0.972	0.136	0.084	0.977	0.142	0.079	0.606	0.174	0.059	0.028	0.040	0.042	0.575	0.168	0.034	0.96
9574-SS-140910-01-12	1.220	0.184	0.086	1.140	0.210	0.139	0.747	0.199	0.054	0.056	0.060	0.067	0.997	0.233	0.036	1.16
9574-SS-140910-01-13	1.020	0.140	0.076	0.978	0.157	0.096	0.724	0.198	0.037	0.046	0.053	0.046	0.744	0.201	0.056	0.98
9574-SS-140910-01-14	1.050	0.146	0.061	0.889	0.156	0.080	0.705	0.193	0.061	0.029	0.042	0.044	0.607	0.178	0.067	0.95
9574-SS-140910-01-15	0.805	0.121	0.058	0.871	0.140	0.110	0.434	0.145	0.058	-0.003	0.005	0.064	0.594	0.171	0.034	0.82
9574-SS-140910-01-16	1.320	0.201	0.090	1.070	0.189	0.153	0.513	0.152	0.054	0.049	0.052	0.059	0.835	0.198	0.031	1.17
9574-SS-140910-01-17	1.190	0.165	0.070	1.100	0.179	0.129	0.639	0.183	0.062	0.024	0.043	0.077	0.844	0.213	0.036	1.12
Min	0.72			0.75			0.35			0.00			0.38			0.72
Max	1.32			1.16			0.83			0.06			1.00			
Mean	1.04			0.97			0.57			0.03			0.65			
Stdev	0.16			0.13			0.15			0.02			0.17			

Use Root DCGLs.

Sub-Surface

Sample ID	Ra-226 w/ 21-Day Ingrowth			Th-232			U-234*			U-235*			U-238*			SOF
	(pCi/g)			(pCi/g)			(pCi/g)			(pCi/g)			(pCi/g)			
	Conc.	Error	MDC	Conc.	Error	MDC	Conc.	Error	MDC	Conc.	Error	MDC	Conc.	Error	MDC	
9574-SS-140910-01-18	1.340	0.193	0.085	1.190	0.200	0.117	0.808	0.200	0.062	0.038	0.047	0.062	0.745	0.191	0.049	1.24
9574-SS-140910-01-20	1.260	0.206	0.109	1.010	0.197	0.176	1.120	0.241	0.057	0.068	0.061	0.041	0.710	0.187	0.050	1.11
9574-SS-140910-01-21	1.070	0.156	0.074	0.982	0.153	0.124	1.040	0.232	0.050	0.028	0.039	0.041	0.705	0.187	0.050	1.01
9574-SS-140910-01-22	0.922	0.131	0.057	1.210	0.170	0.106	0.829	0.215	0.065	0.013	0.032	0.071	0.981	0.236	0.037	1.05
9574-SS-140910-01-23	1.130	0.170	0.084	1.370	0.229	0.115	1.140	0.254	0.055	0.073	0.068	0.069	0.994	0.235	0.036	1.23
9574-SS-140910-01-24	1.200	0.165	0.065	1.390	0.221	0.131	1.090	0.247	0.055	0.024	0.043	0.078	0.992	0.234	0.055	1.28
9574-SS-140910-01-25	1.230	0.164	0.065	0.990	0.156	0.126	0.887	0.216	0.053	0.069	0.065	0.065	0.959	0.226	0.070	1.09
9574-SS-140910-01-26	1.080	0.159	0.079	1.210	0.179	0.106	0.730	0.219	0.078	0.019	0.037	0.056	0.764	0.223	0.045	1.13
9574-SS-140910-01-27	1.310	0.185	0.082	1.050	0.163	0.110	1.160	0.255	0.036	0.059	0.059	0.044	0.956	0.228	0.062	1.16
9574-SS-140910-01-28	1.280	0.188	0.089	1.390	0.201	0.131	0.871	0.217	0.055	0.060	0.060	0.045	0.895	0.220	0.036	1.31
9574-SS-140910-01-29	1.080	0.154	0.081	0.955	0.160	0.146	0.842	0.208	0.059	0.011	0.029	0.064	0.708	0.189	0.051	1.00
9574-SS-140910-01-30	0.960	0.161	0.086	0.851	0.166	0.156	0.744	0.196	0.035	0.072	0.065	0.043	0.787	0.203	0.053	0.89
9574-SS-140910-01-31	1.060	0.146	0.050	1.100	0.159	0.089	0.572	0.170	0.070	0.099	0.075	0.043	0.986	0.228	0.052	1.06
9574-SS-140910-01-32	1.060	0.157	0.071	1.170	0.177	0.078	0.598	0.174	0.060	0.058	0.058	0.043	0.758	0.198	0.060	1.10
9574-SS-140910-01-33	1.030	0.147	0.069	0.954	0.153	0.119	0.772	0.196	0.050	0.014	0.028	0.041	0.828	0.203	0.033	0.98
9574-SS-140910-01-34	0.618	0.099	0.040	0.225	0.085	0.099	0.389	0.138	0.052	0.014	0.029	0.043	0.494	0.156	0.035	0.41
Min	0.62			0.23			0.39			0.01			0.49			0.41
Max	1.34			1.39			1.16			0.0992			0.994			
Mean	1.10			1.07			0.85			0.04			0.83			
Stdev	0.18			0.28			0.22			0.03			0.14			

\* alpha spectroscopy results.

Use Root DCGLs.

DCLG <sub>w</sub> , Measure Tc-99, All SEAs			
	Surface	Root	Excavation
U-234	508.5	235.6	872.4
U-235	102.3	64.1	208.1
U-238	297.6	183.3	551.1
Tc-99	151	30.1	74
Th-232	4.7	2	5.2
Ra-226	5	2.1	5.4

No Tc-99 expected in background area.

Dataset Min = 0.618 0.225 0.345 -0.00262 0.379

HDP-PR-FSS-701 Final Status Survey Plan Development  
Appendix P-1 Step 8. Calculate the Number of Samples in the Statistical Survey Population

DCGL Criteria Evaluation	
N/2 Value Verification	
Isotope(s)	SOF (Ra/Tc/Th/Iso U)
St. Dev.	0.11
DCGL <sub>SOF</sub>	1
LBGR (Mean)	0.30
Shift	0.70
Relative Shift ( $\Delta/\sigma$ )	6.27
MARSSIM Table 5.1 ( $P_r$ )	1.000000
N	12
N + 20%	14.4
N/2	8
FSS N/2	11
Verification Check	SUFFICIENT MEASUREMENTS
"N/2" Corresponds to the number of survey unit measurement locations required for the WRS Test	

MARSSIM Table 5.1

$\Delta/\sigma$	$P_r$
0.1	0.528182
0.2	0.556223
0.3	0.583985
0.4	0.611335
0.5	0.638143
0.6	0.664290
0.7	0.689665
0.8	0.714167
0.9	0.737710
1.0	0.760217
1.1	0.781627
1.2	0.801892
1.3	0.820978
1.4	0.838864
1.5	0.855541
1.6	0.871014
1.7	0.885299
1.8	0.898420
1.9	0.910413
2.0	0.921319
2.25	0.944167
2.5	0.961428
2.75	0.974067
3.0	0.983039
3.5	0.993329
4.0	0.997658
4.01	1.000000

MARSSIM Table 5.2,  $\alpha = 0.05$ ,  $\beta = 0.10$

$\alpha$ (or $\beta$ )	$Z_{1-\alpha}$ (or $Z_{1-\beta}$ )
0.005	2.576
0.01	2.326
0.015	2.241
0.025	1.960
0.05	1.645
0.10	1.282
0.15	1.036
0.2	0.842
0.25	0.674
0.30	0.524

$\alpha$   
 $\beta$

Hematite Decommissioning Project		Procedure: HDP-PR-FSS-703, Final Status Survey Quality Control										
										Revision: 2	Page 1 of 1	
<b>FORM HDP-PR-FSS-703-1</b> <b>FIELD DUPLICATE SAMPLE ASSESSMENT</b>												
Survey Unit No.:		LSA 08-12			Survey Unit Description:		Central Open Land Area					
Sample ID	Field Duplicate Sample ID	Radionuclide	Sample (pCi/g)		Field Duplicate Sample (pCi/g)		Average Activity ( $\bar{x}$ ) (pCi/g)	Nuclide DCGL (pCi/g)	Statistic <sup>2</sup>	Warning Limit	Control Limit	Statistic Exceeds Limit? (Y/N)
			Activity (x <sub>i</sub> )	MDC	Activity (x <sub>i</sub> )	MDC						
L08-12-15-T-E-S-00	L08-12-15-T-E-Q-00	Ra-226	1.420	0.0805	1.270	0.072	1.345	5.4	0.150	0.764	1.145	N
L08-12-15-T-E-S-00	L08-12-15-T-E-Q-00	Tc-99	2.11	0.234	1.680	0.233	1.895	74	0.430	10.471	15.688	N
L08-12-15-T-E-S-00	L08-12-15-T-E-Q-00	Th-232	1.150	0.120	1.230	0.104	1.190	5.2	0.080	0.736	1.102	N
L08-12-15-T-E-S-00	L08-12-15-T-E-Q-00	U-234 <sup>1</sup>	1.917	N/A	1.329	N/A	1.623	872.4	0.588	123.445	184.949	N
L08-12-15-T-E-S-00	L08-12-15-T-E-Q-00	U-235	0.104	0.241	0.066	0.253	0.085	208.1	NA	29.446	44.117	NA
L08-12-15-T-E-S-00	L08-12-15-T-E-Q-00	U-238	0.738	0.84	1.240	0.835	0.989	551.1	NA	77.981	116.833	NA
Comments: 1. U-234 is inferred, no MDC available. 2. Duplicate assessment is not necessary if the result of either sample is < MDC.												
Performed by: Thomas Yardy						Reviewed by: Clark Evers						
Date:						Date:						
Quality Record												

Hematite Decommissioning Project		Procedure: HDP-PR-FSS-703, Final Status Survey Quality Control										
										Revision: 2	Page 1 of 1	
<b>FORM HDP-PR-FSS-703-1</b> <b>FIELD DUPLICATE SAMPLE ASSESSMENT</b>												
Survey Unit No.:		LSA 08-12			Survey Unit Description:		Central Open Land Area					
Sample ID	Field Duplicate Sample ID	Radionuclide	Sample (pCi/g)		Field Duplicate Sample (pCi/g)		Average Activity ( $\bar{x}$ ) (pCi/g)	Nuclide DCGL (pCi/g)	Statistic <sup>2</sup>	Warning Limit	Control Limit	Statistic Exceeds Limit? (Y/N)
			Activity (x <sub>i</sub> )	MDC	Activity (x <sub>i</sub> )	MDC						
L08-12-21-T-R-B-00	L08-12-21-T-R-Q-00	Ra-226	0.758	0.031	0.838	0.059	0.798	5.4	0.080	0.764	1.145	N
L08-12-21-T-R-B-00	L08-12-21-T-R-Q-00	Tc-99	23.3	0.2	20.800	0.216	22.050	74	2.500	10.471	15.688	N
L08-12-21-T-R-B-00	L08-12-21-T-R-Q-00	Th-232	0.452	0.045	0.572	0.112	0.512	5.2	0.120	0.736	1.102	N
L08-12-21-T-R-B-00	L08-12-21-T-R-Q-00	U-234 <sup>1</sup>	17.423	N/A	18.295	N/A	17.859	872.4	0.873	123.445	184.949	N
L08-12-21-T-R-B-00	L08-12-21-T-R-Q-00	U-235	0.962	0.149	1.010	0.204	0.986	208.1	0.048	29.446	44.117	N
L08-12-21-T-R-B-00	L08-12-21-T-R-Q-00	U-238	3.03	0.593	3.050	0.745	3.040	551.1	0.020	77.981	116.833	N
Comments: 1. U-234 is inferred, no MDC available. 2. Duplicate assessment is not necessary if the result of either sample is < MDC.												
Performed by: Thomas Yardy						Reviewed by: Clark Evers						
Date:						Date:						
Quality Record												

LSA 08-12 Sys SOF

0.2

0.2

0.1

0.4

0.0

0.1

0.4

0.1

0.2

0.1

0.2

0.3

0.2

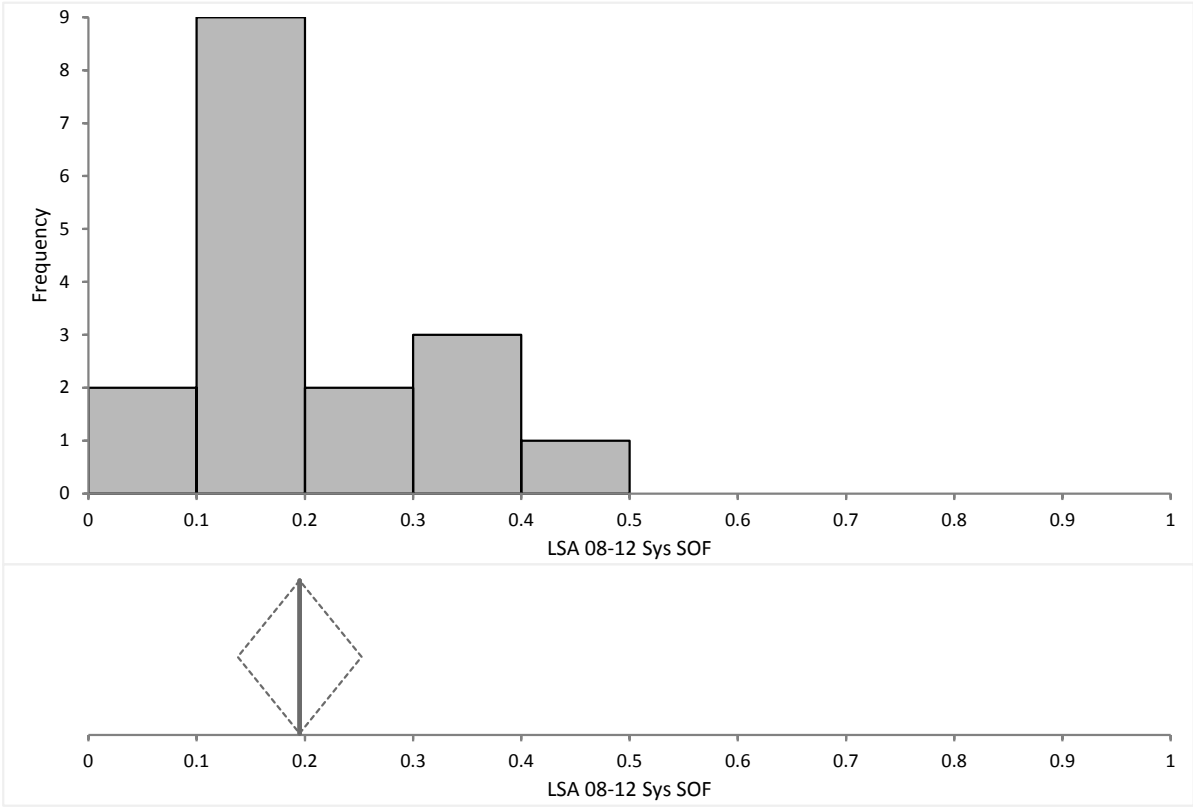
0.4

0.1

0.3

0.1

Descriptives



N | 17

	Mean	95% CI	Mean SE	SD	Variance	Skewness	Kurtosis
LSA 08-12 Sys SOF	0.20	0.14 to 0.25	0.027	0.11	0.01	0.8	-0.13
	Minimum	1st quartile	Median	95.1% CI	3rd quartile	Maximum	IQR
LSA 08-12 Sys SOF	0.04	0.12	0.16	0.13 to 0.25	0.27	0.4	0.14