

Hematite Decommissioning Project	Procedure: HDP-PR-FSS-701, Final Status Survey Plan Development		
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**APPENDIX P-4  
FSS SAMPLE & MEASUREMENT LOCATIONS & COORDINATES**

<b>Survey Area:</b>	LSA 08	<b>Description:</b>	Plant Soils SEA Open Land Area
<b>Survey Unit:</b>	15	<b>Description:</b>	Central Open Land Area
<b>Survey Type:</b>	FSS	<b>Classification:</b>	Class 2

Measurement or Sample ID	Surface or CSM	Type	Start Elevation*	End Elevation*	Northing** (Y Axis)	Easting** (X Axis)	Remarks / Notes
L08-15-01-P-S-S-00	Uniform	S	434.86	434.4	864565.0	827061.5	Surface 6-inch grab
L08-15-02-P-R-S-00	Uniform	S	434.37	429.9	864565.0	827061.5	Root 4.4-ft composite
L08-15-04-P-S-S-00	Uniform	S	434.62	434.1	864518.7	827034.8	Surface 6-inch grab
L08-15-05-P-R-S-00	Uniform	S	434.13	429.7	864518.7	827034.8	Root 4.4-ft composite
L08-15-07-P-S-S-00	Uniform	S	434.92	434.4	864518.7	827088.3	Surface 6-inch grab
L08-15-08-P-R-S-00	Uniform	S	434.43	430.0	864518.7	827088.3	Root 4.4-ft composite
L08-15-10-P-S-S-00	Uniform	S	434.07	433.6	864472.5	827008.0	Surface 6-inch grab
L08-15-11-P-R-S-00	Uniform	S	433.58	429.2	864472.5	827008.0	Root 4.4-ft composite
L08-15-13-P-S-S-00	Uniform	S	434.45	434.0	864472.5	827061.5	Surface 6-inch grab
L08-15-14-P-R-S-00	Uniform	S	434.0	429.5	864472.5	827061.5	Root 4.4-ft composite
L08-15-16-P-S-S-00	Uniform	S	434.0	433.6	864426.2	827034.8	Surface 6-inch grab
L08-15-17-P-R-S-00	Uniform	S	433.6	429.1	864426.2	827034.8	Root 4.4-ft composite
L08-15-19-P-S-S-00	Uniform	S	434.7	434.2	864426.2	827088.3	Surface 6-inch grab
L08-15-20-P-R-S-00	Uniform	S	434.2	429.8	864426.2	827088.3	Root 4.4-ft composite
L08-15-22-P-S-S-00	Uniform	S	434.1	433.6	864380.0	827061.5	Surface 6-inch grab
L08-15-23-P-R-S-00	Uniform	S	433.6	429.2	864380.0	827061.5	Root 4.4-ft composite
L08-15-11-P-R-Q-00	Uniform	Q	433.6	429.2	864472.5	827008.0	Root 4.4-ft composite
L08-15-20-P-R-Q-00	Uniform	Q	434.2	429.8	864426.2	827088.3	Root 4.4-ft composite
L08-15-25-P-S-B-00	Uniform	B	433.5	433.0	864343.5	827108.2	Biased 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]  
 Surface: Floor = F; Wall = W; Ceiling = C; Roof = R  
 CSM: Three-Layer (Surface-Root-Excavation) or Uniform DCGLs used  
 Type: Systematic = S, Biased = B; QC = Q; Investigation = I







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Appendix B.1 Step 8 Calculate the Number of Samples in the Statistical Population

Uniform DCGL Criteria Evaluation	
N/2 Value Verification	
Isotope(s)	SOF (Ra/Tc/Th/Iso U)
St. Dev.	0.08
DCGL <sub>SOF</sub>	1
LBGR (Mean)	0.09
Shift	0.91
Relative Shift ( $\Delta/\sigma$ )	11.68
MARSSIM Table 5.1 ( $P_r$ )	1.000000
N	12
N + 20%	14.4
N/2	8
FSS N/2	8
Verification Check	<b>SUFFICIENT MEASUREMENTS</b>
"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

$\alpha$   
 $\beta$

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**FORM HDP-PR-FSS-703-1  
FIELD DUPLICATE SAMPLE ASSESSMENT**

Survey Unit No.:		LSA 08-10					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							
L08-15-11-P-R-S-00	L08-15-11-P-R-Q-00	Ra-226	1.04	0.0768	0.87	0.0828	0.955	1.9	0.17	0.269	0.403	N	
L08-15-11-P-R-S-00	L08-15-11-P-R-Q-00	Tc-99	0.921	0.248	1.08	0.224	1.001	25.1	0.159	3.552	5.321	N	
L08-15-11-P-R-S-00	L08-15-11-P-R-Q-00	Th-232	1.02	0.145	1.01	0.172	1.015	2.0	0.010	0.283	0.424	N	
L08-15-11-P-R-S-00	L08-15-11-P-R-Q-00	U-234 <sup>1</sup>	2.574	N/A	3.156	N/A	2.865	195.4	0.582	27.649	41.425	N	
L08-15-11-P-R-S-00	L08-15-11-P-R-Q-00	U-235	0.14	0.411	0.172	0.222	0.156	51.6	NA	7.301	10.939	NA	
L08-15-11-P-R-S-00	L08-15-11-P-R-Q-00	U-238	0.951	0.867	1.09	0.824	1.021	168.8	0.139	23.885	35.786	N	

Comments:

- U-234 is inferred, no MDC available.
- 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

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**FORM HDP-PR-FSS-703-1  
FIELD DUPLICATE SAMPLE ASSESSMENT**

Survey Unit No.:	LSA 08-10				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						
L08-15-20-P-R-S-00	L08-15-20-P-R-Q-00	Ra-226	1.11	0.0678	1.14	0.0855	1.125	1.9	0.03	0.269	0.403	N
L08-15-20-P-R-S-00	L08-15-20-P-R-Q-00	Tc-99	5.11	0.245	8.42	0.24	6.765	25.1	3.31	3.552	5.321	N
L08-15-20-P-R-S-00	L08-15-20-P-R-Q-00	Th-232	1.06	0.137	1.03	0.104	1.045	2.0	0.030	0.283	0.424	N
L08-15-20-P-R-S-00	L08-15-20-P-R-Q-00	U-234 <sup>1</sup>	7.712	N/A	5.394	N/A	6.553	195.4	2.318	27.649	41.425	N
L08-15-20-P-R-S-00	L08-15-20-P-R-Q-00	U-235	0.426	0.251	0.295	0.22	0.361	51.6	0.131	7.301	10.939	N
L08-15-20-P-R-S-00	L08-15-20-P-R-Q-00	U-238	1.51	0.872	1.72	0.988	1.615	168.8	0.210	23.885	35.786	N

Comments:

- U-234 is inferred, no MDC available.
- Duplicate assessment is not necessary if the result of either sample is < MDC.

Performed by: Thomas Yardy \_\_\_\_\_

Reviewed by: Clark Evers \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

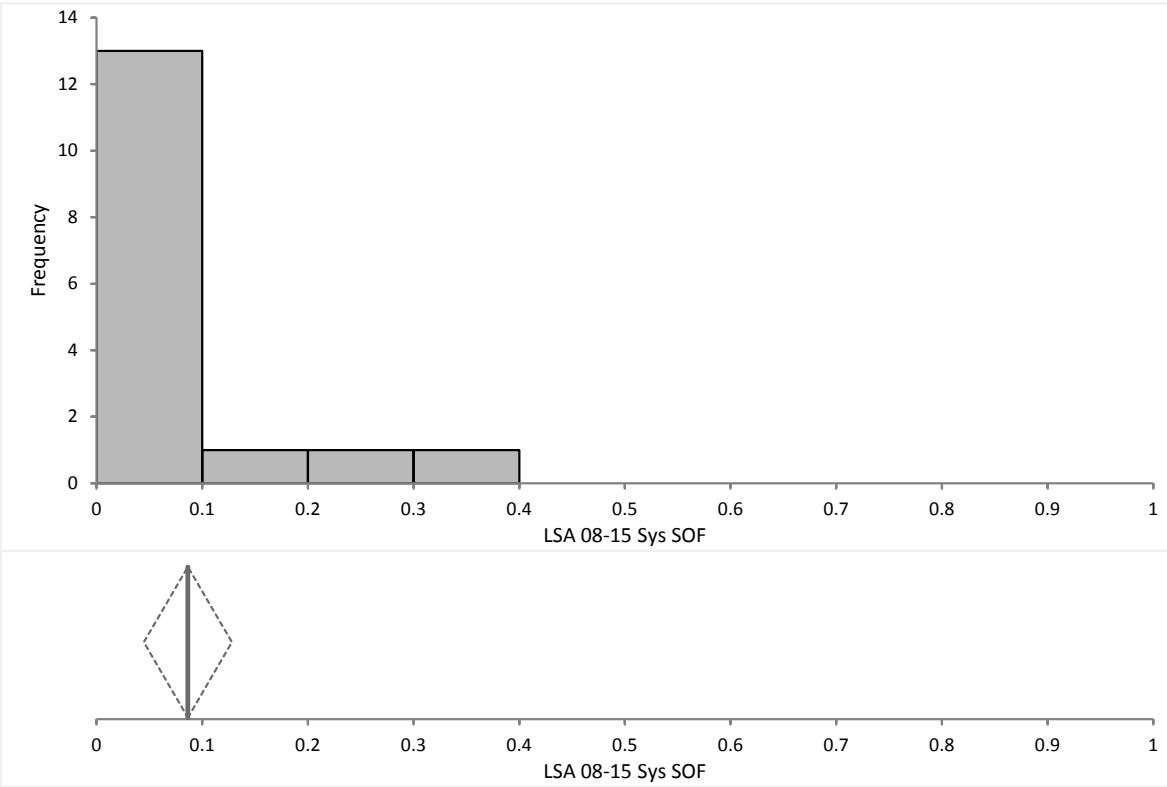
Quality Record

LSA 08-15 Sys SOF

0.1  
0.1  
0.0  
0.0  
0.0  
0.1  
0.1  
0.1  
0.1  
0.2  
0.1  
0.0  
0.0  
0.3  
0.1  
0.1



Descriptives



N	16						
LSA 08-15 Sys SOF	Mean	95% CI	Mean SE	SD	Variance	Skewness	Kurtosis
	0.09	0.04 to 0.13	0.020	0.08	0.01	2.1	4.25
LSA 08-15 Sys SOF	Minimum	1st quartile	Median	97.87% CI	3rd quartile	Maximum	IQR
	0.0	0.04	0.06	0.04 to 0.10	0.09	0.3	0.06