Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report	
RSY Pad: RSY 20 Lift 2	Soil Origin: TU-098C ESU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 12/8/2020

Systematic Soil Sample Data: RSY 20 Lift 2

Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total ^{90}Sr Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331
HPPG-ESU-TU098C-001	1	Systematic	10,715	15,658	0.330	-0.0385	0.0770
HPPG-ESU-TU098C-002	2	Systematic	10,533	15,658	0.556	0.0327	N/A
HPPG-ESU-TU098C-003	3	Systematic	10,805	15,658	0.397	-0.0193	N/A
HPPG-ESU-TU098C-004	4	Systematic	10,871	15,658	0.547	-0.0117	N/A
HPPG-ESU-TU098C-005	5	Systematic	10,905	15,658	0.362	0.00569	N/A
HPPG-ESU-TU098C-006	6	Systematic	10,897	15,658	0.533	0.00807	N/A
HPPG-ESU-TU098C-007	7	Systematic	11,089	15,658	0.323	0.0305	N/A
HPPG-ESU-TU098C-008	8	Systematic	10,607	15,658	0.404	0.0312	N/A
HPPG-ESU-TU098C-009	9	Systematic	10,906	15,658	0.338	-0.00227	N/A
HPPG-ESU-TU098C-010	10	Systematic	11,204	15,658	0.423	-0.0503	N/A
HPPG-ESU-TU098C-011	11	Systematic	11,104	15,658	0.313	-0.0292	0.0113
HPPG-ESU-TU098C-012	12	Systematic	10,537	15,658	0.361	-0.0214	N/A
HPPG-ESU-TU098C-013	13	Systematic	10,913	15,658	0.287	0.000688	N/A
HPPG-ESU-TU098C-014	14	Systematic	10,340	15,658	0.127	0.0176	N/A
HPPG-ESU-TU098C-015	15	Systematic	11,389	15,658	0.462	0.0257	N/A
HPPG-ESU-TU098C-016	16	Systematic	10,997	15,658	0.280	-0.0272	N/A
HPPG-ESU-TU098C-017	17	Systematic	11,055	15,658	0.352	-0.0221	N/A
HPPG-ESU-TU098C-018	18	Systematic	10,564	15,658	0.478	0.00956	N/A
HPPG-ESU-TU098C-019	19	Systematic	11,083	15,658	0.417	0.0346	N/A
HPPG-ESU-TU098C-020	20	Systematic	11,004	15,658	0.289	-0.00272	N/A
HPPG-ESU-TU098C-021	21	Systematic	11,067	15,658	0.357	0.00928	0.0145
HPPG-ESU-TU098C-022	22	Systematic	11,189	15,658	0.290	0.00788	N/A
HPPG-ESU-TU098C-023	23	Systematic	11,459	15,658	0.432	0.00606	N/A
HPPG-ESU-TU098C-024	24	Systematic	11,221	15,658	0.101	0.0131	N/A
HPPG-ESU-TU098C-025	25	Systematic	10,839	15,658	0.340	0.0313	N/A
Soil Systematic Sample Statistics					^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total ^{90}Sr Final Analytical Results (pCi/g)
Maximum					0.5560	0.0346	0.077
Mean					0.3640	0.0016	0.0343
Median					0.3570	0.0061	0.0145
Minimum					0.1010	-0.0503	0.0113
Standard Deviation					0.1102	0.0239	N/A

Biased Soil Sample Data: RSY 20 Lift 2

Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total ^{90}Sr Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331
HPPG-ESU-TU098C-B-001	1	Biased	11,036	15,658	0.312	-0.00184	N/A

CPM Counts per minute

pCi/g Picocuries per gram

* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	**Survey #**	**Date**	**Meter**	**Calibration Due Date**	**Serial #**
Gamma Walkover Survey	HPRS-10092020-PG-ROV-173	10/09/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-10122020-PG-JSS-169	10/12/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-10132020-PG-JSS-170	10/13/2020	3x3	08/06/2021	108853
Biased Sample Survey	HPRS-10132020-PG-JSS-171	10/13/2020	3x3	08/06/2021	108853

Region of Interest (ROI) Summary	
ROI	**Nuclide and Energy**
ROI 3	Ra-226 (1764 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 20 Lift 2

1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 60 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data.

2) One-minute static follow-up measurements with the RS-700 were collected at 60 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-73.

3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 74-108). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 74-108).

Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.

4) In accordance with Final Parcel G Work Plan Section 3.3.1, one biased sample was collected from the location of the highest gross gamma scan measurement, since all follow-up static measurements were below the ROC-specific critical levels. TestAmerica sample results are attached (pages 74-108). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.

Conclusions:

In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background.

RSY 20 Lift 2 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-098C ESU.

APTIM requests RASO concurrence to release this soil as Non-LLRW.
Disposition: This soil shall be used as backfill for TU-098.

Soil Scan Statistics

Statistical Summary

Dataset	PG-RSY-20-U2				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	27.06	12.13	12.02	3.51
ROI-06	55.12	120.27	86.50	86.19	9.45
ROI-07	38.08	95.18	67.31	67.15	8.46
ROI-08	75.17	155.34	109.50	109.23	10.75
ROI-10	2,037.62	2,535.14	2,266.12	2,267.03	68.72

Statistical Summary Reference Background

TYPE	Scan RBA (Bldg 809)				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64	255.66

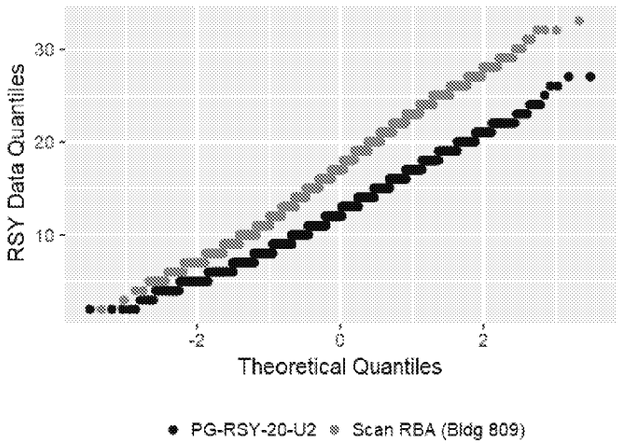
cps = counts per second

Dataset	Number of Data Points
PG-RSY-20-U2	5476
Scan RBA (Bldg 809)	4632

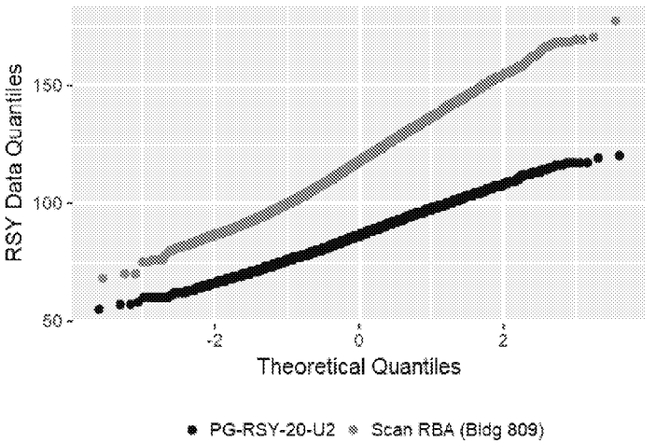
Soil Scan Statistics

Normal Q-Q Plots

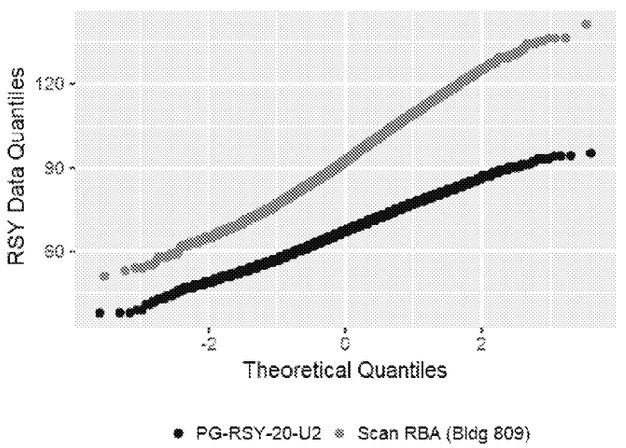
ROI 03



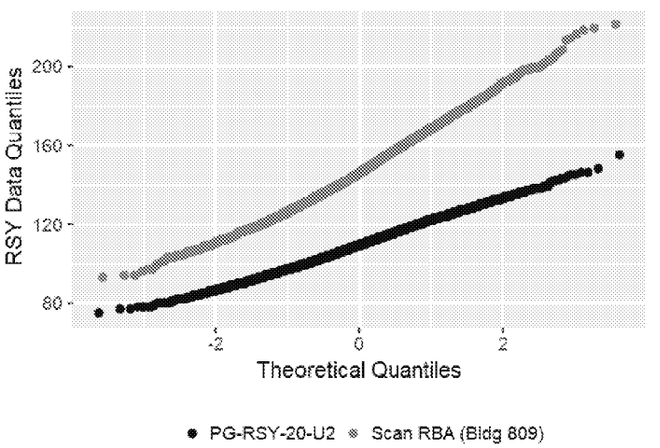
ROI 06



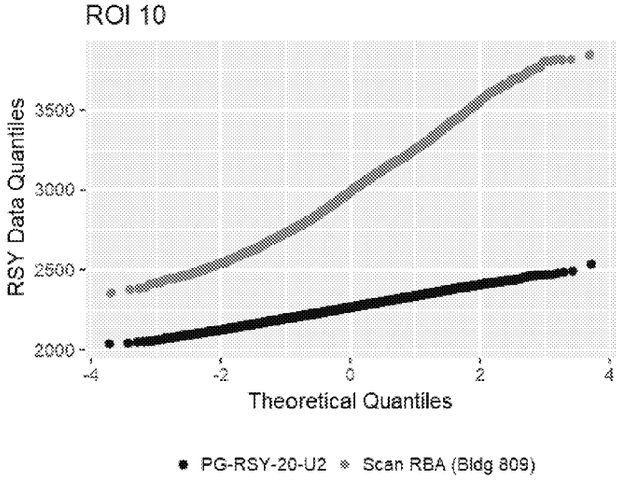
ROI 07



ROI 08



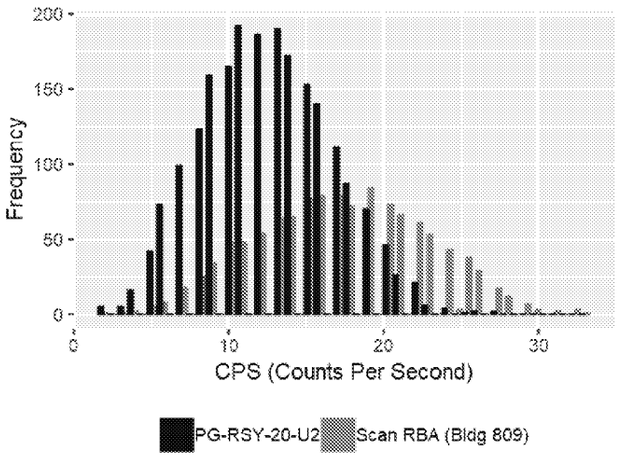
ROI 10



Soil Scan Statistics

Histograms

ROI 03



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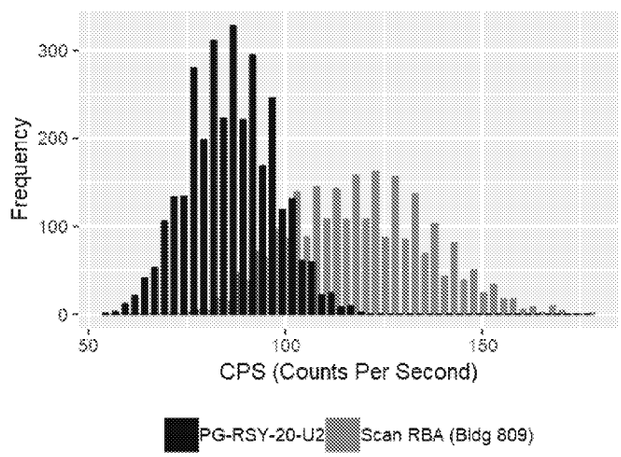

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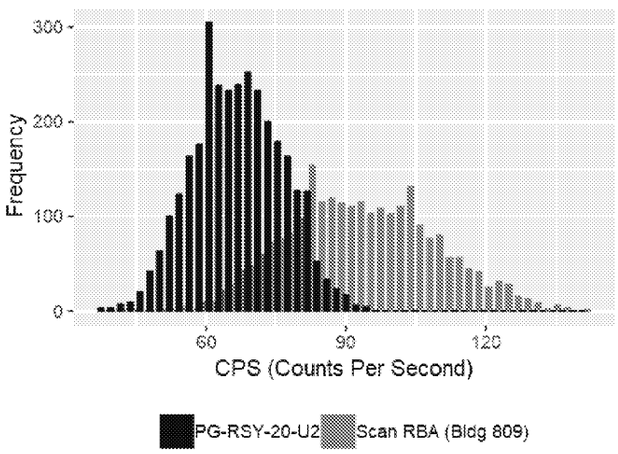

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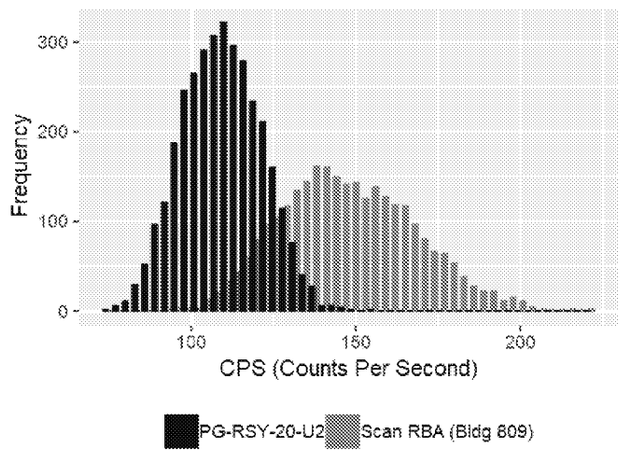

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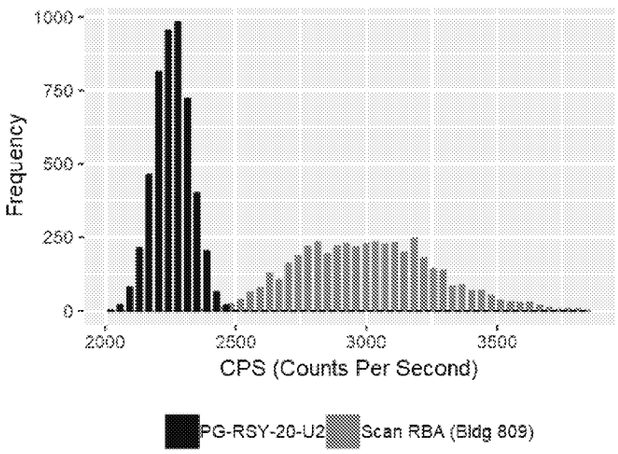
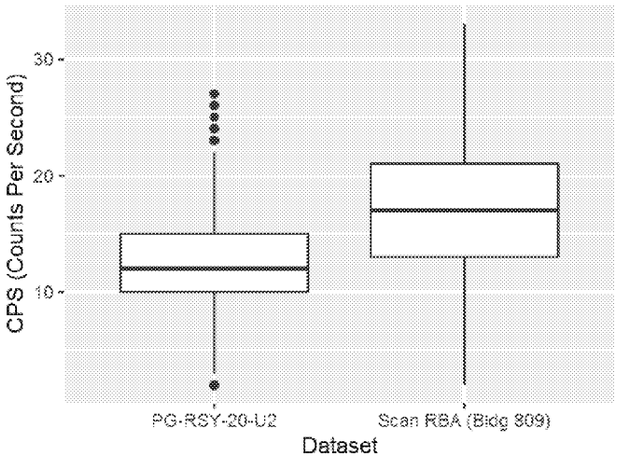


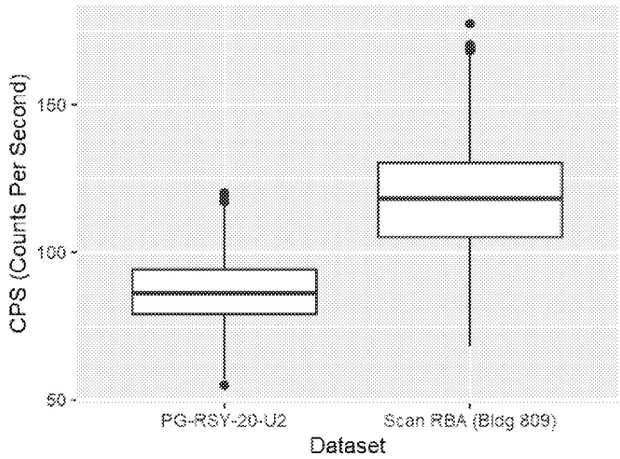
Soil Scan Statistics

Box Plots

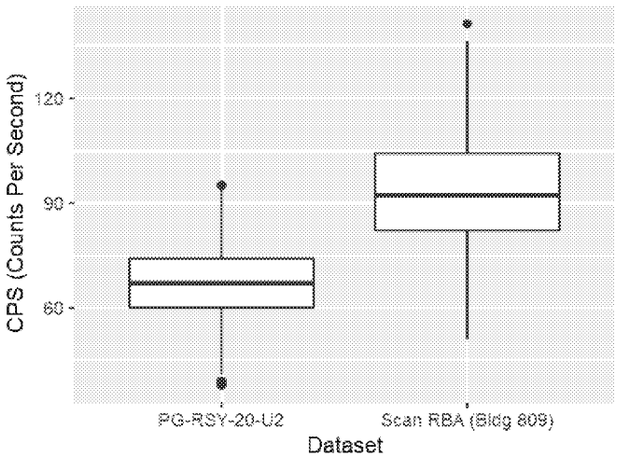
ROI 03



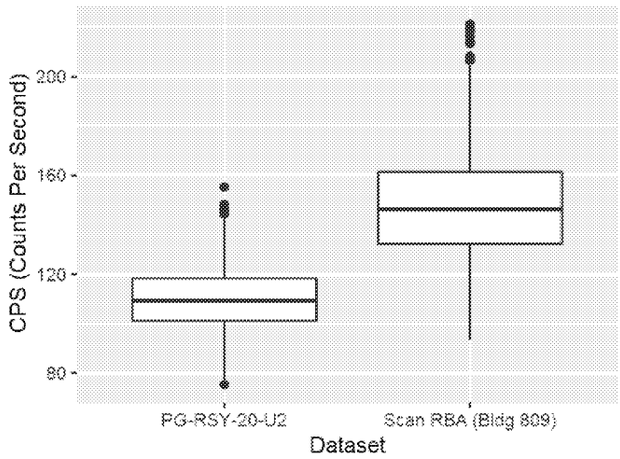
ROI 06



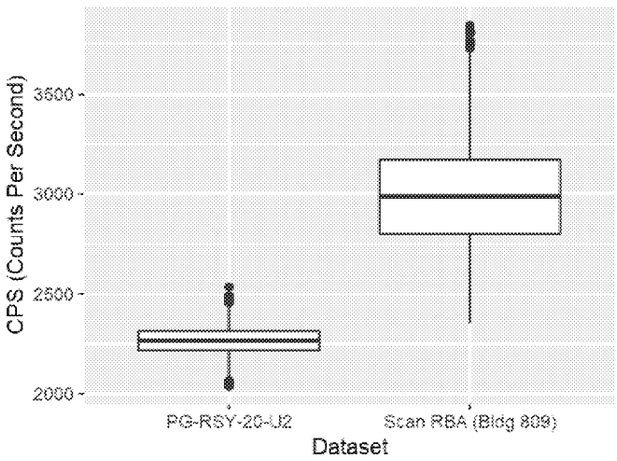
ROI 07



ROI 08

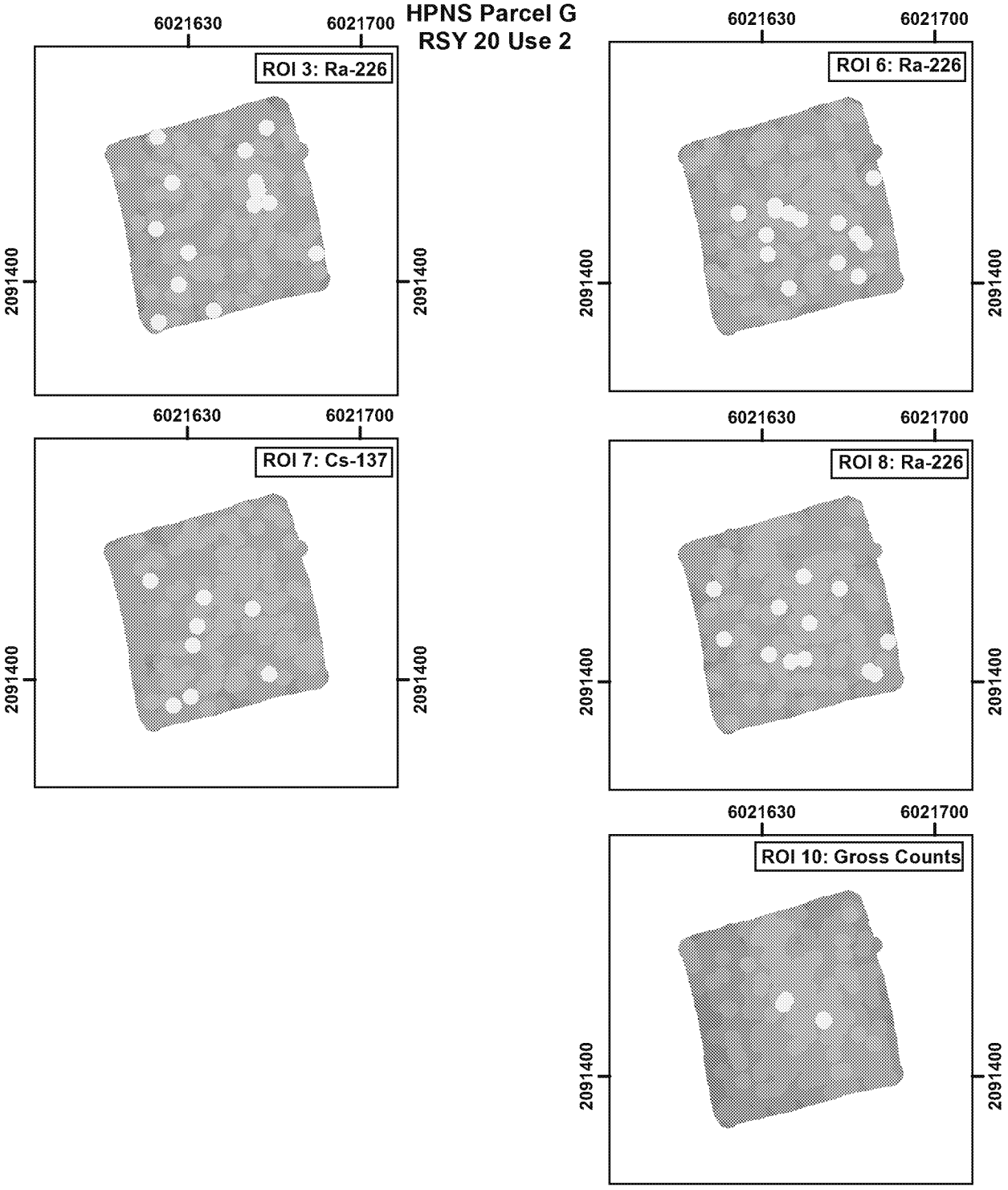


ROI 10



TU-098C ESU

RSI Data Plots
HPNS Parcel G
RSY 20 Use 2



RS 700 Gamma Walkover Survey Data (VD1)

- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

0 25 50 100 Feet

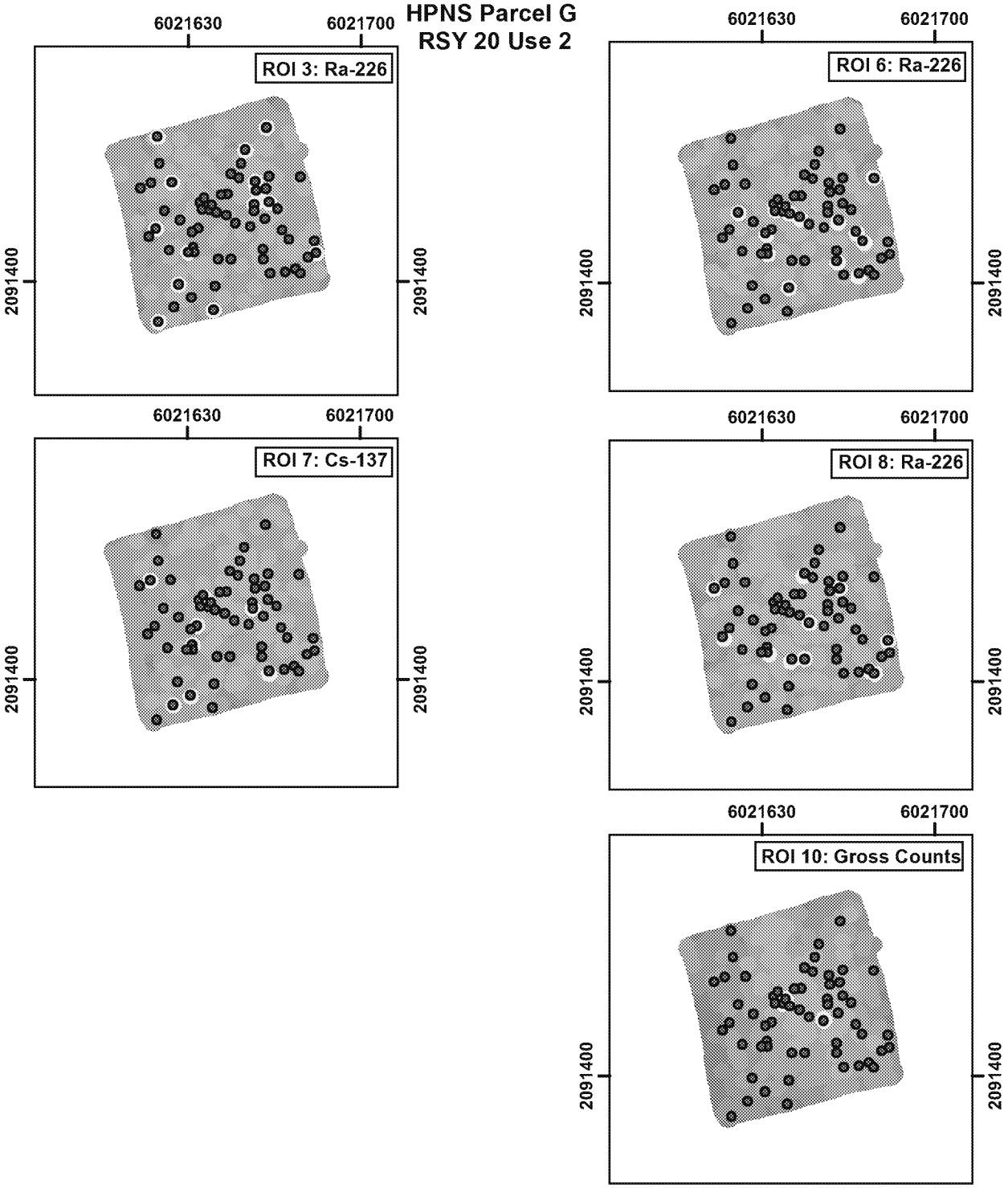
Coordinate system: CSP Zone III. NAD83, US Survey Foot

APTIM

F:\Radiological\Parcel G\RSY 20\U2\HPNSPG_RSY20_Use2ContourMaps.mxd

RSI Data Plots
HPNS Parcel G
RSY 20 Use 2

TU-098C ESU



RS 700 Gamma Walkover Survey Data (VD1)

- Follow-Up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

0 25 50 100 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

APTIM

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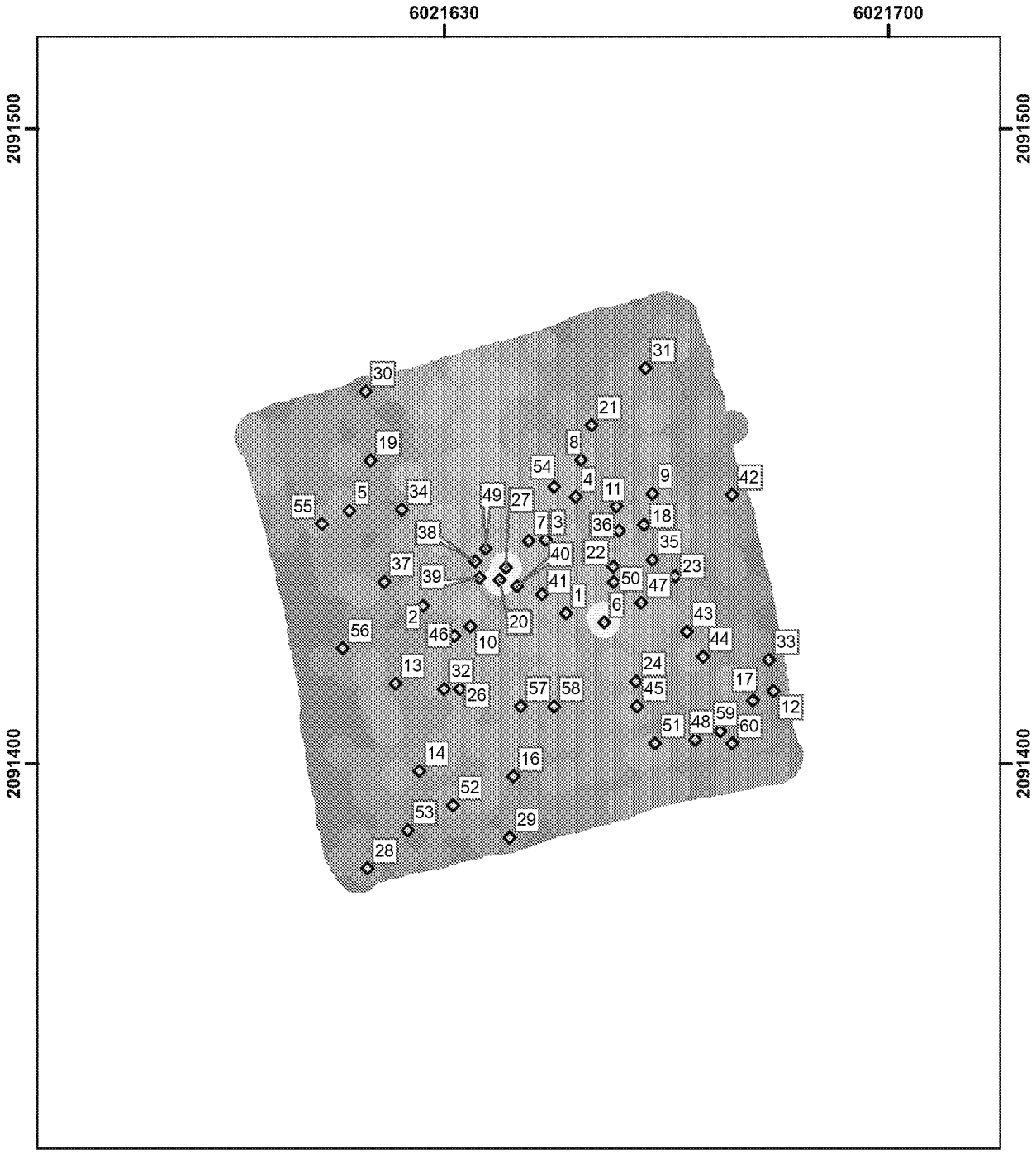
TU-098C ESU

Follow-Up Static Survey
HPNS Parcel G
RSY 20 Use 2



RSY 20 Use 2 (VD1, ROI 10 Gross Gamma)

- Follow-Up Location
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

20 10 0 20 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

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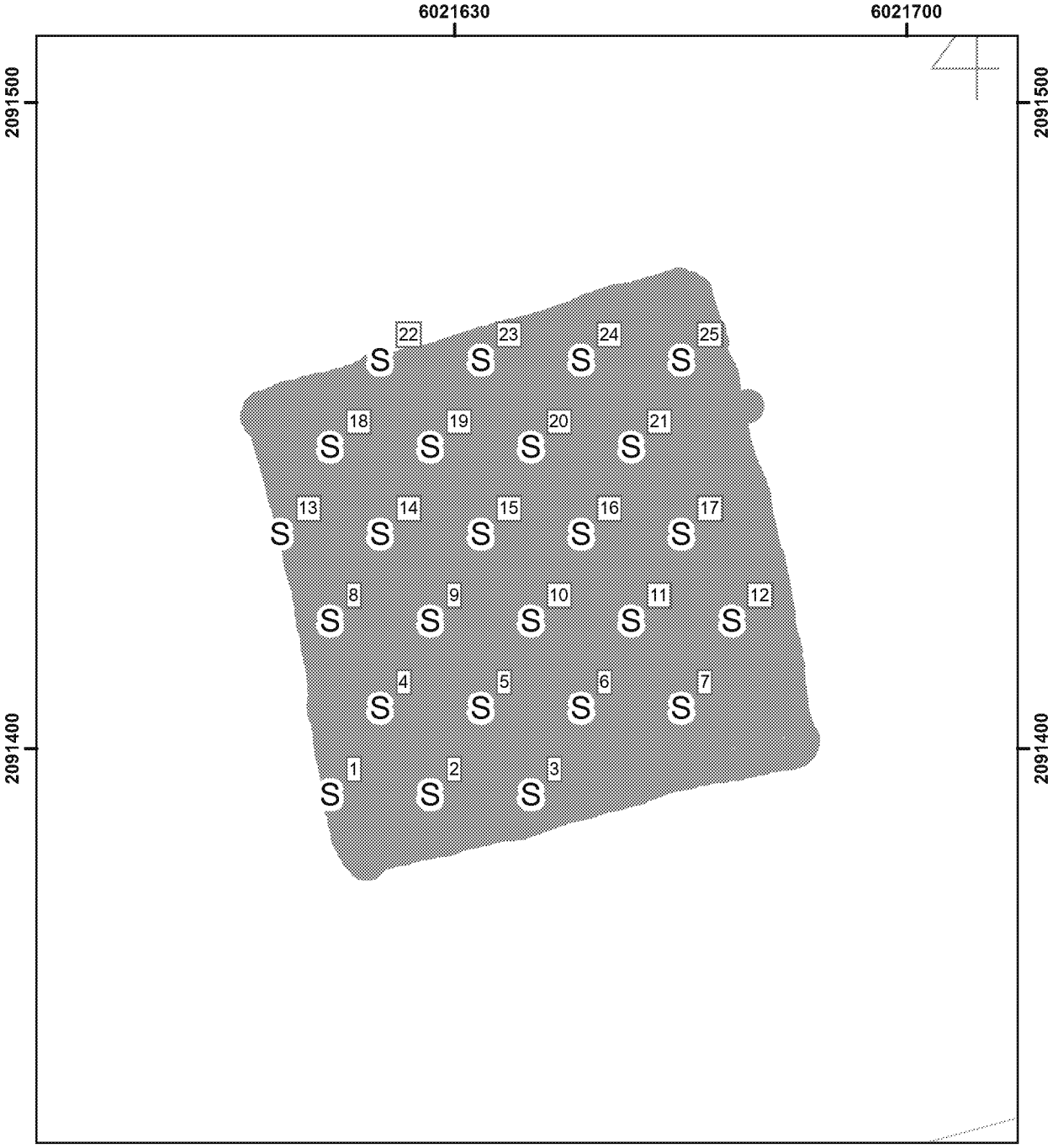
TU-098C ESU

Systematic Sampling
HPNS Parcel G
RSY 20 Use 2



RSY 20 Use 2

S Systematic Sample Locations

RS-700 GWS Coverage

0 10 20 40 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

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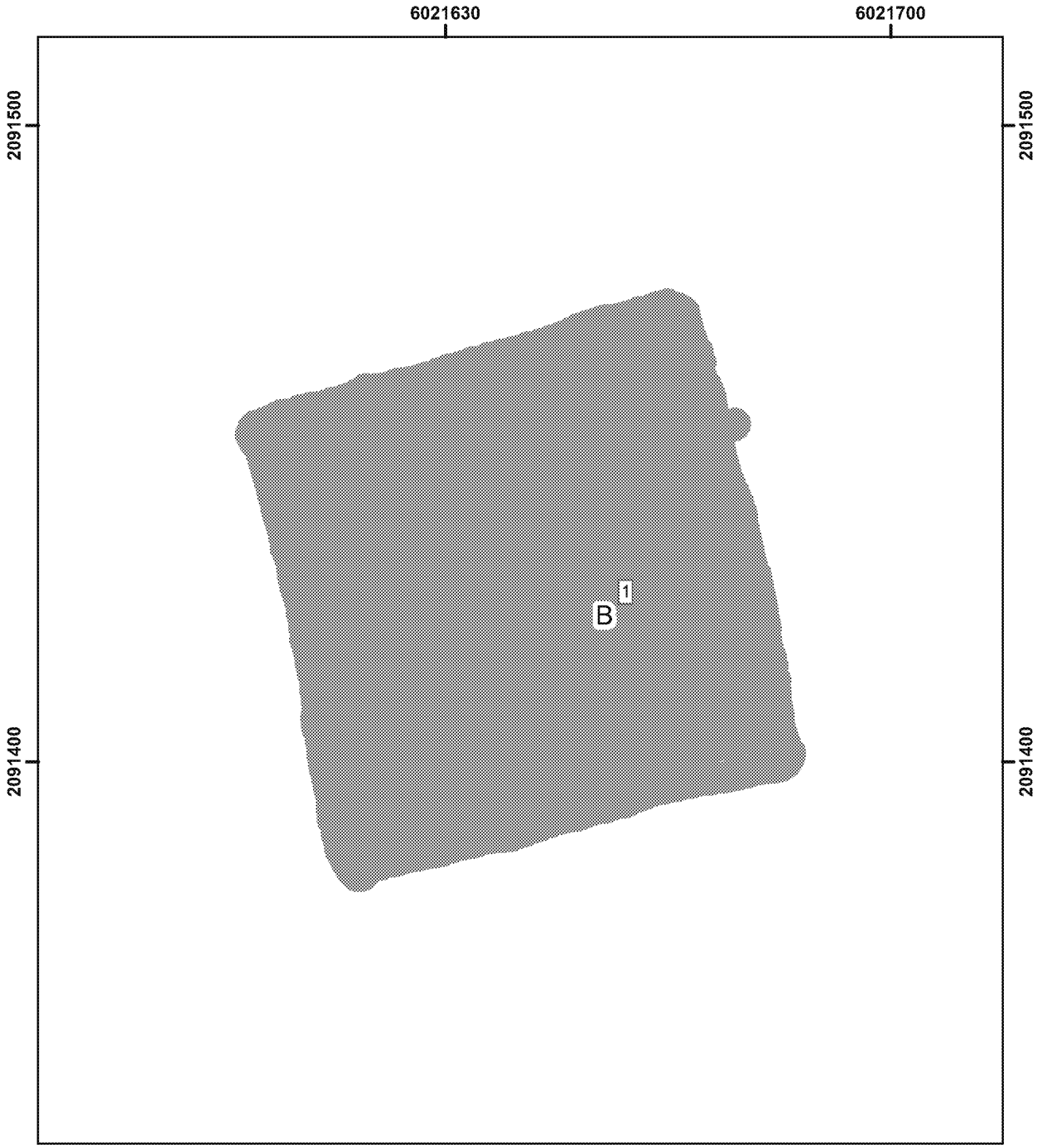
TU-098C ESU

Biased Sampling
HPNS Parcel G
RSY 20 Use 2



RSY 20 Use 2

B Biased Sample Location

RS-700 GWS Coverage

Coordinate system: CSP Zone III. NAD83, US Survey Foot

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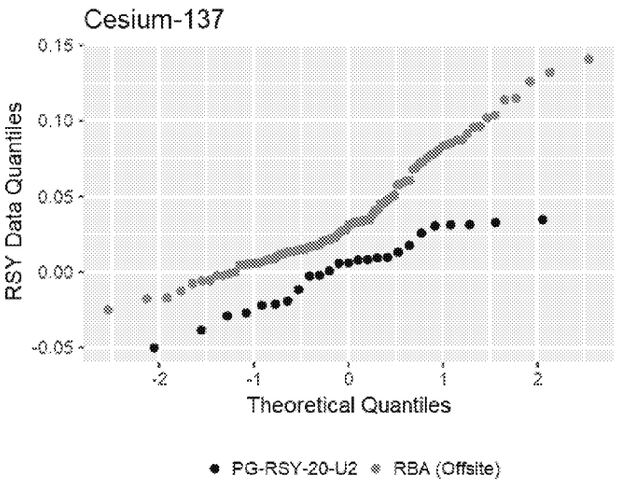
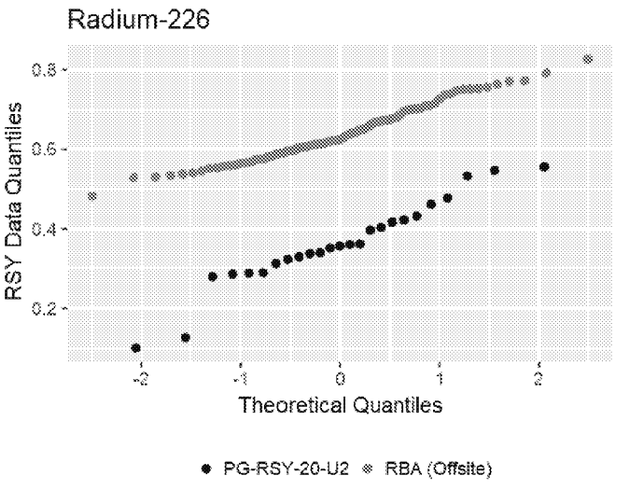
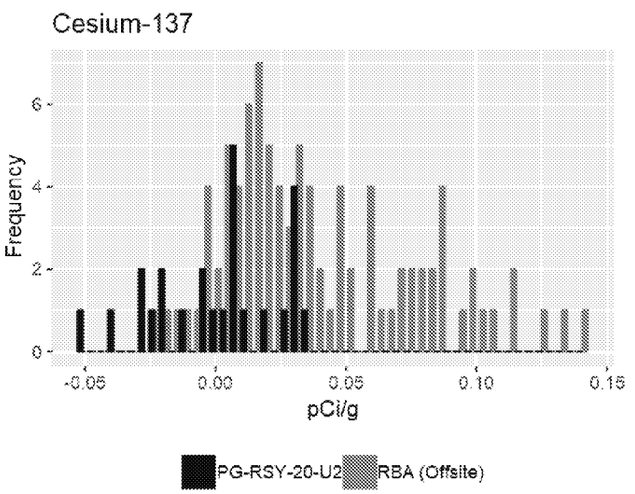
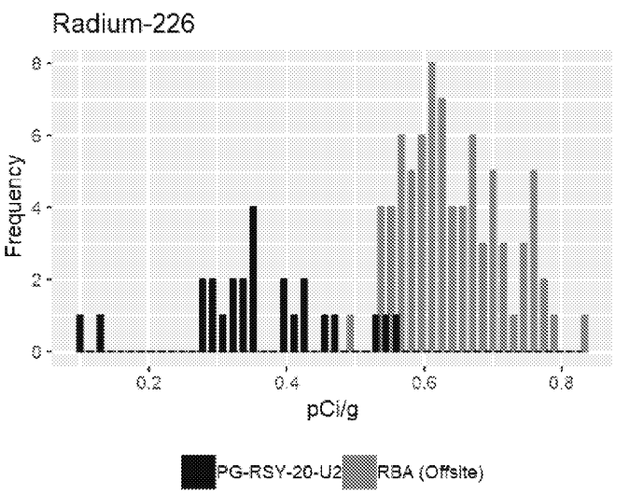
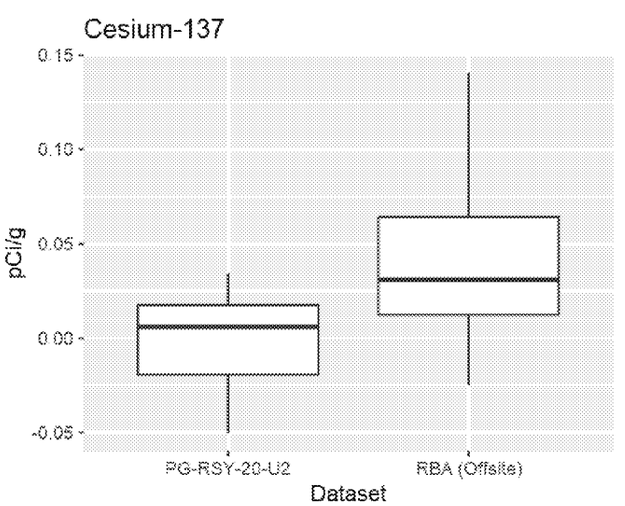
Soil Sample Statistics

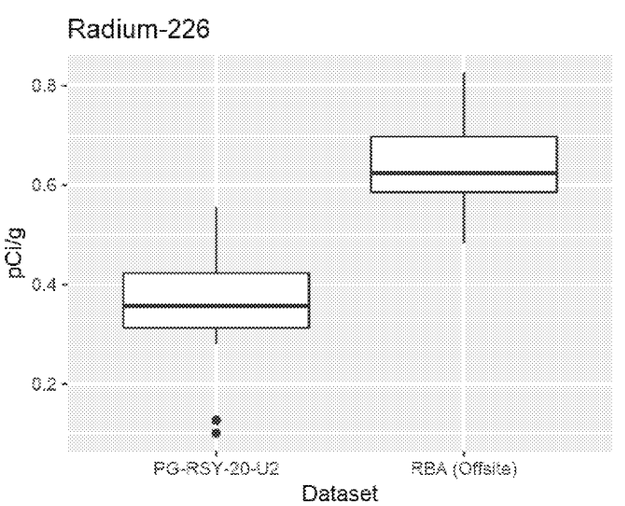












WILCOXON RANK SUM TEST

Nuclide: [redacted] Location: [redacted]

LBGR: [redacted] pCi/g

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT RANKS
[redacted]				
0.33				
0.666				26
0.397				18
0.547				24
0.362				15
0.833				27
0.323				13
0.404				17
0.338				14
0.423				19
0.313				12
0.361				14
0.287				8
0.127				3
0.462				20
0.28				9
0.382				17
0.478				21
0.417				18
0.289				10
0.387				13
0.29				11
0.432				20
0.101				1
0.34				16
	Sum =	[redacted]		[redacted]

Sorted Ranks	Location Associated with Sorted Rank
[redacted]	

DCGL [redacted]
LBGR = [redacted]
LBGR = [redacted]

	SU Stats	
Count	26	m
SD	[redacted]	
Median	[redacted]	

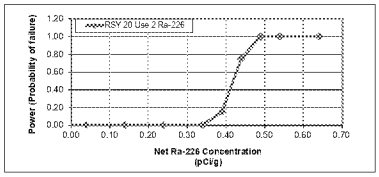
	Ref Stats	
Count	100	n
SD	[redacted]	

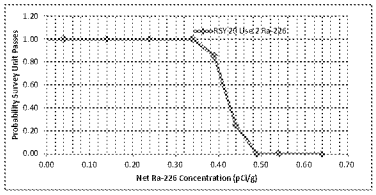
Critical Value [redacted]

Number of Samples	
σ	[redacted]
LBGR	[redacted]
Δ/σ	[redacted]
Pr	[redacted]
N	[redacted]
N/2	[redacted]
Actual N	26
SU σ	[redacted]
Z(1-alpha)	[redacted]
Z(1-beta)	[redacted]

POWER CURVE CALCULATION

Concentration	Concentration above Background	(C-LBGR)/σ SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing
[redacted]										





QUANTILE TEST

From NUREG 1505, Table A.7b Values of r and k for the Quantile Test When α Is Approximately 0.025

[redacted] n (number of survey unit measurements)
[redacted] m (number of reference area measurements)

Use:
m = [redacted]
n = [redacted]
[redacted] r
[redacted] k
[redacted] alpha

If k or more of the r largest measurements in the combined ranked data set are from the survey unit, the null hypothesis of the Quantile test (that there is no residual radioactivity above the LBGR in any part of the survey unit) is rejected.

[redacted] "The null hypothesis is accepted."

# of R: [redacted] n
# of S: [redacted] m
Avg Rank R: [redacted]
Avg Rank S: [redacted]

For m or n greater than 20, the critical value (k) can be calculated from

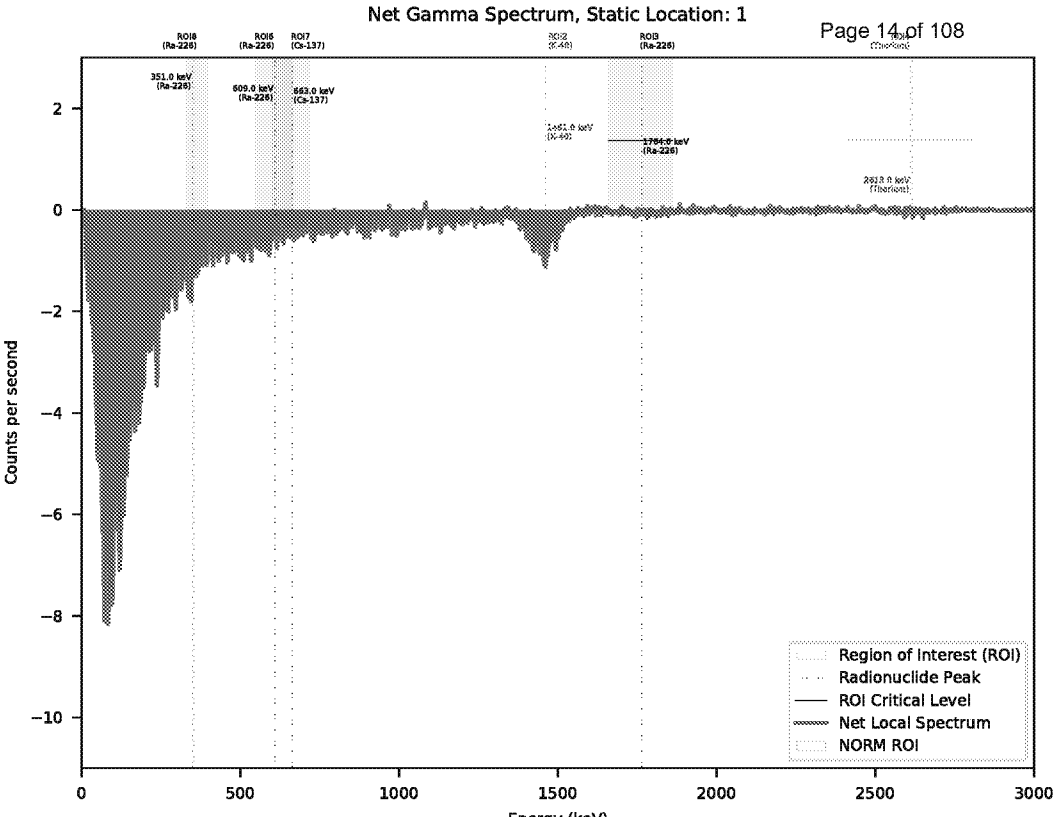
$$\frac{m(n+m+1)}{2} + z\sqrt{\frac{mn(n+m+1)}{12}}$$

[redacted]

k = [redacted]

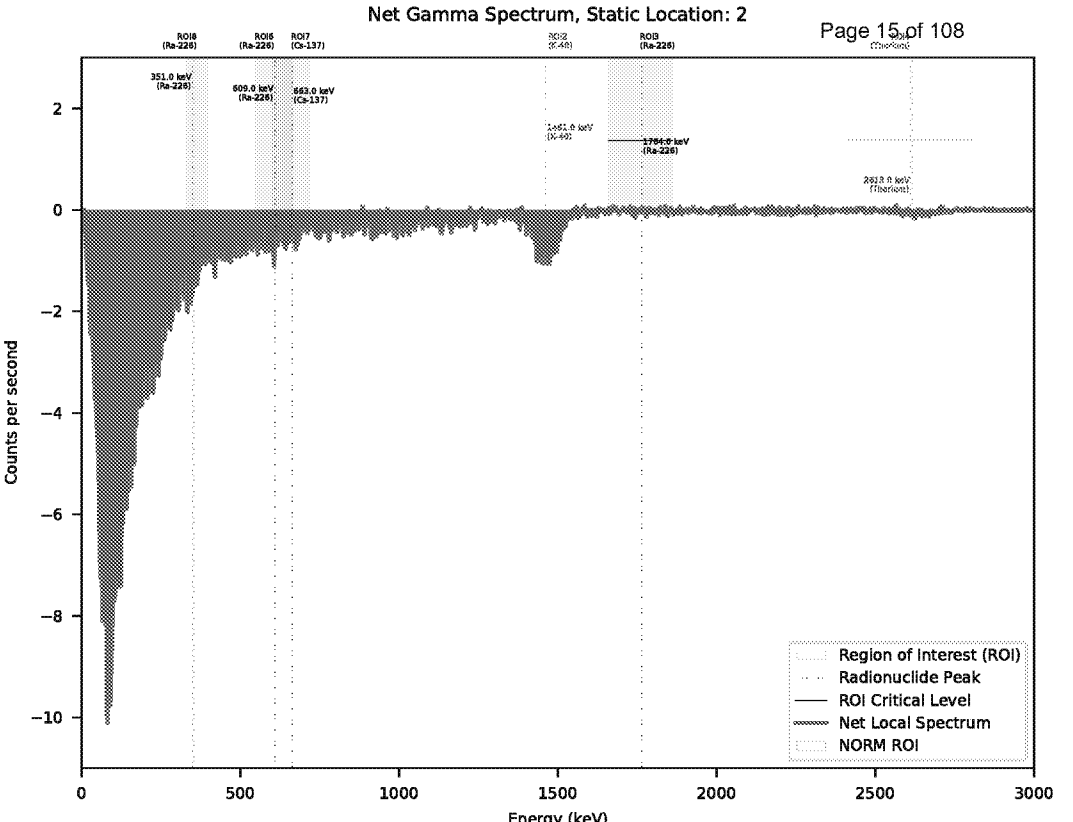
$\alpha_w = \alpha/2 =$ [redacted]
β = [redacted]

[redacted]



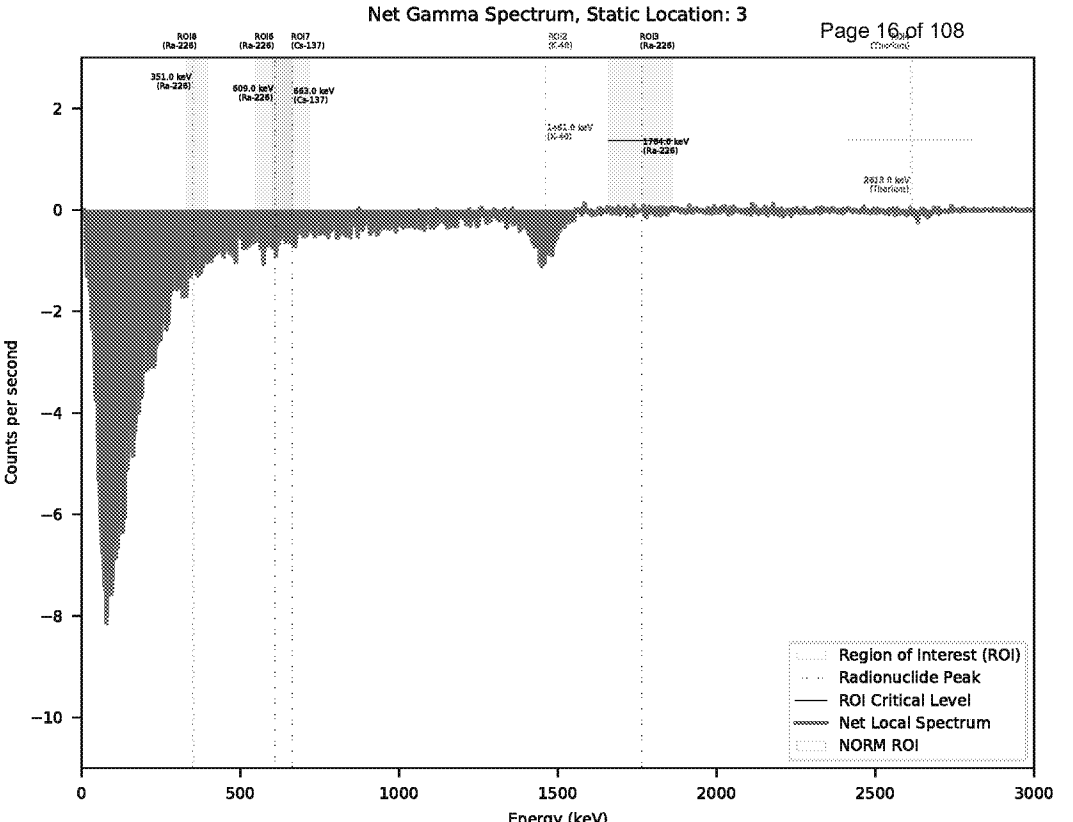
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

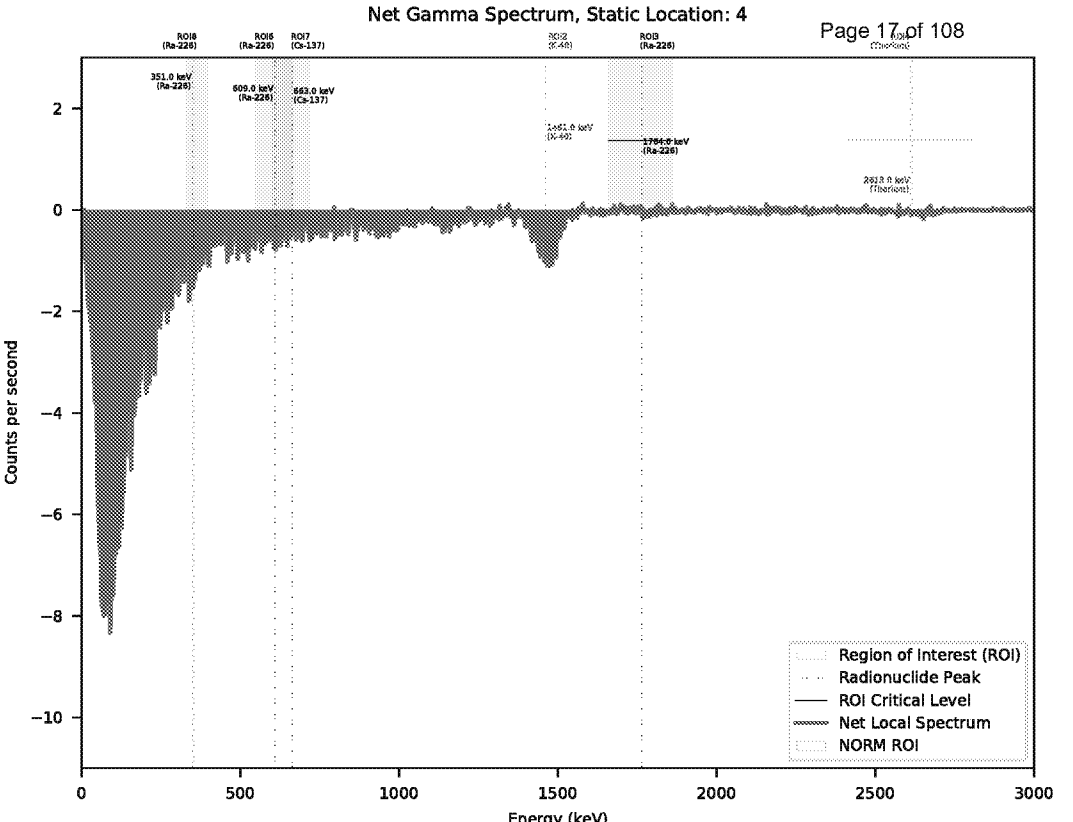
Local Coordinates (Longitude, Latitude): -122.36726805507249, 37.72386103768115 4

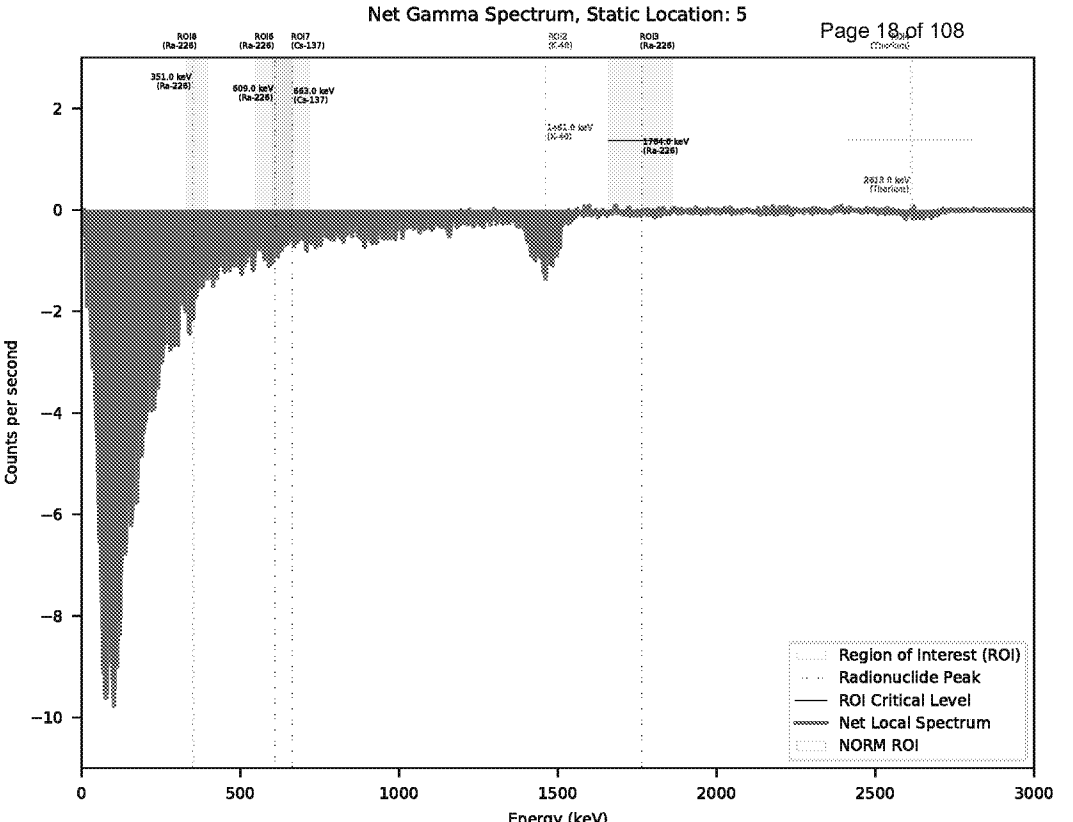


Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36734695522387, 37.723869317910406

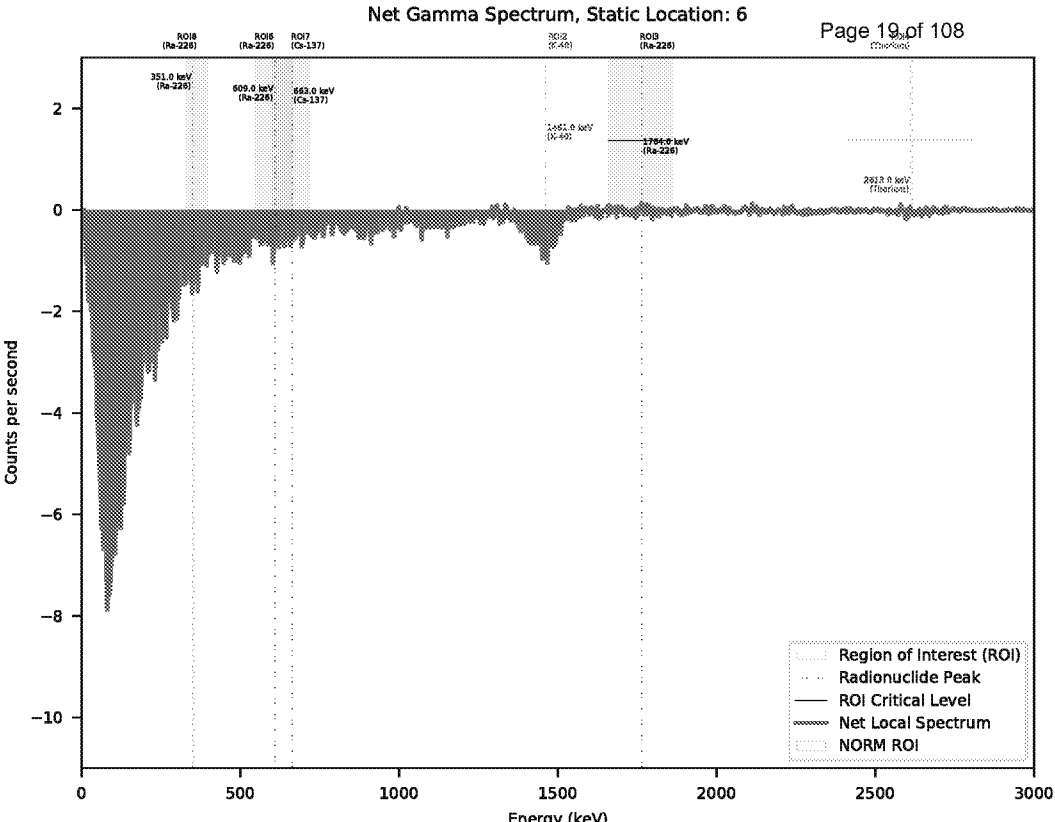

Net Gamma Spectrum, Static Location: 3
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36728586219503, 37.72389071097563


Net Gamma Spectrum, Static Location: 4
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36727013797467, 37.72390571772153



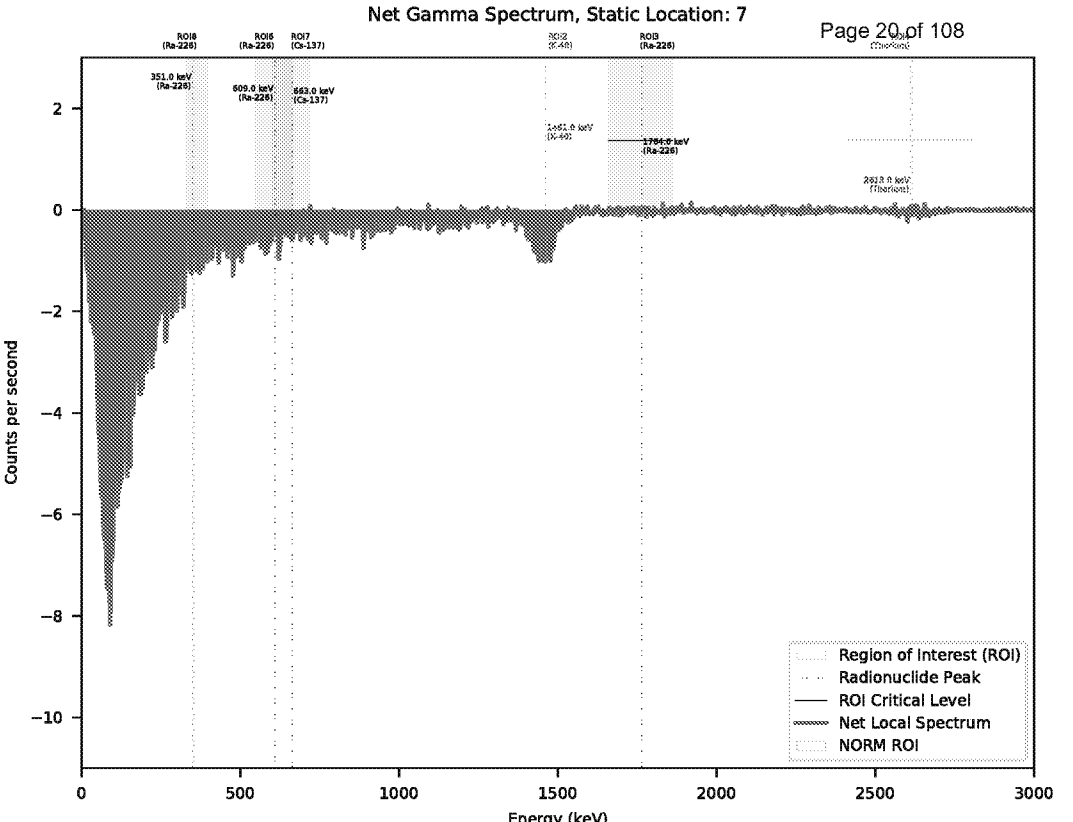
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36739476081085, 37.72390242162162



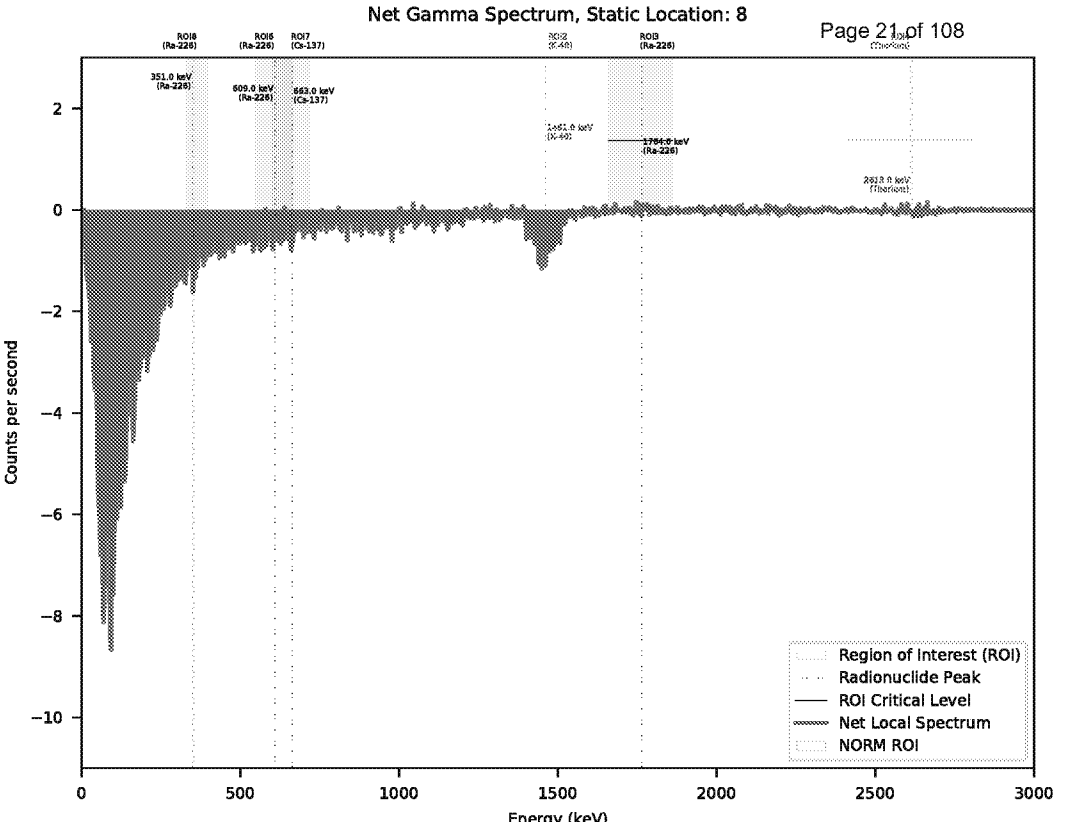
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.367248602898 47, 37.72386161884059



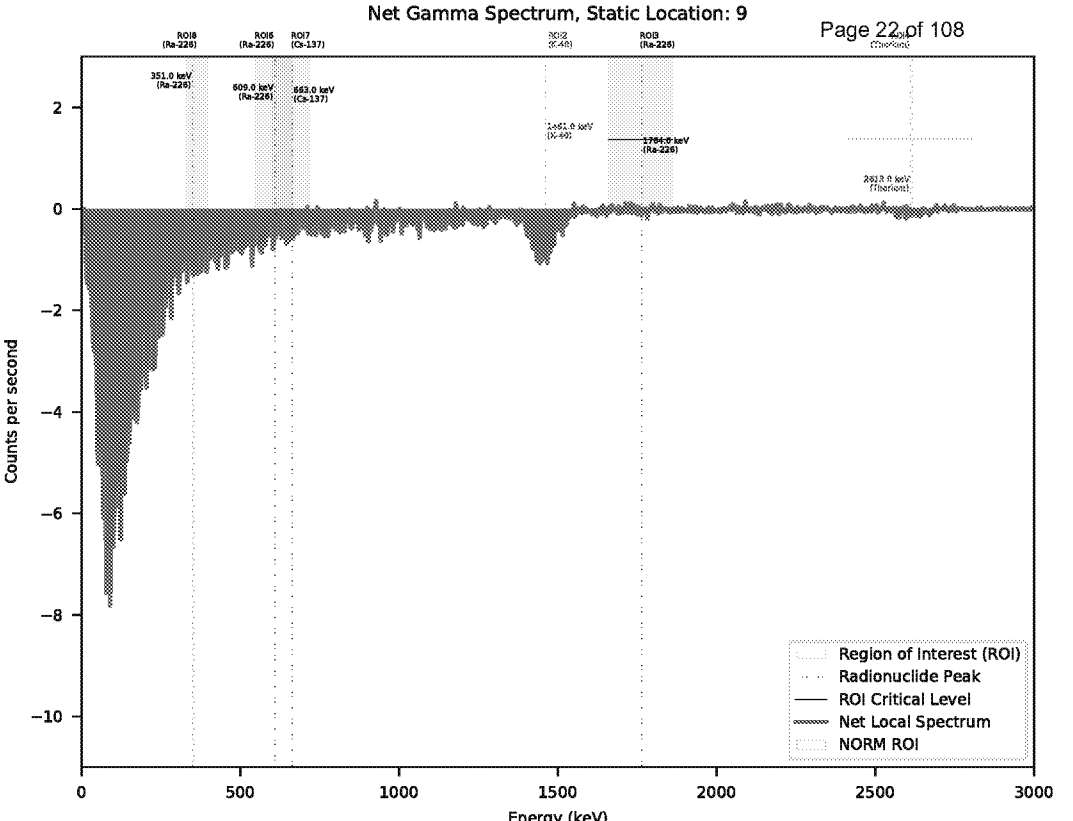
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36729457313422, 37.723889873134304



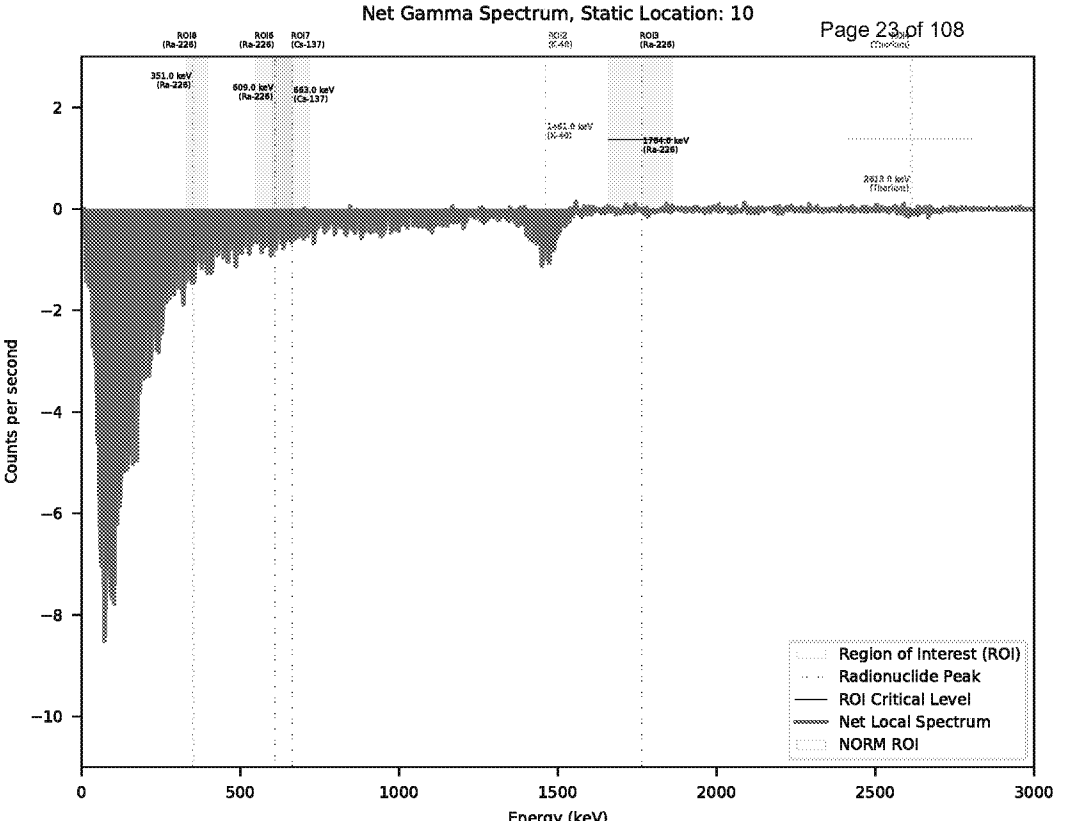
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36726500266668, 37.72392127999999



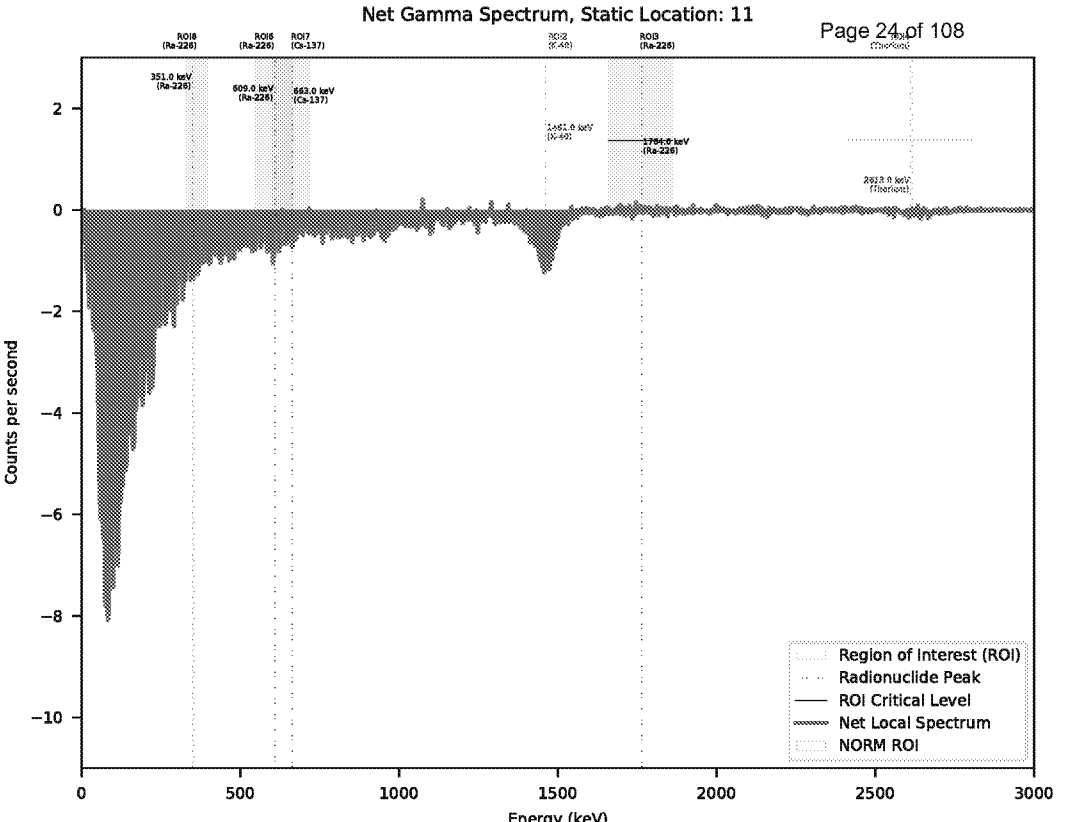
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

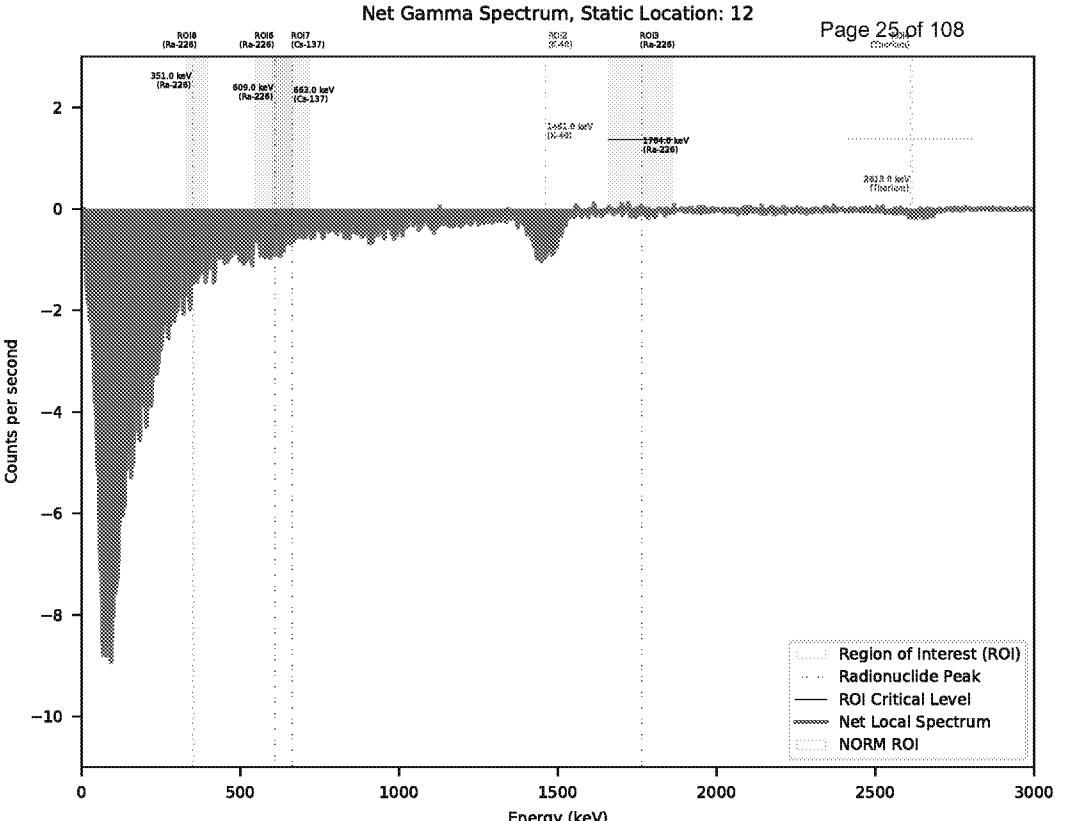
Local Coordinates (Longitude, Latitude): -122.36722554920642, 37.72391379999999



Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

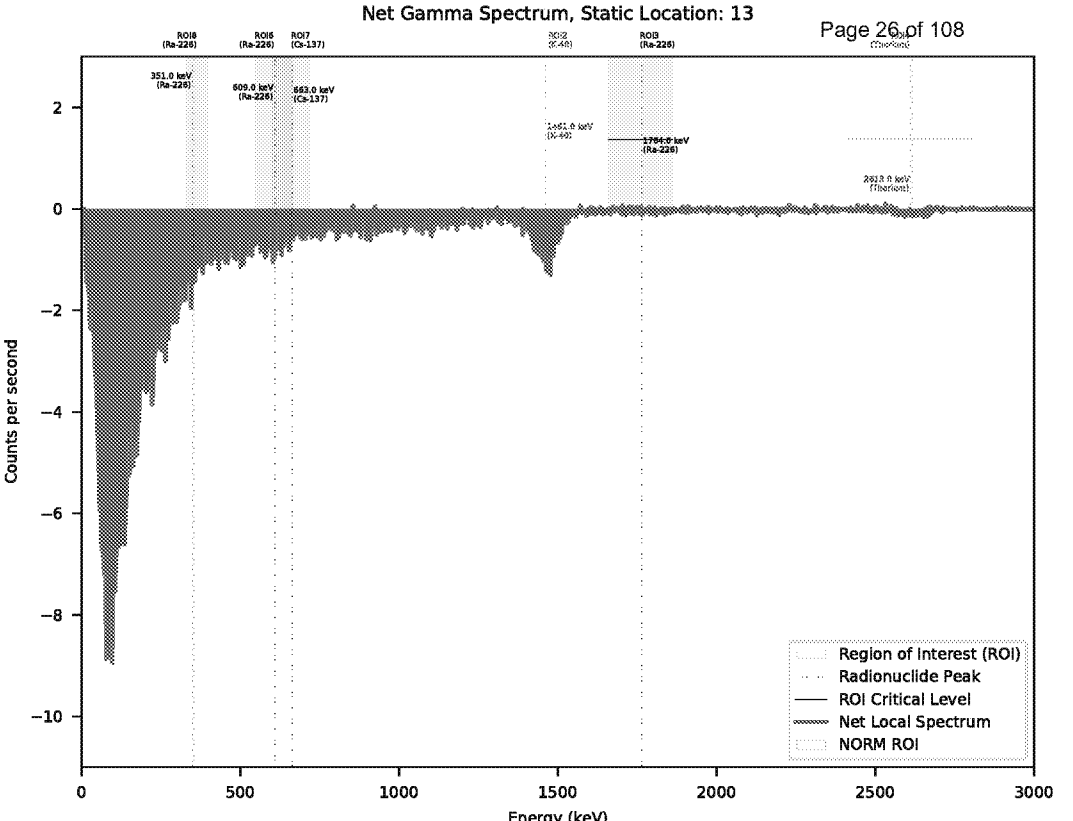
Local Coordinates (Longitude, Latitude): -122.36731900632913, 37.72386329999999


Net Gamma Spectrum, Static Location: 11
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Chlorine)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3672482283783, 37.72390529864864



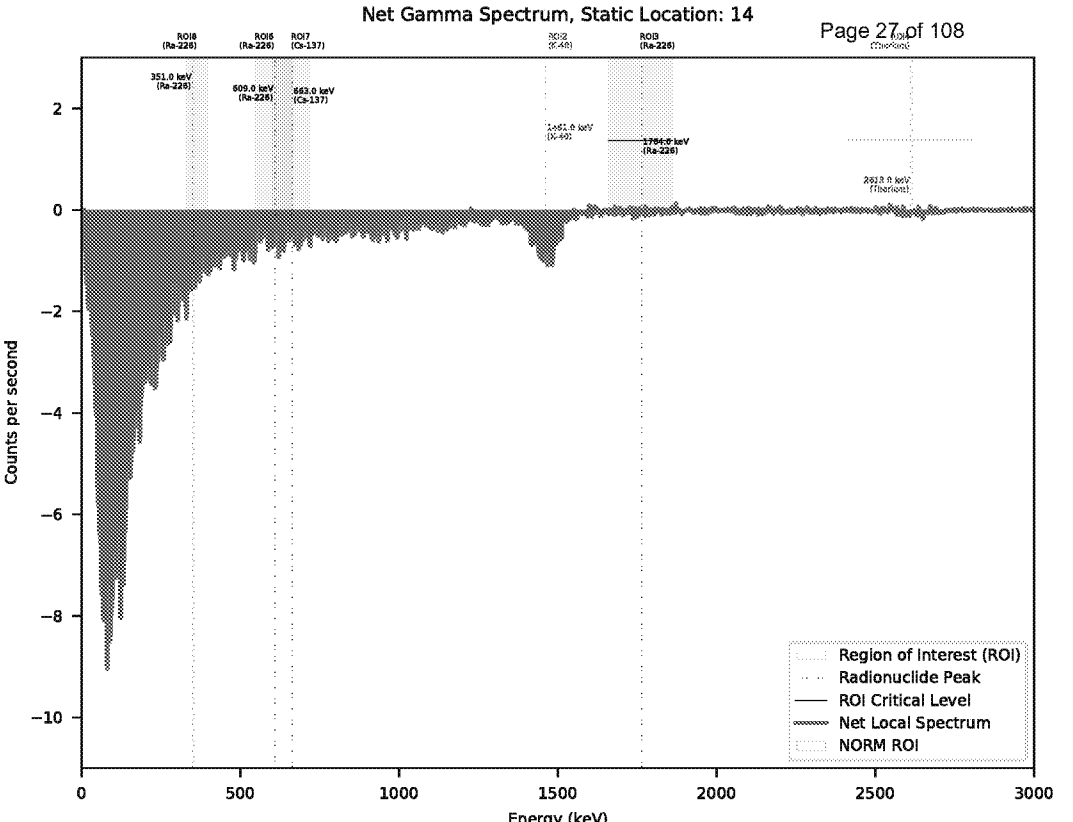
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36715769736843, 37.723827223684225



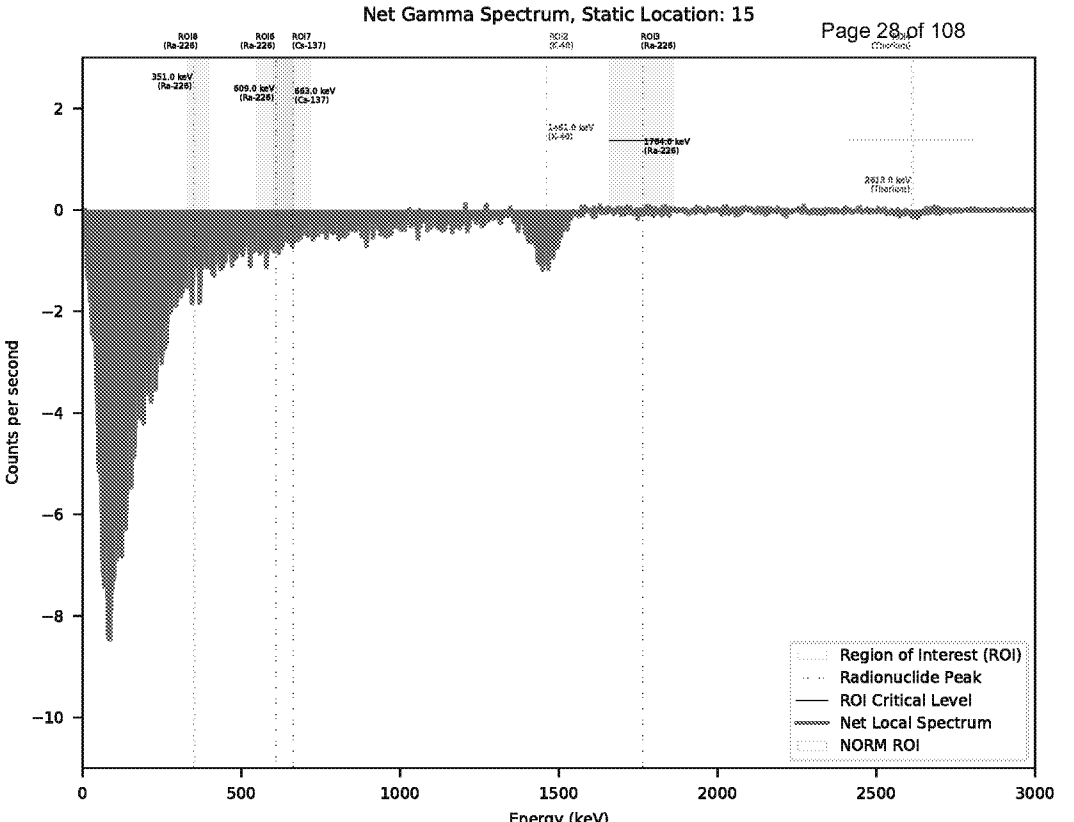
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36736317042251, 37.723832809859154



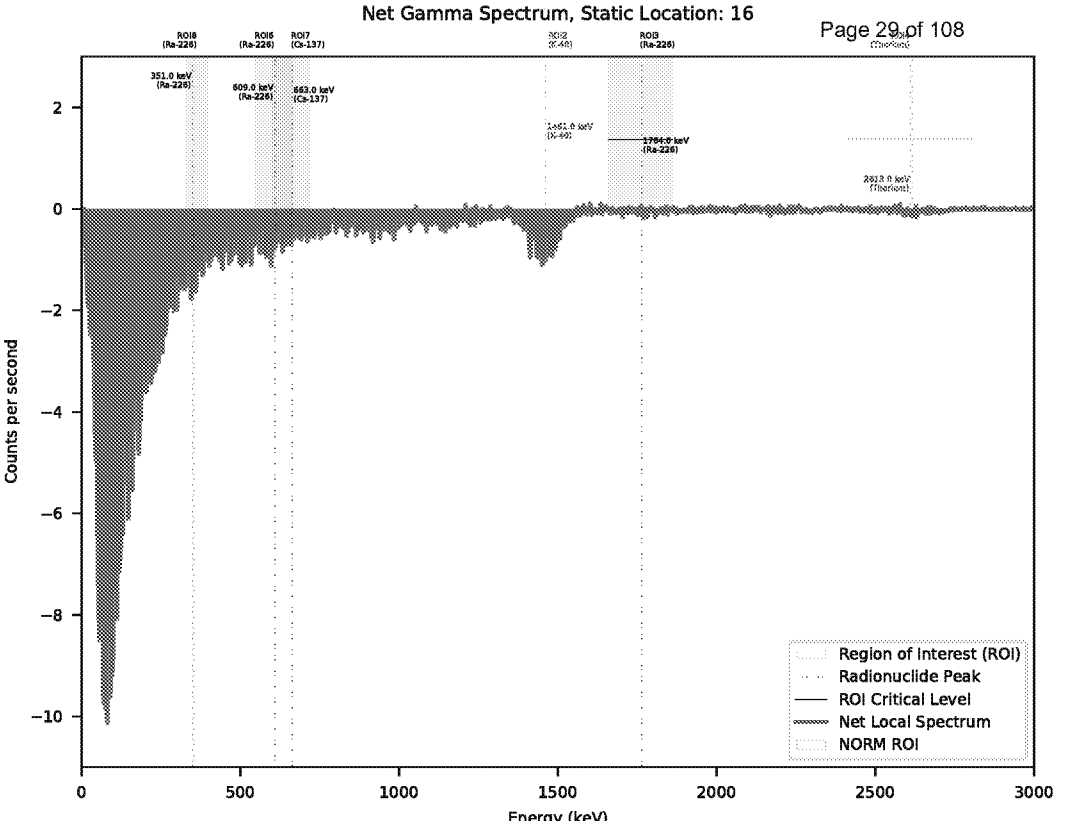
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

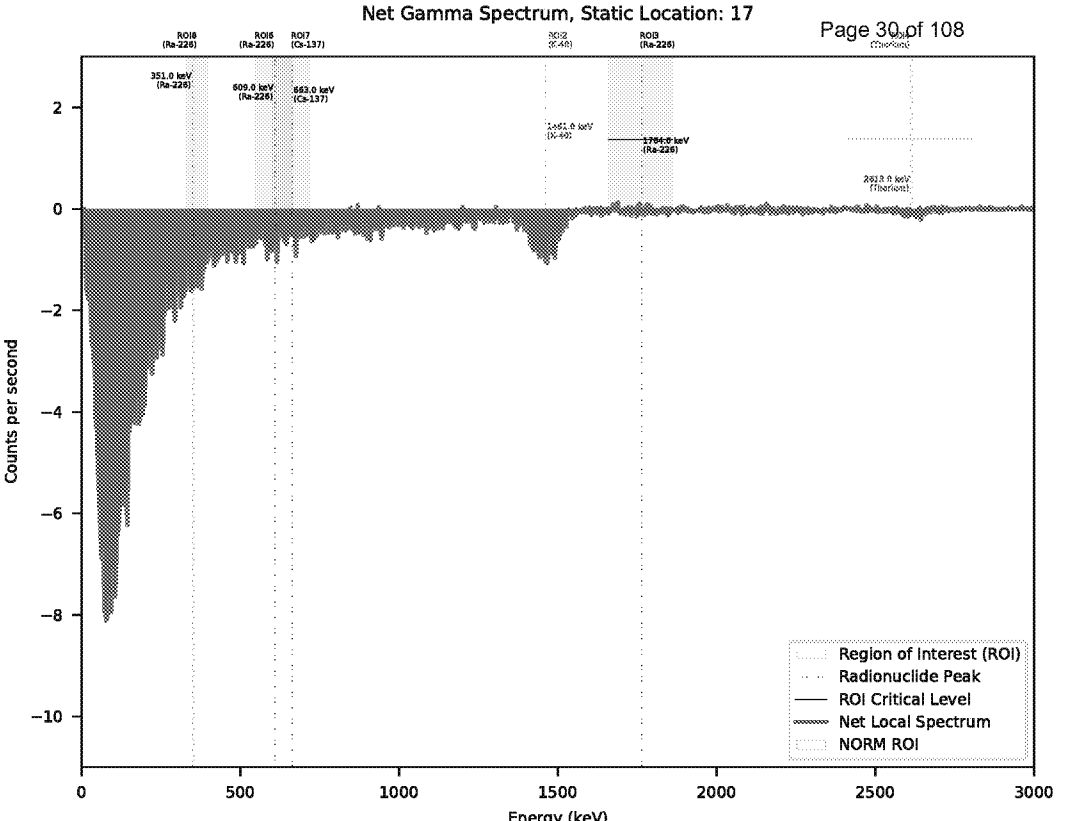
Local Coordinates (Longitude, Latitude): -122.36735042000002, 37.723795052499995



Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

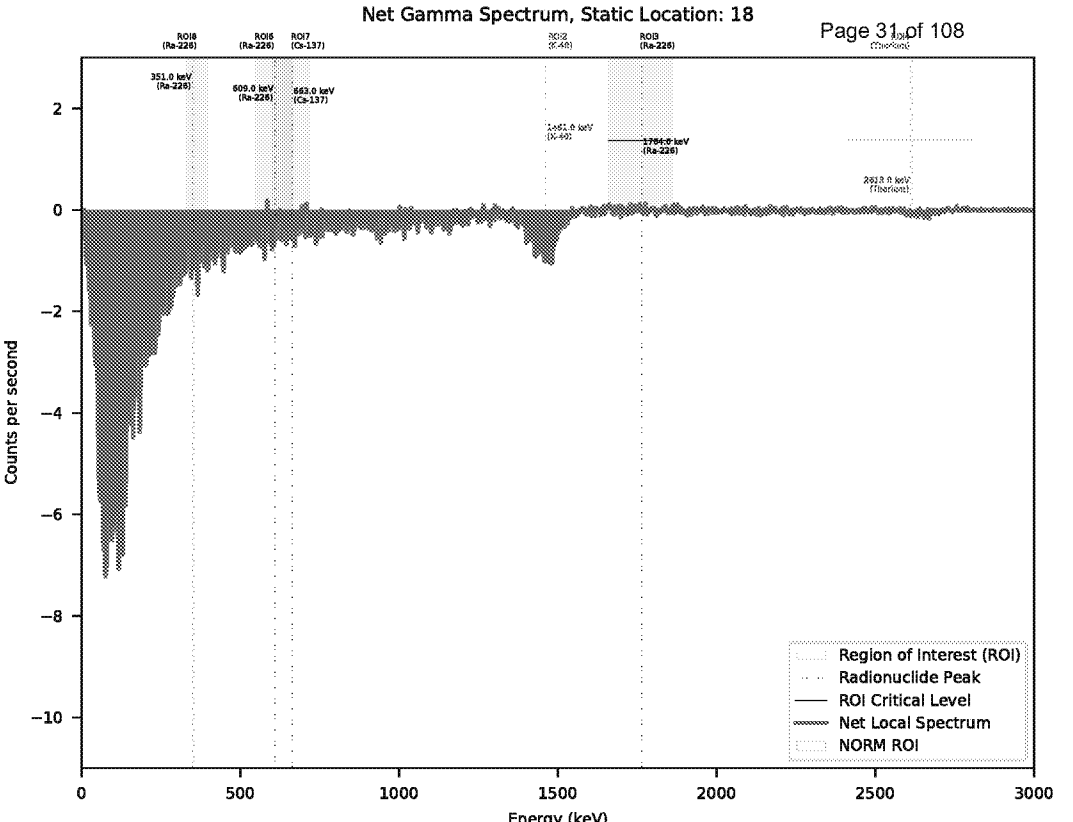
Local Coordinates (Longitude, Latitude): -122.36732900657898, 37.723840085526305


Net Gamma Spectrum, Static Location: 16
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36729711216226, 37.72379677702704



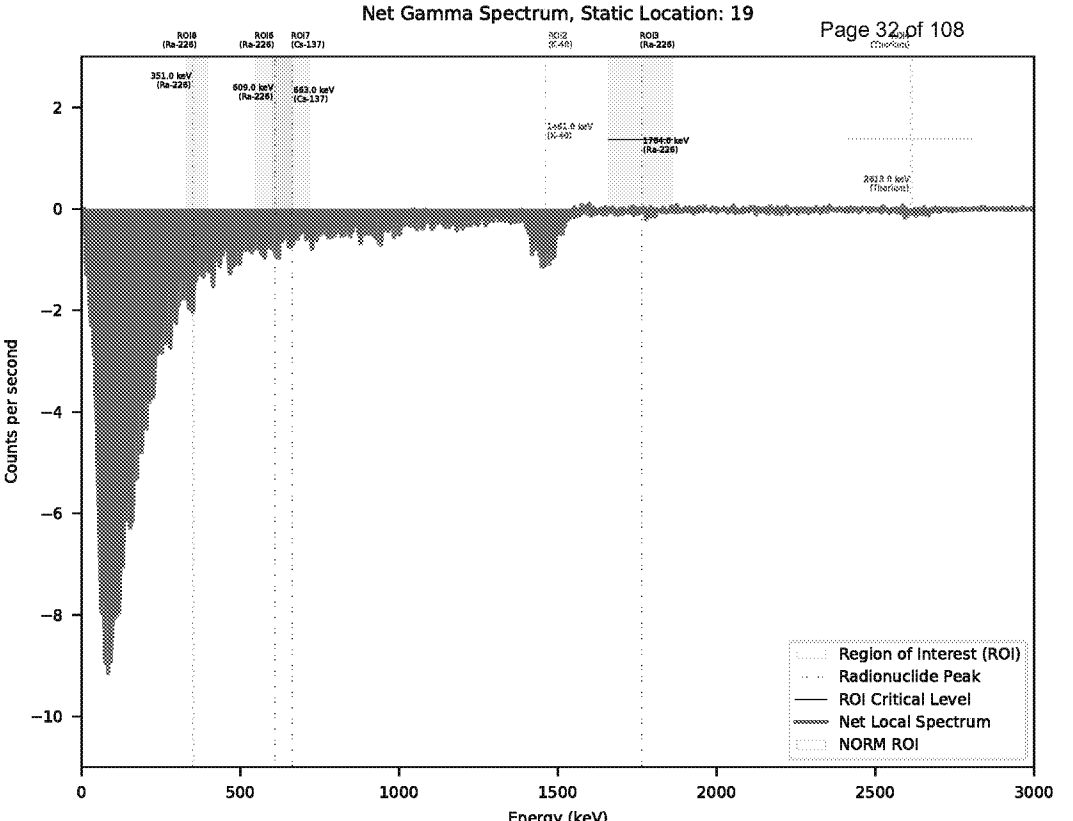
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36716874794524, 37.7238241520548



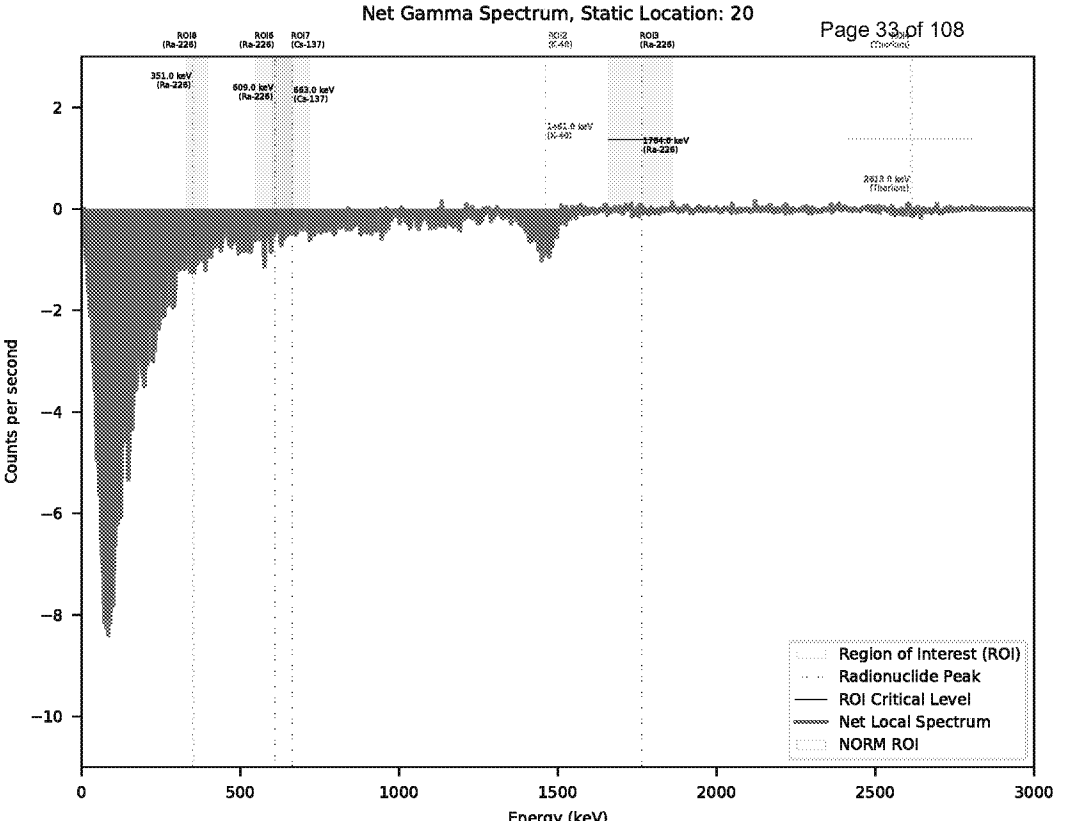
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36723127272728, 37.72389747727276



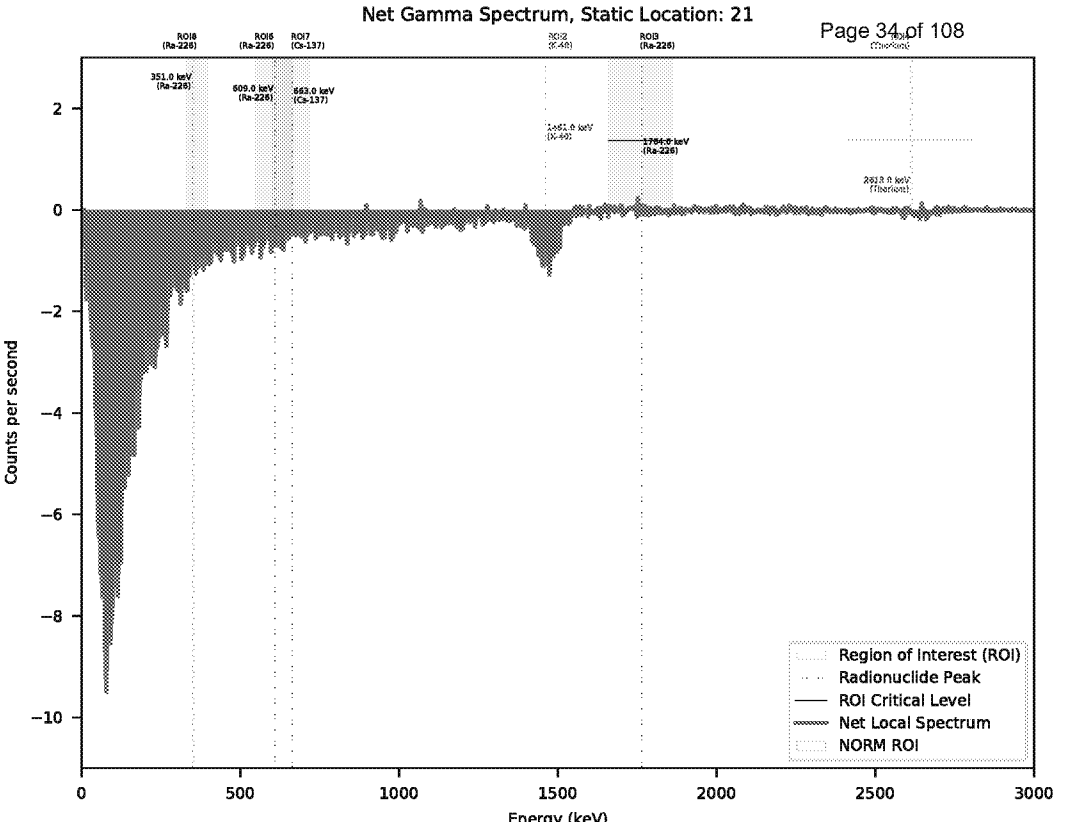
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36738015301214, 37.72392180843373



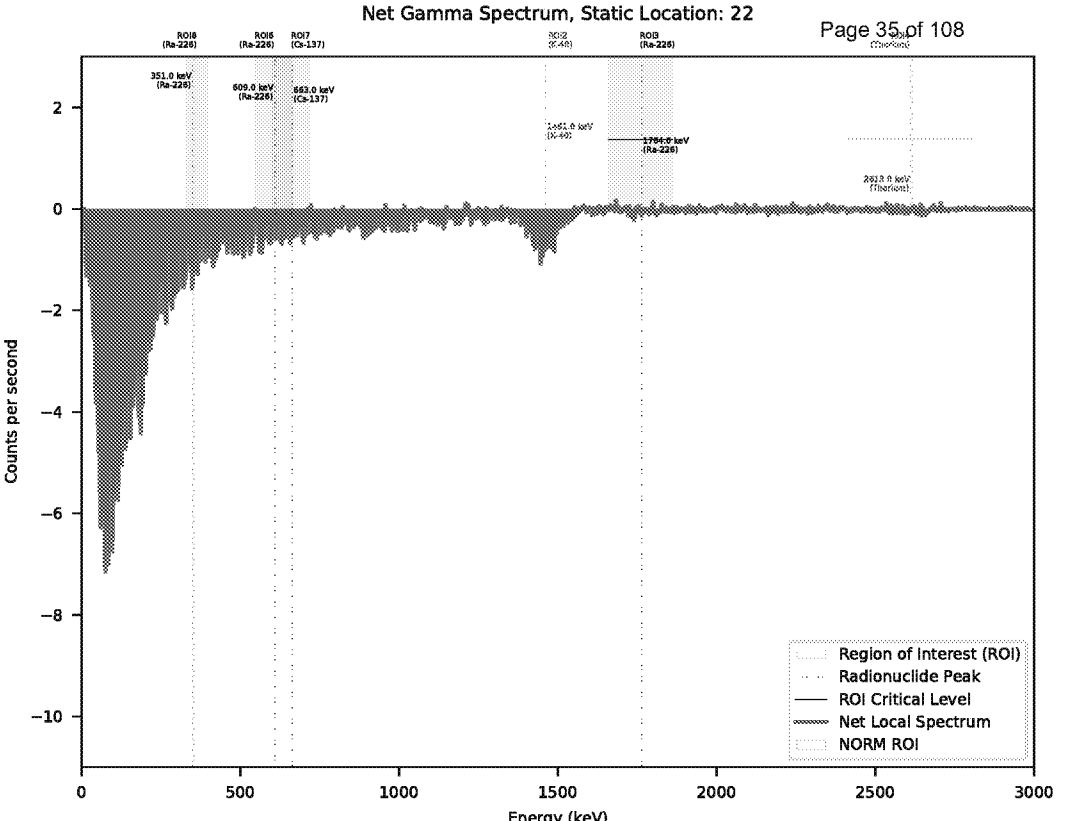
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36731094324327, 37.72387169729729



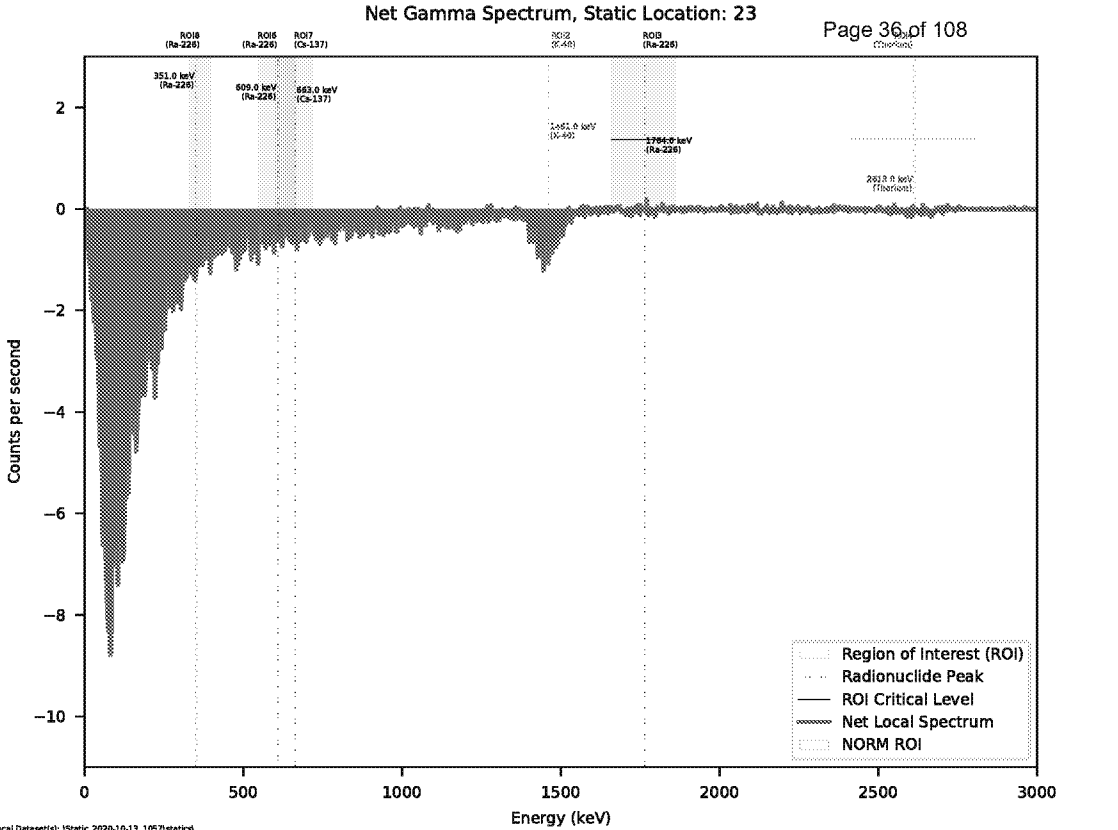
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

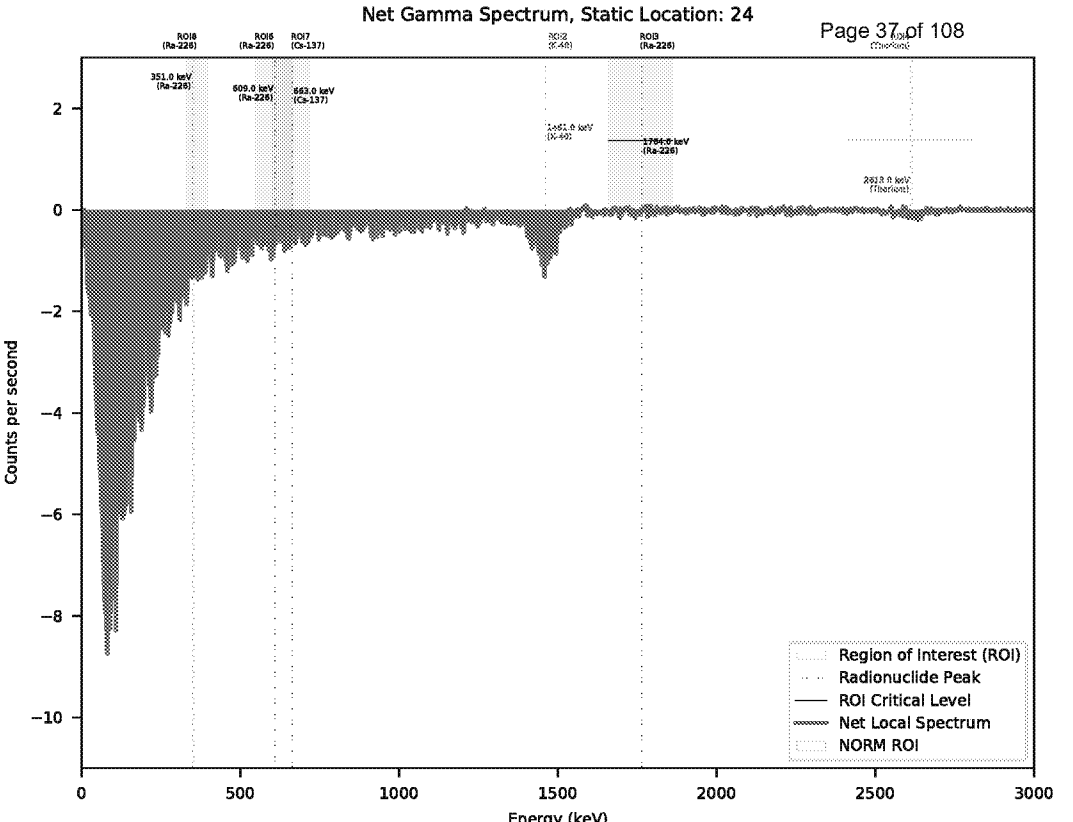
Local Coordinates (Longitude, Latitude): -122.3672620942029, 37.72393699275361

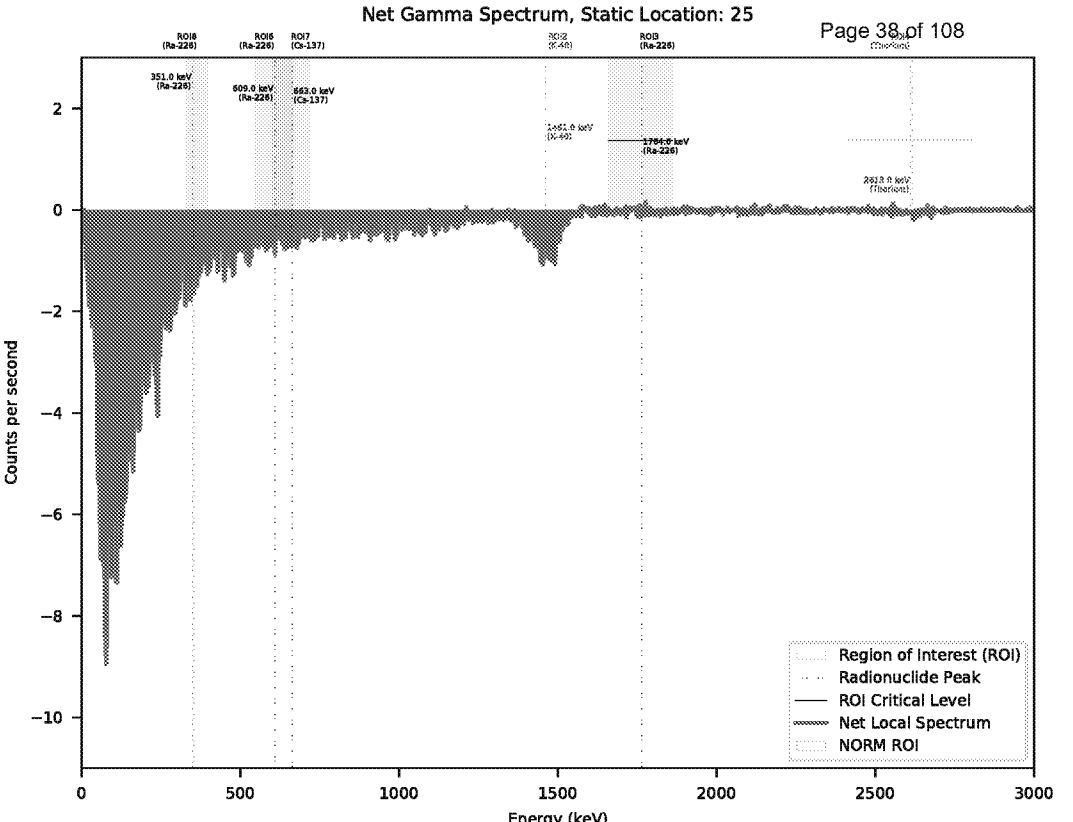


Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36724471159421, 37.72387575217391

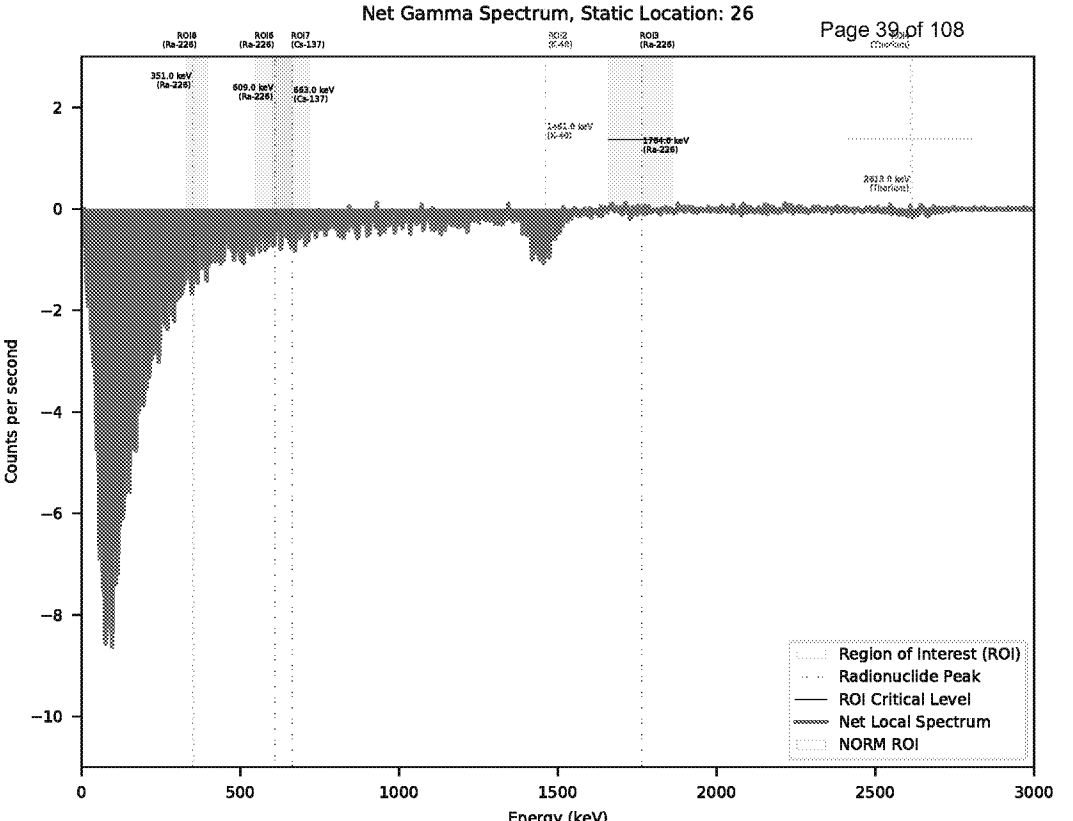

Net Gamma Spectrum, Static Location: 23
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.3672119557143, 37.723873884285716


Net Gamma Spectrum, Static Location: 24
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI1 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36723209253731, 37.72383968059702



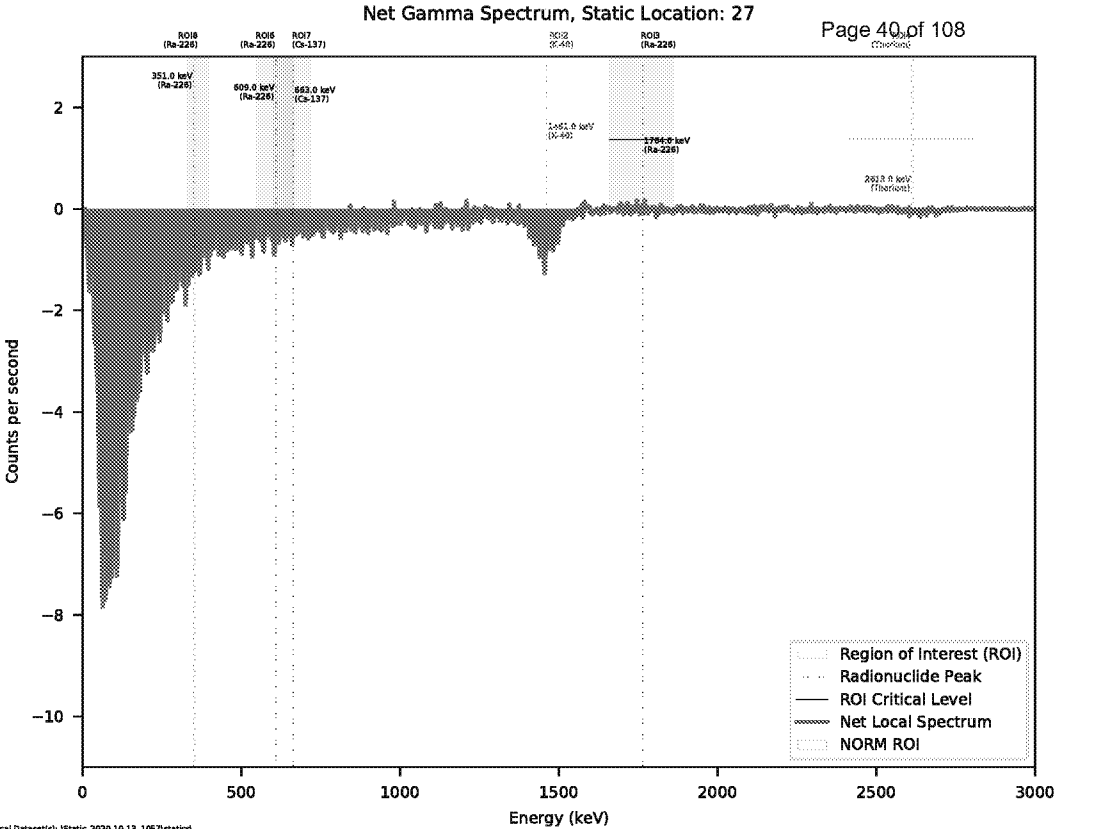
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36738176376815, 37.72385809275362



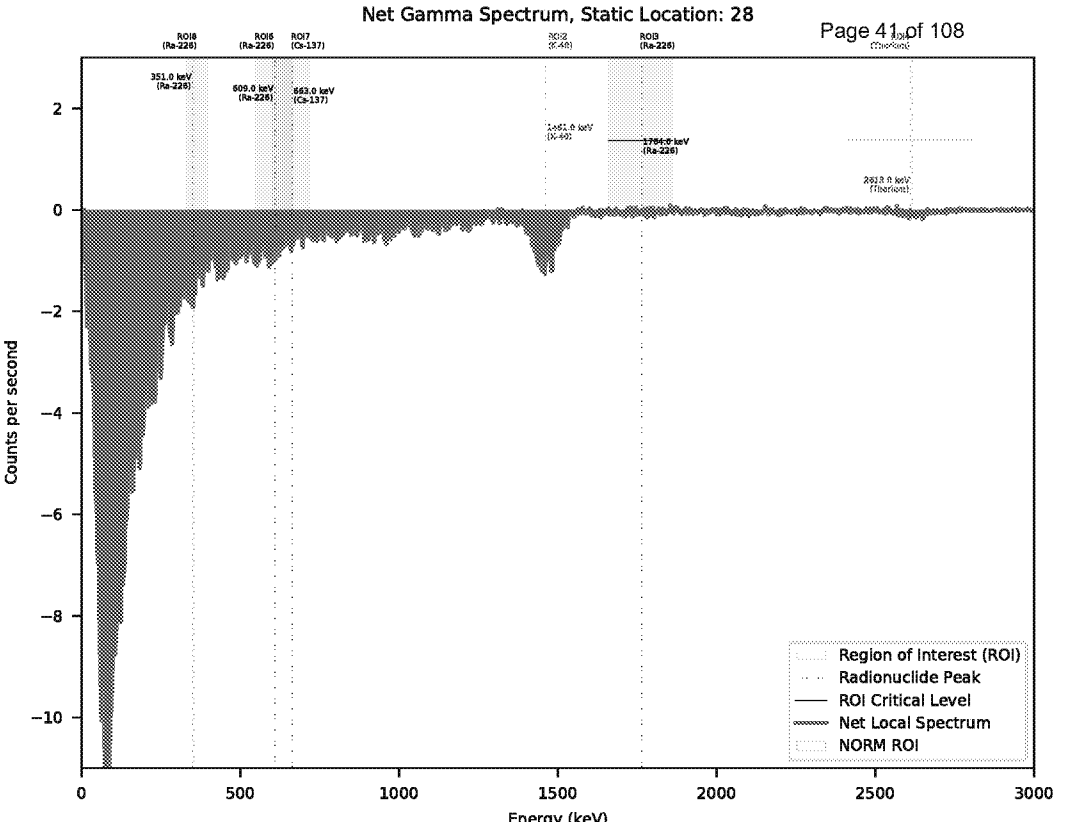
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36733046617644, 37.72383270586235



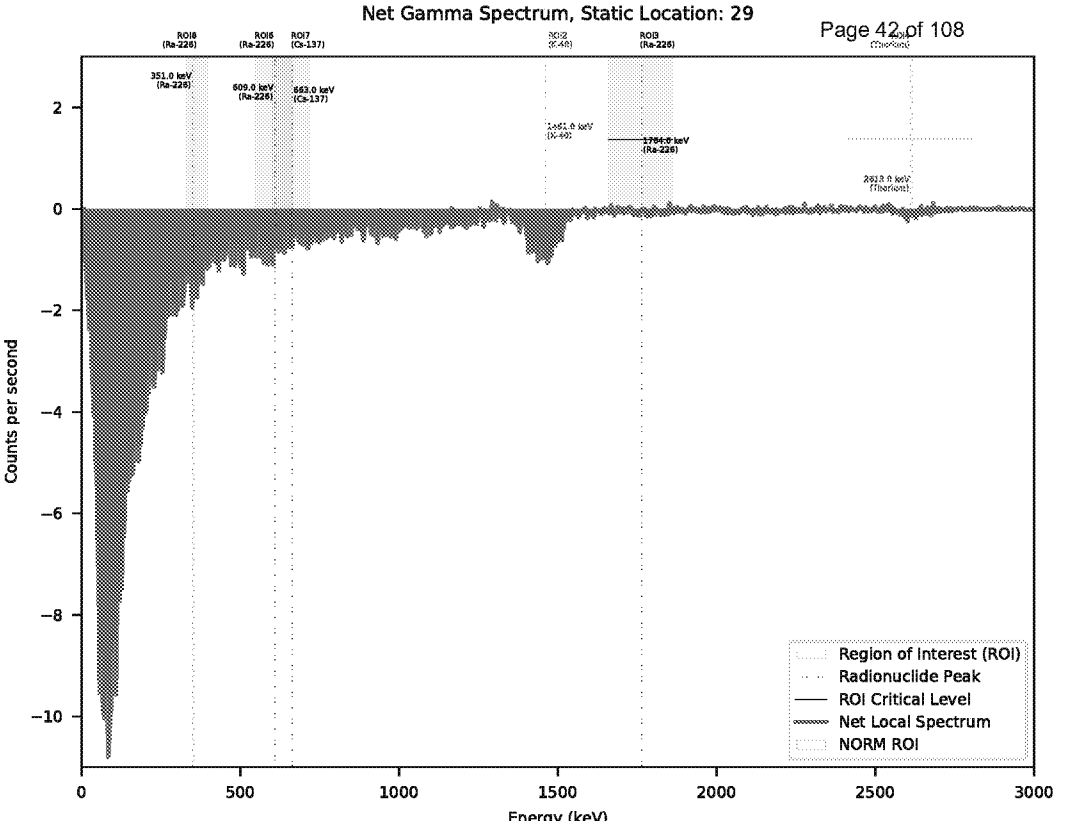
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36730655200003, 37.723875893333336



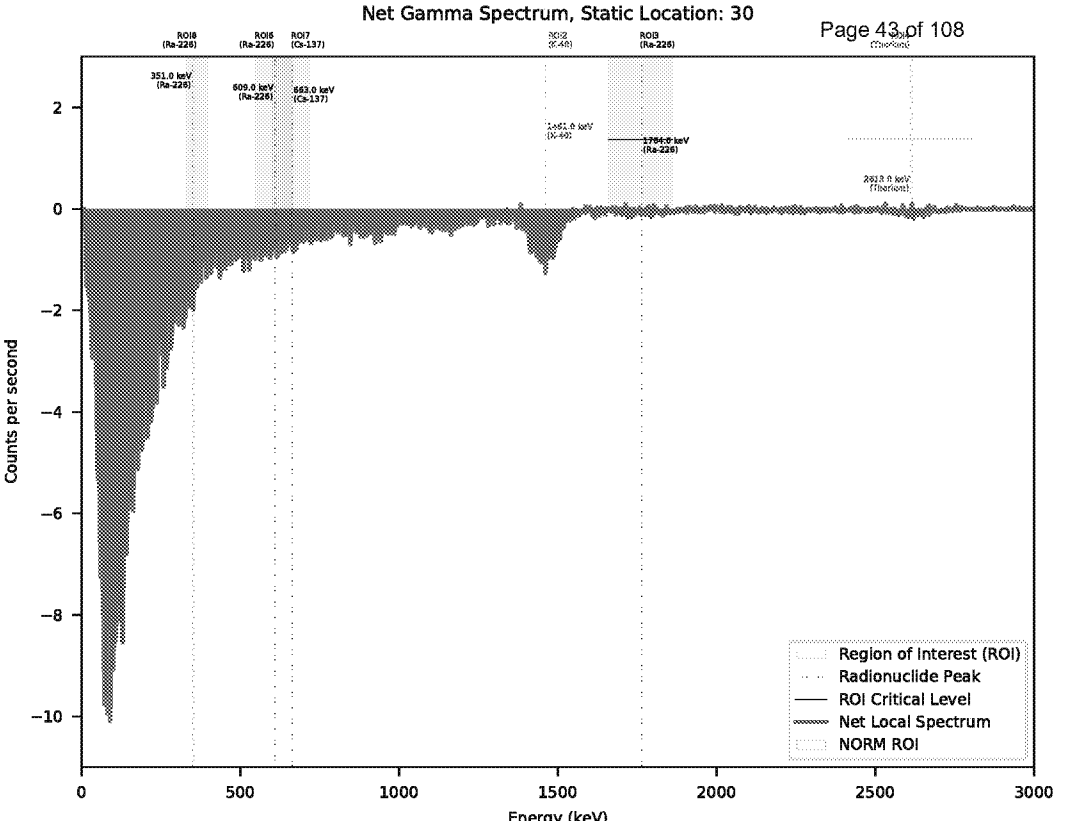
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36737936021518, 37.72375745698922



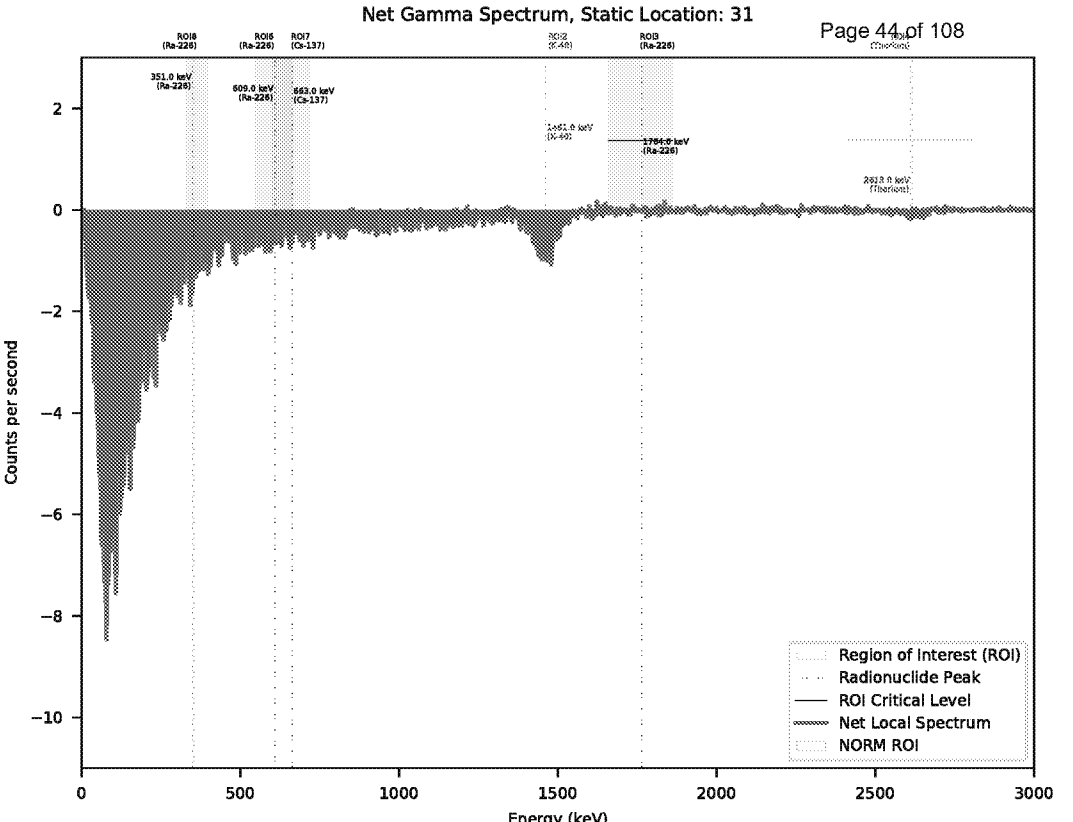
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36732686984126, 37.72376772380954



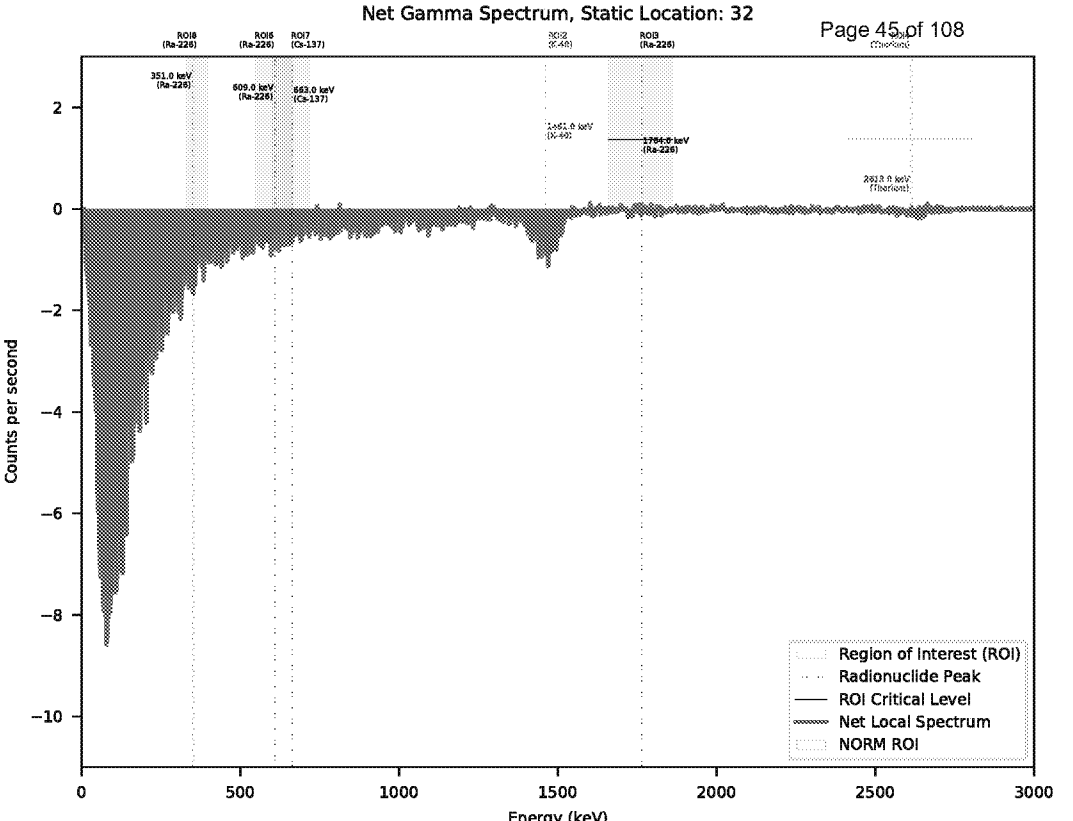
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36739857205879, 37.72394502056826



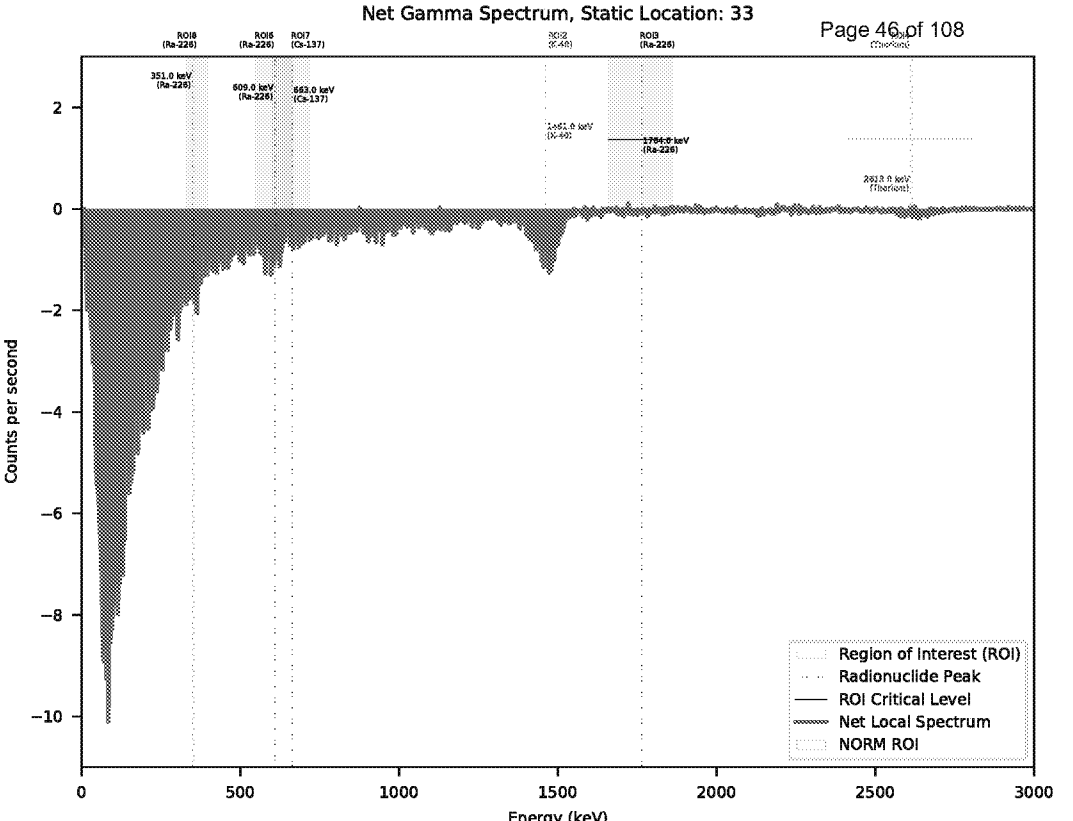
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36723555857141, 37.72396339714285



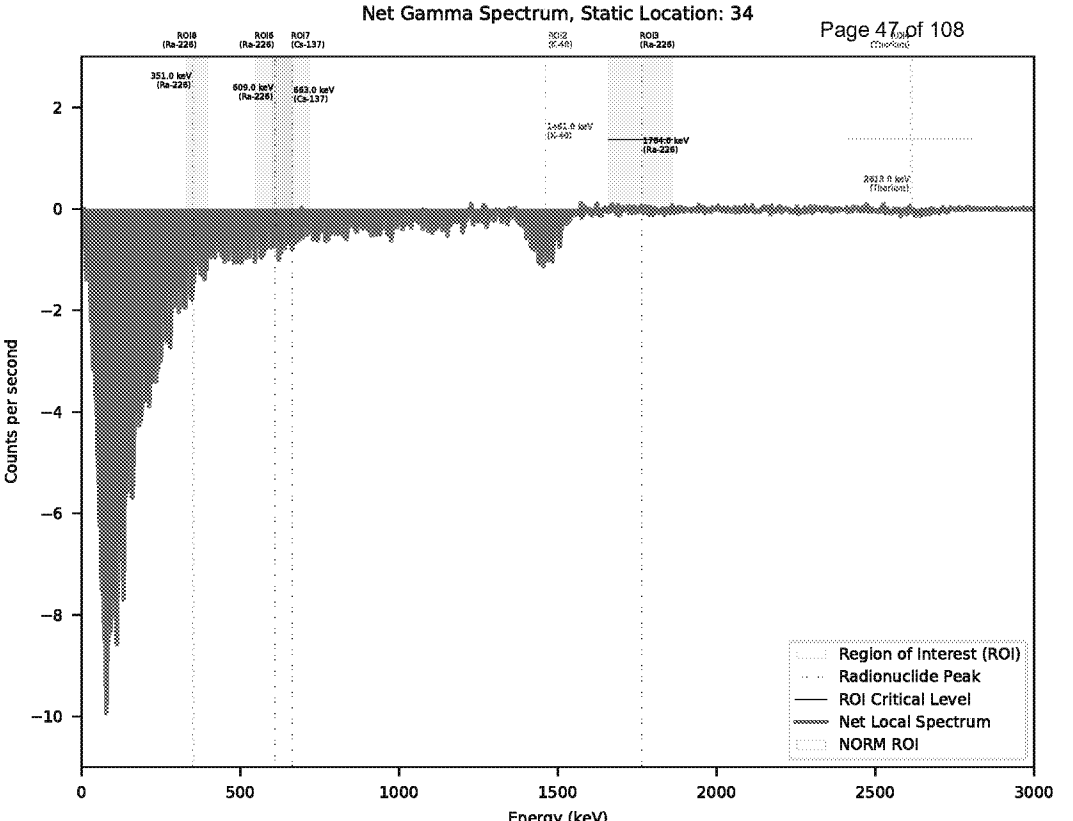
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

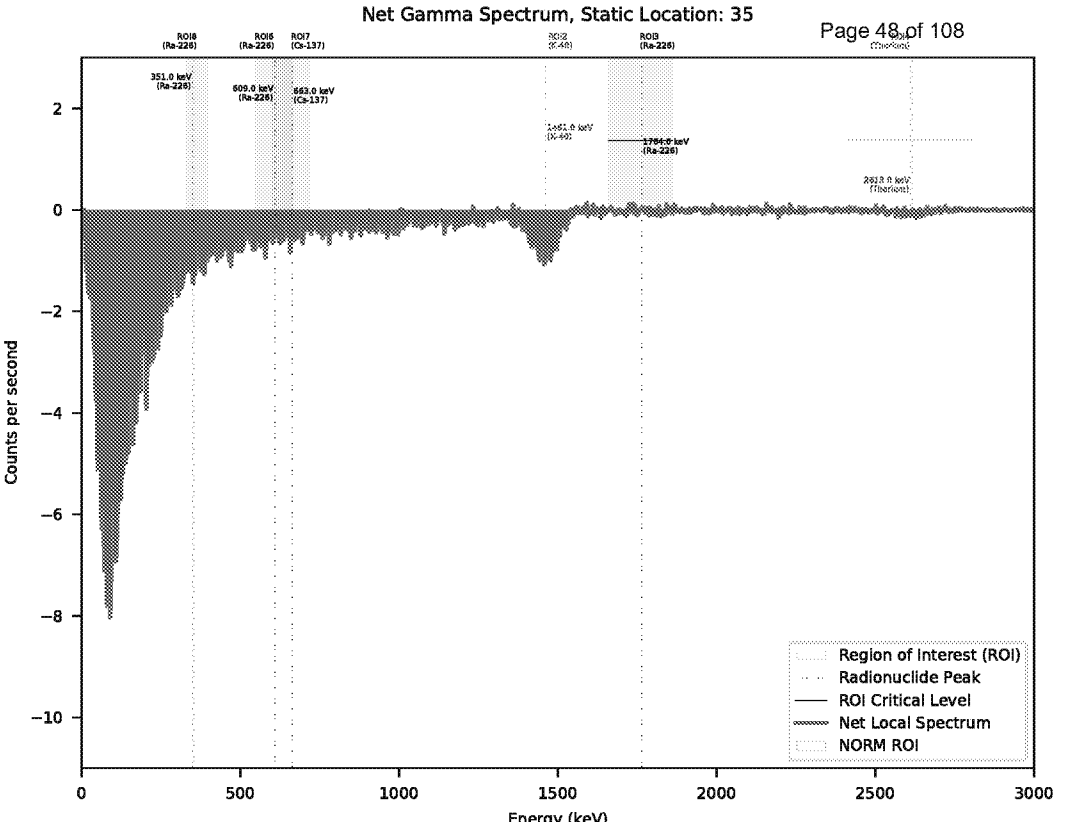
Local Coordinates (Longitude, Latitude): -122.36733817419348, 37.723830603225814

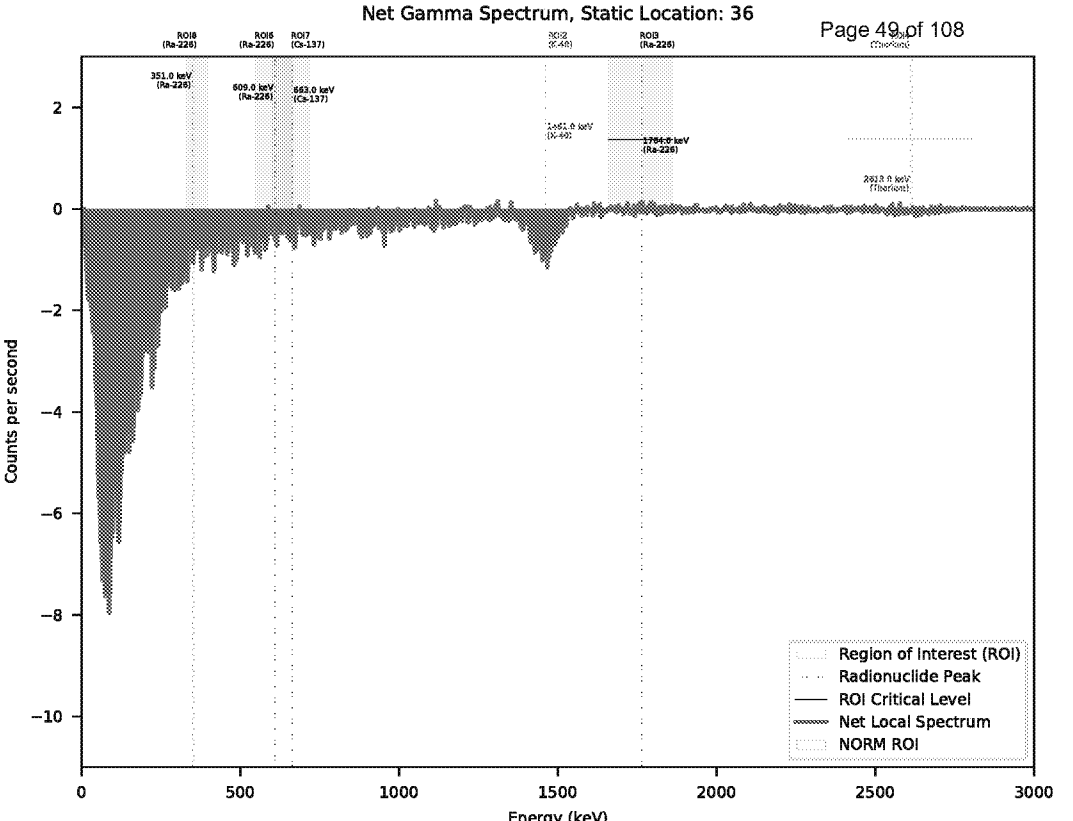


Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36716109870132, 37.72383901298702


Net Gamma Spectrum, Static Location: 34
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI1 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36736449142863, 37.72390419285712


Net Gamma Spectrum, Static Location: 35
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36722520704222, 37.72387811126762



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Background Dataset(s): RSI2_SoilRBA_Static.csv

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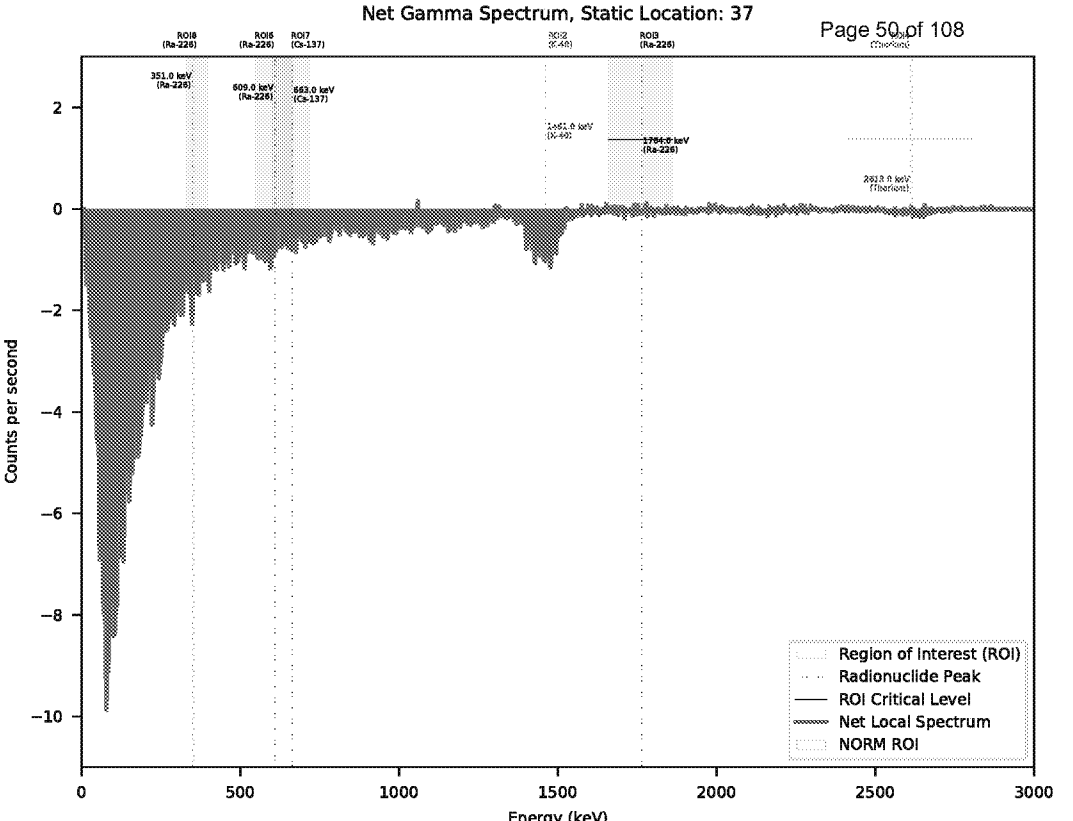

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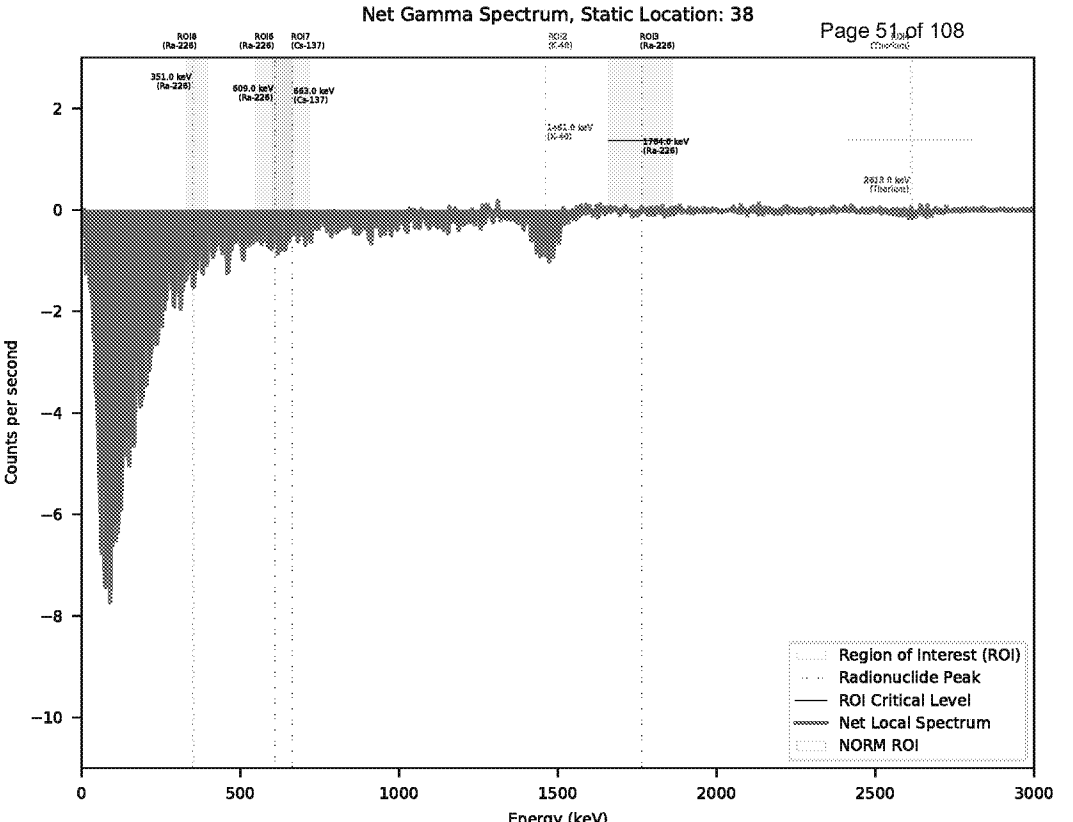

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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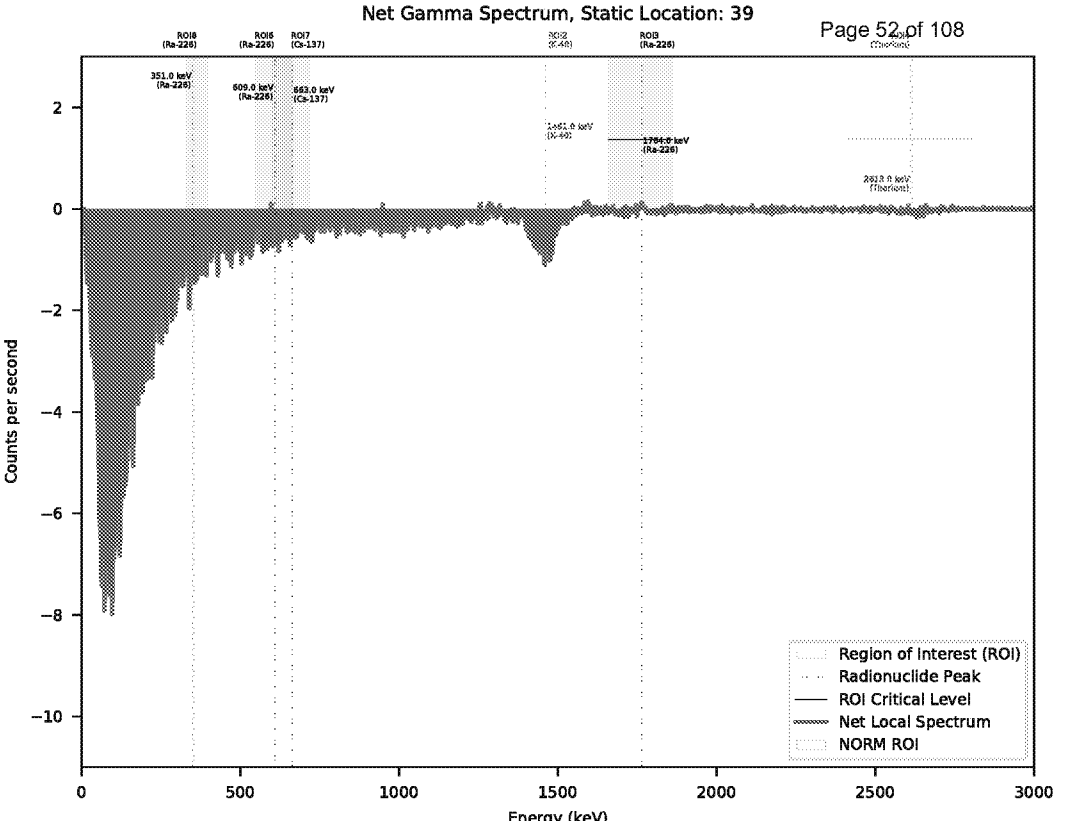

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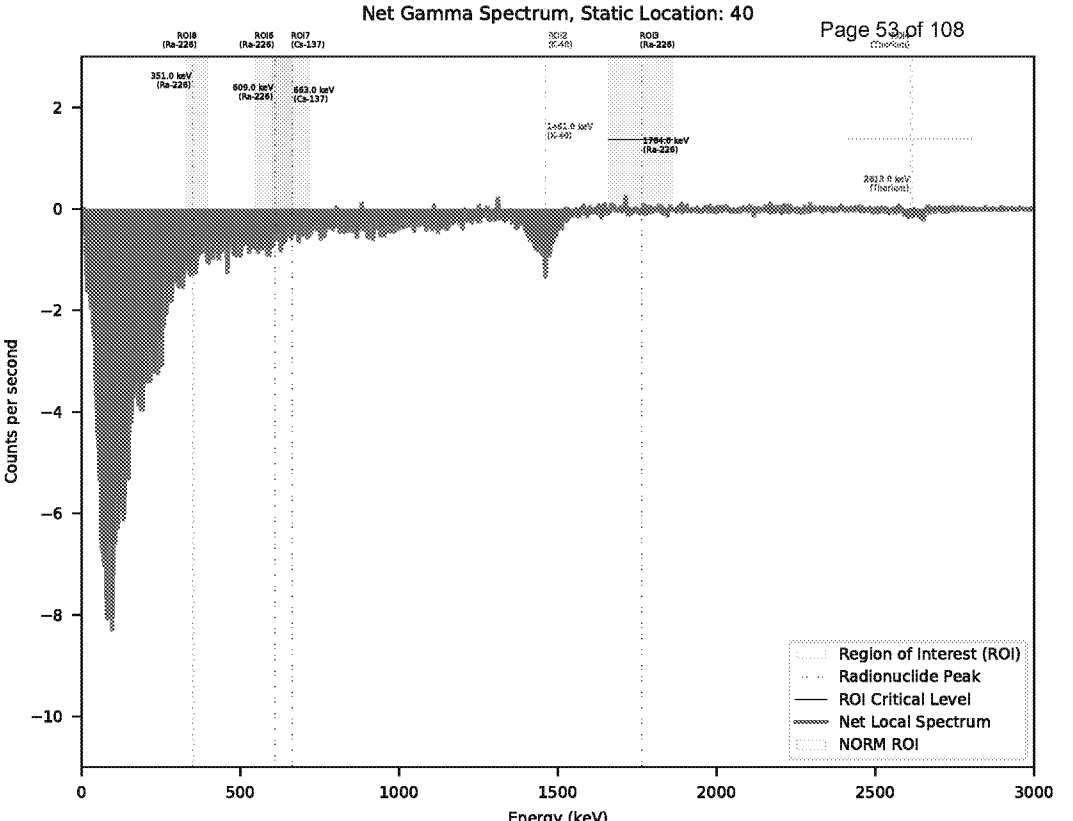

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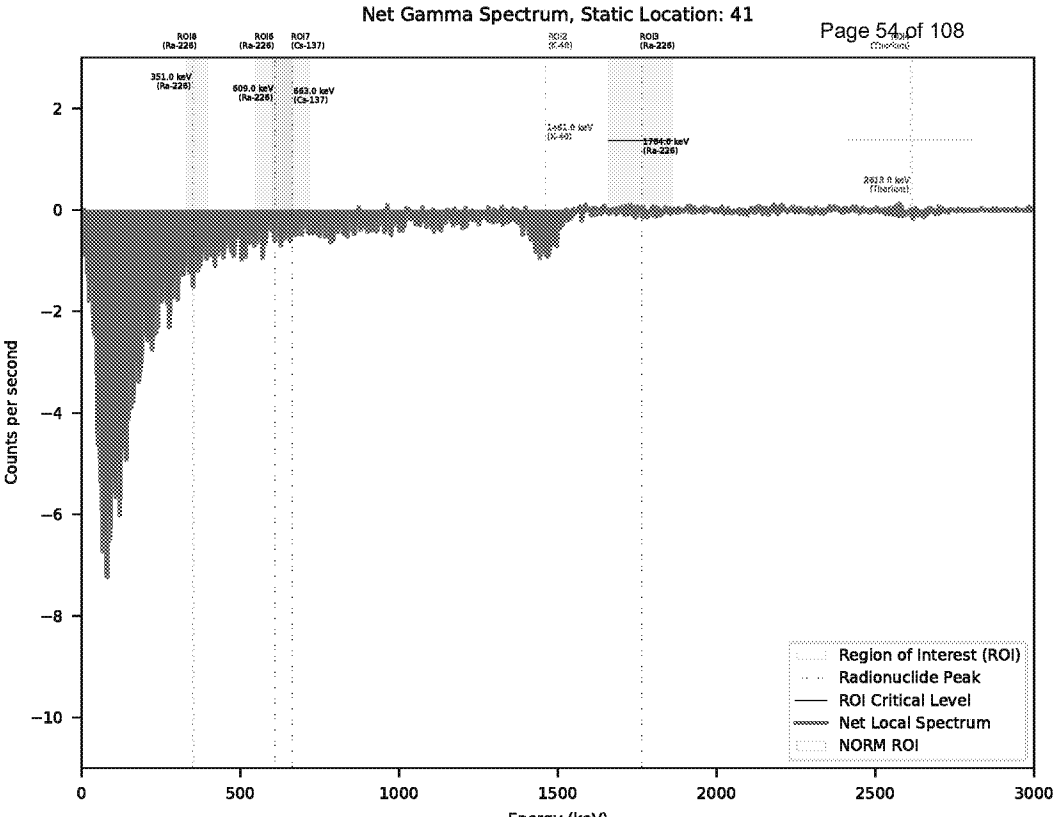

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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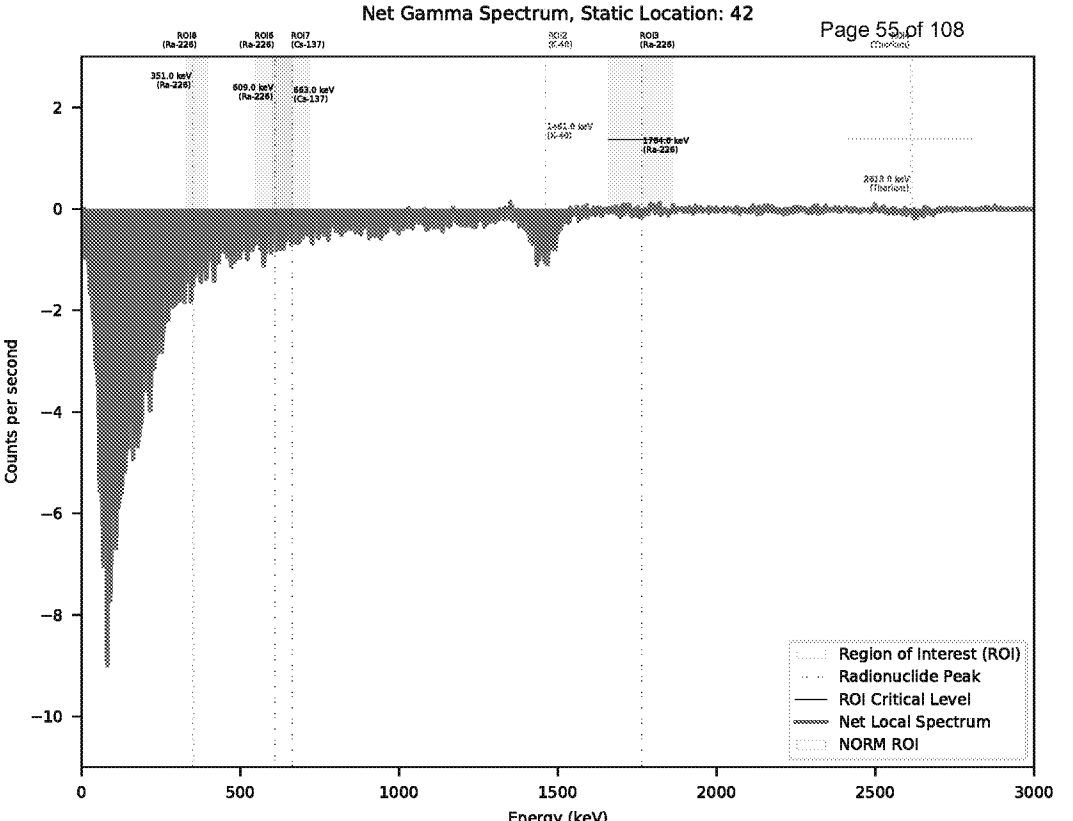

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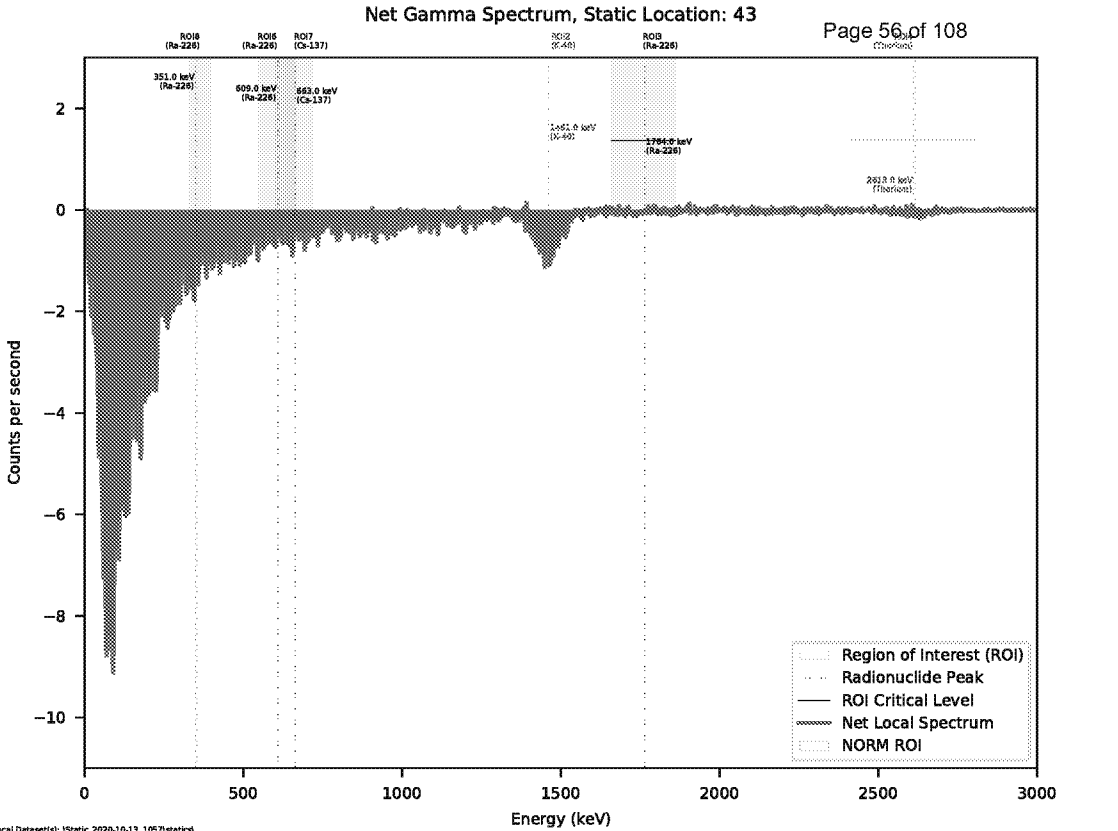
Net Gamma Spectrum, Static Location: 43
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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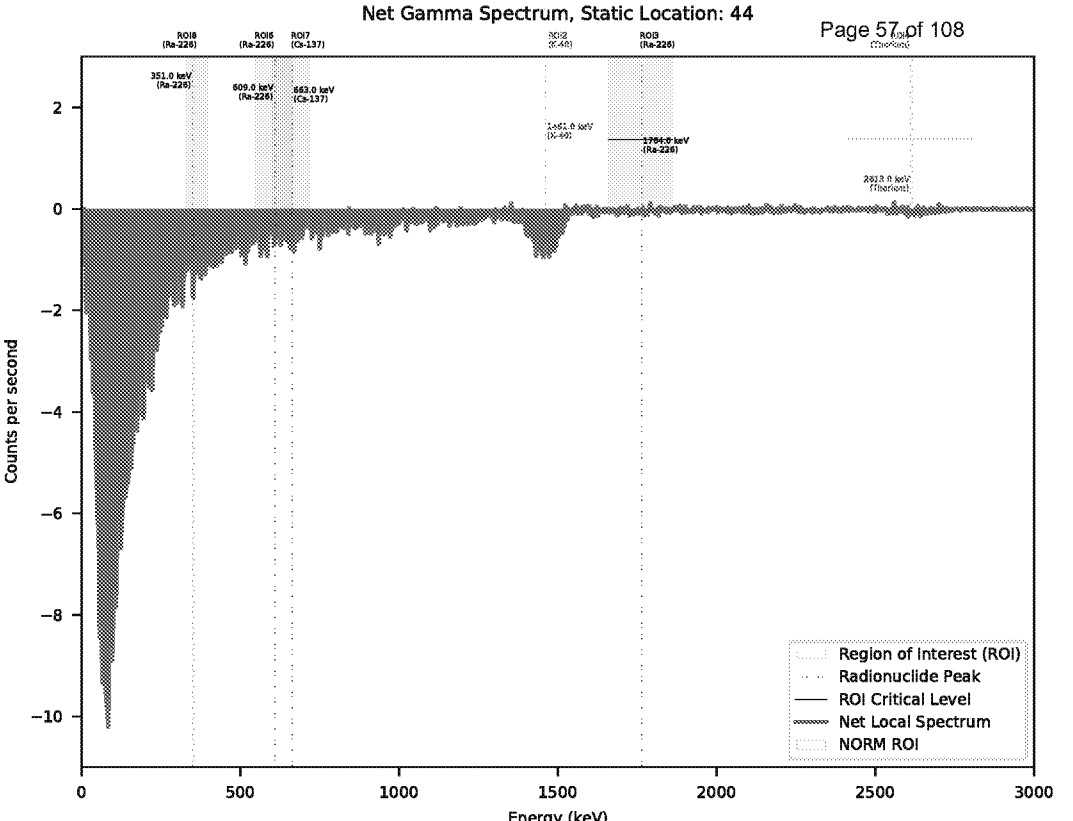
Net Gamma Spectrum, Static Location: 44
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI1 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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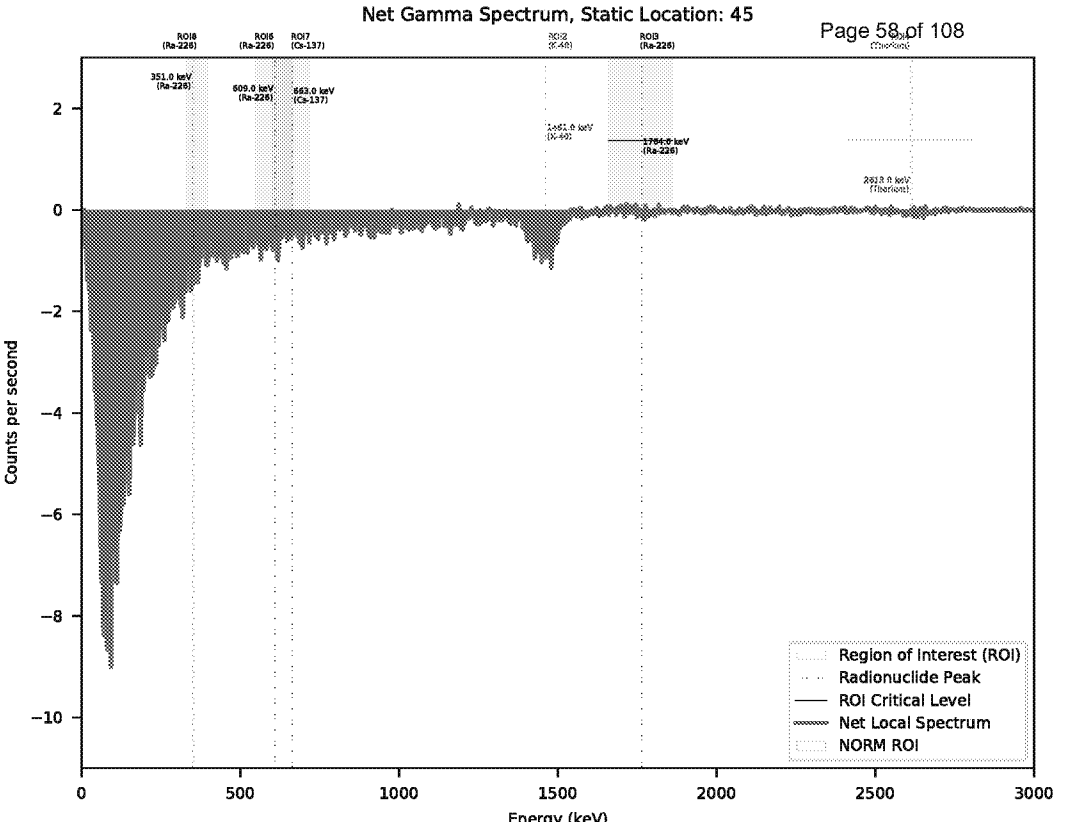

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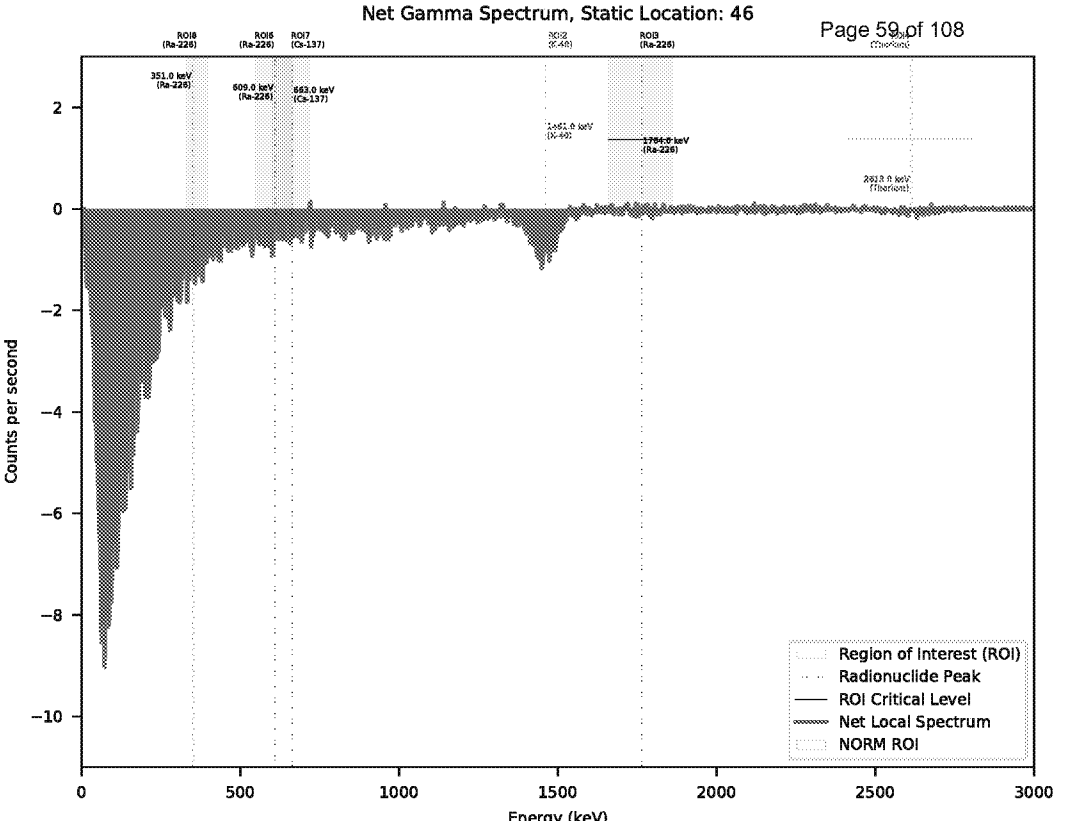

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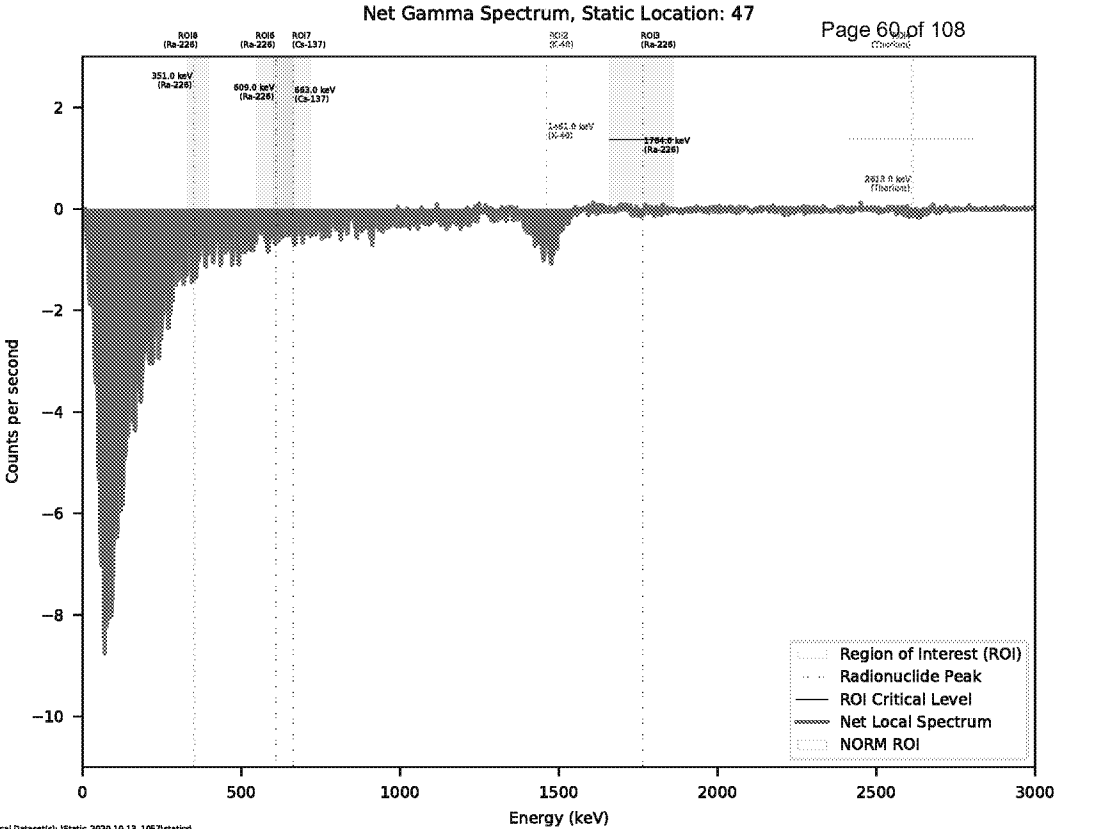

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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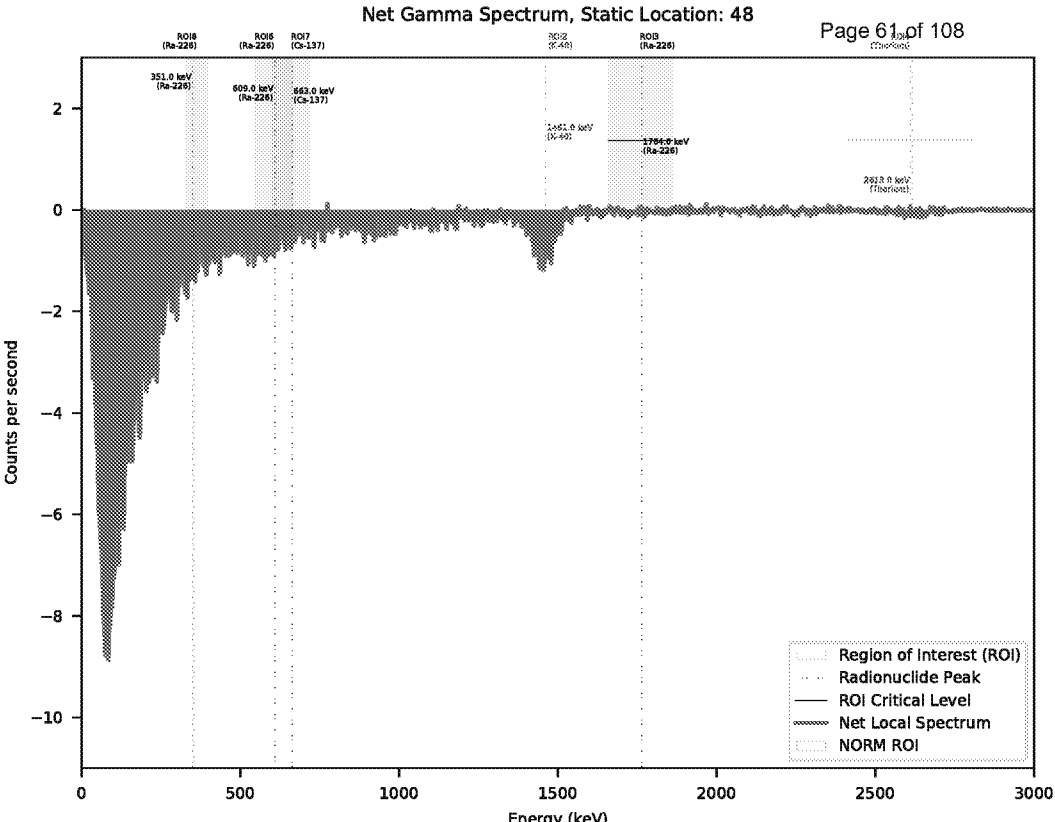

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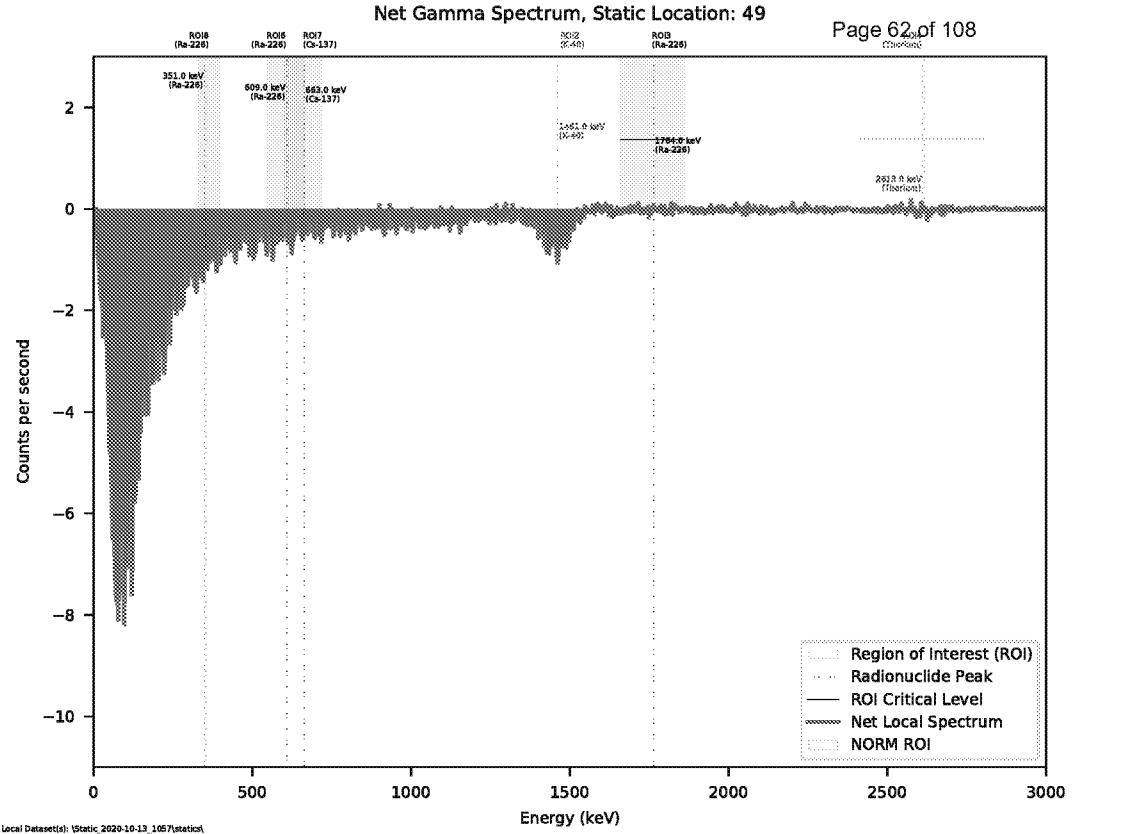
Net Gamma Spectrum, Static Location: 49
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI1 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
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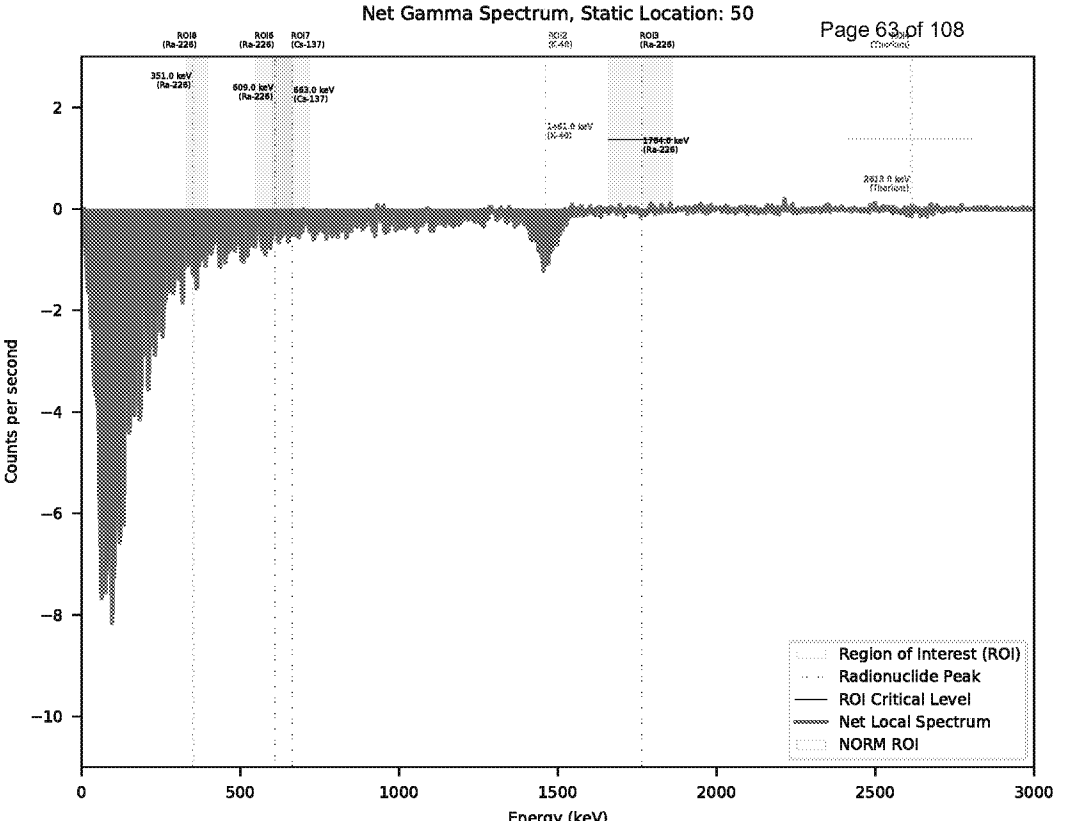

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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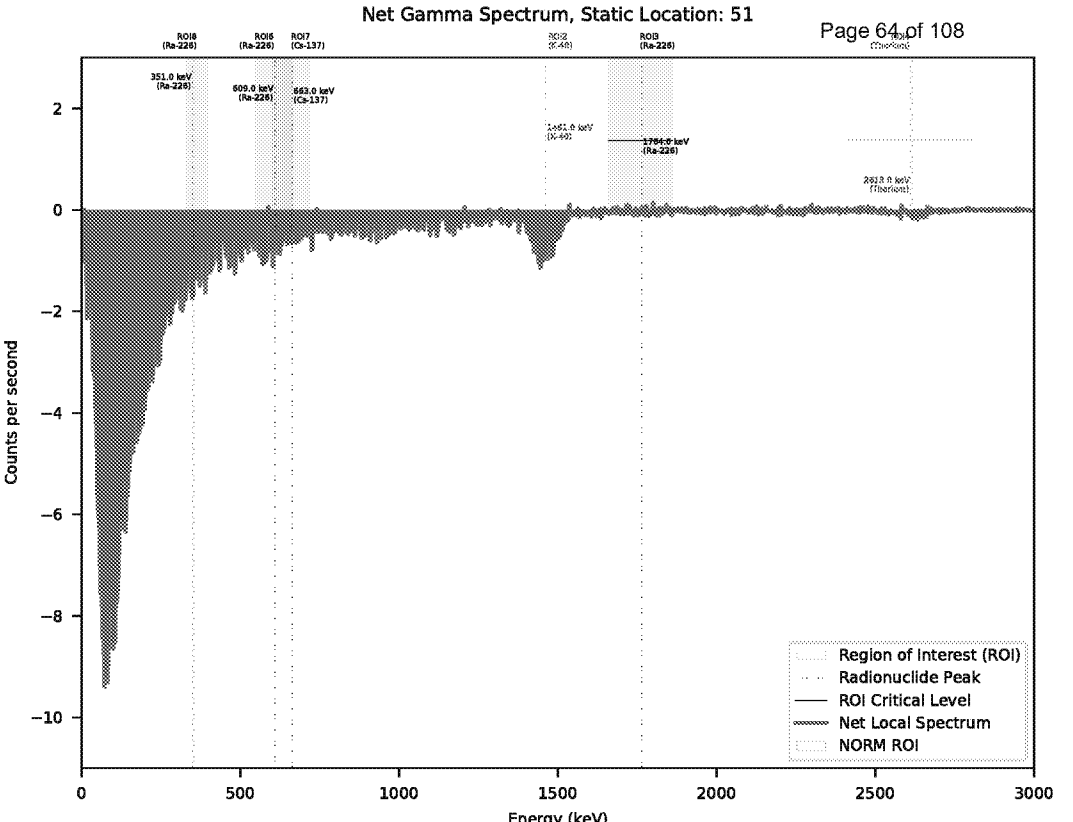

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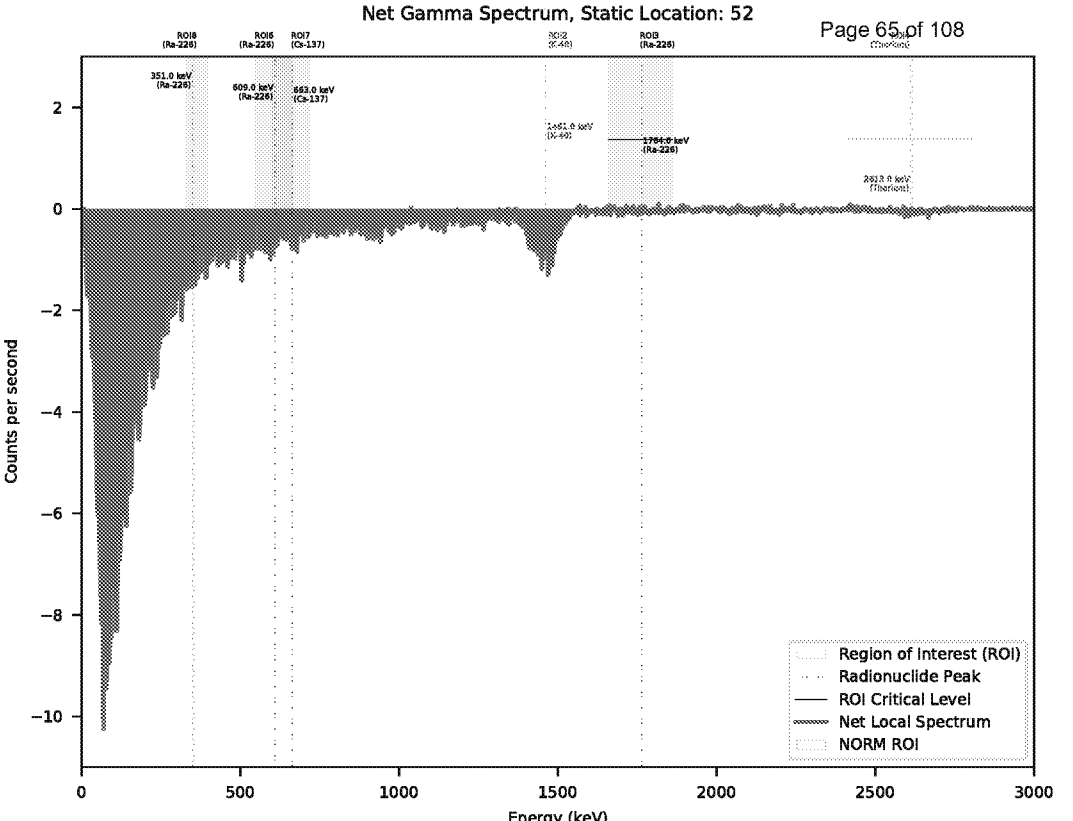

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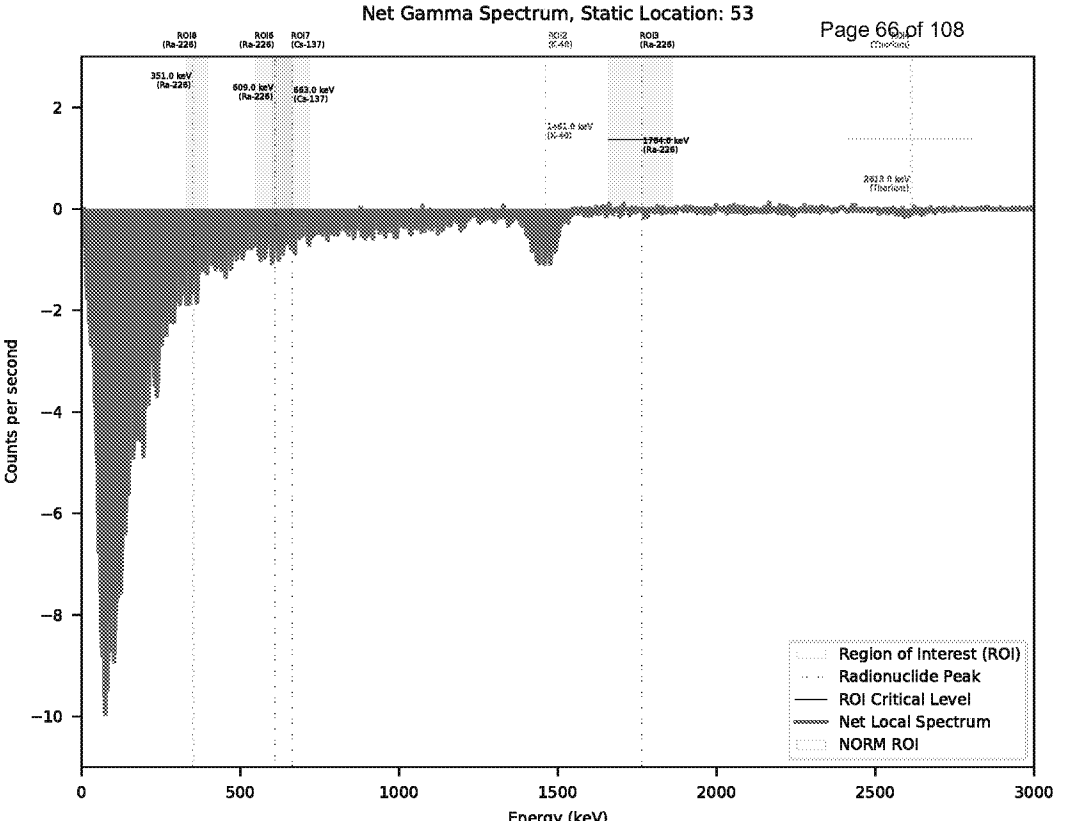

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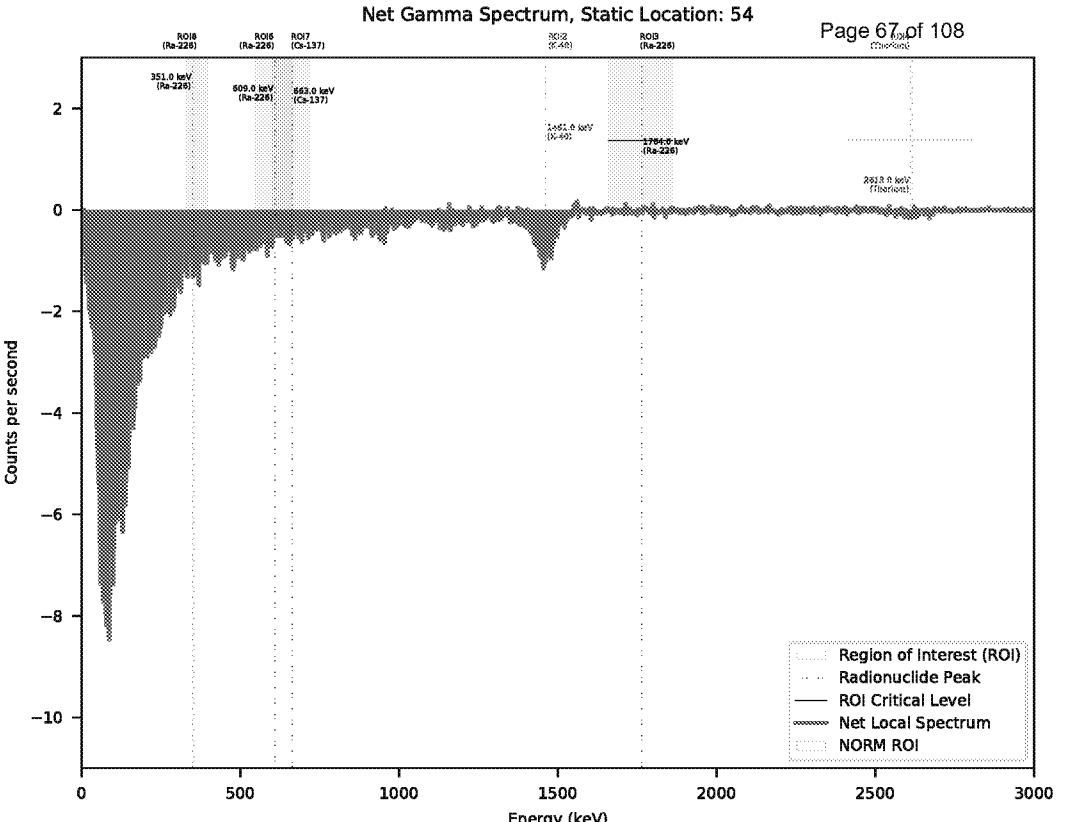

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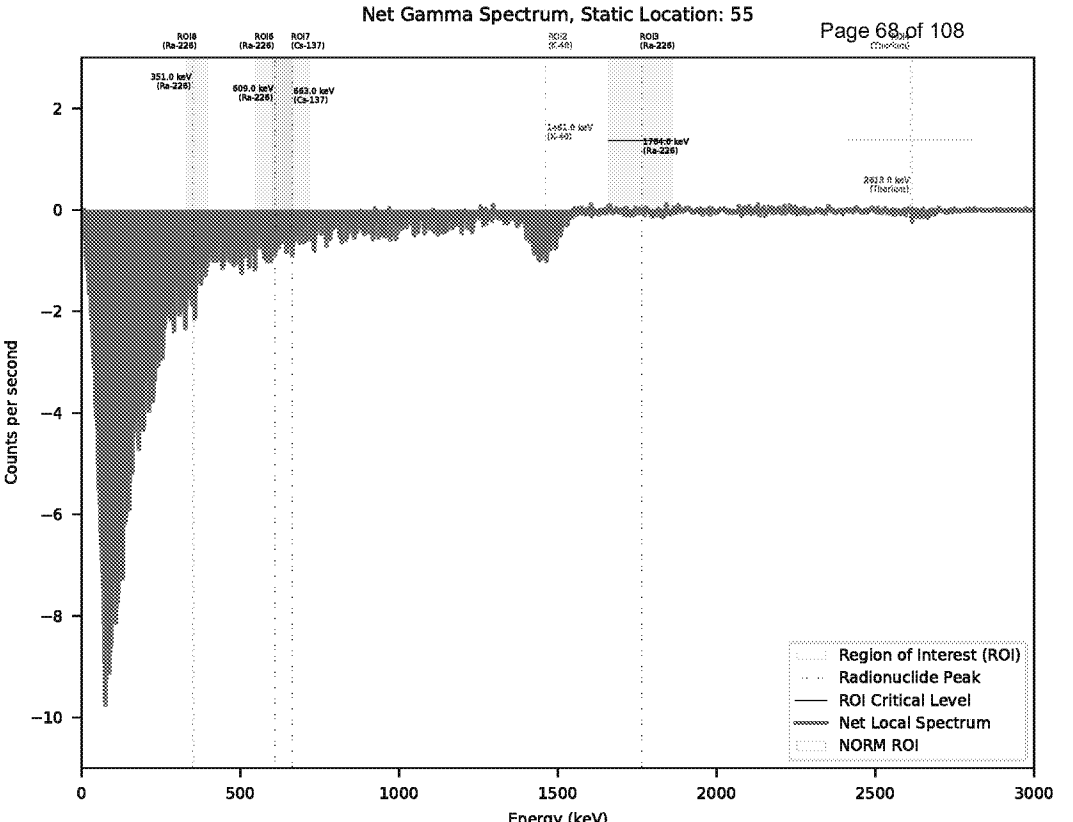
Net Gamma Spectrum, Static Location: 55
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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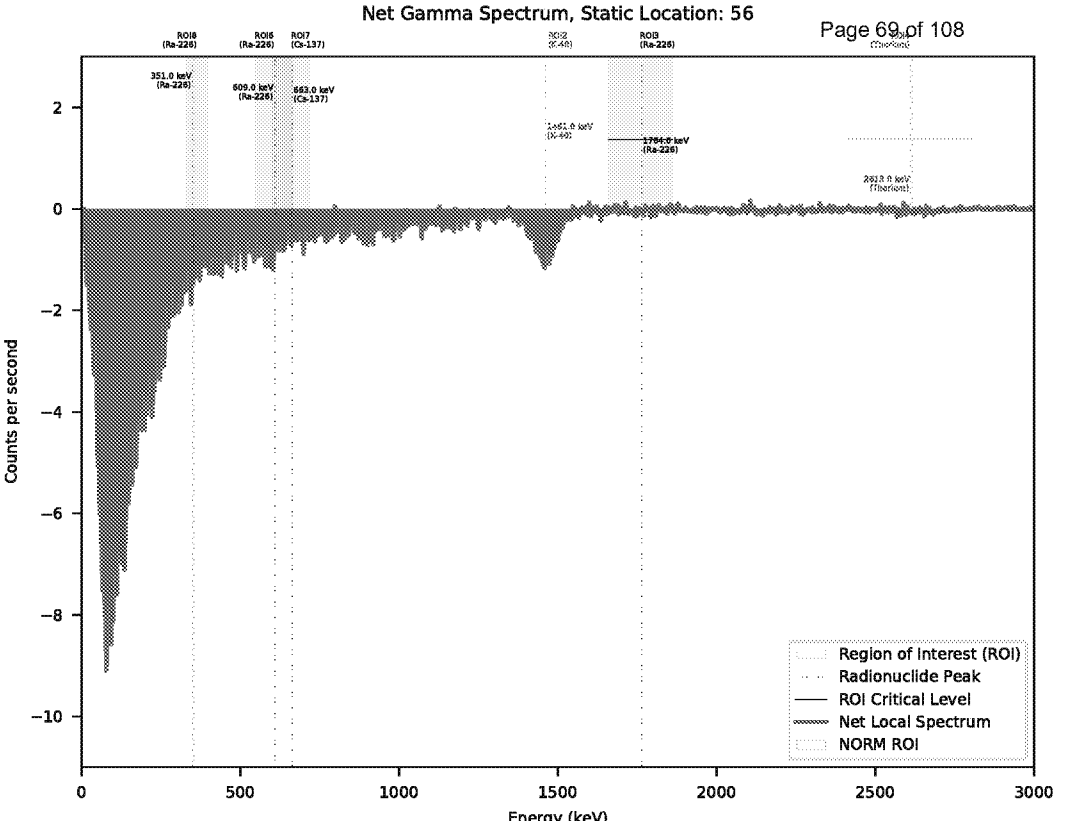
Net Gamma Spectrum, Static Location: 56
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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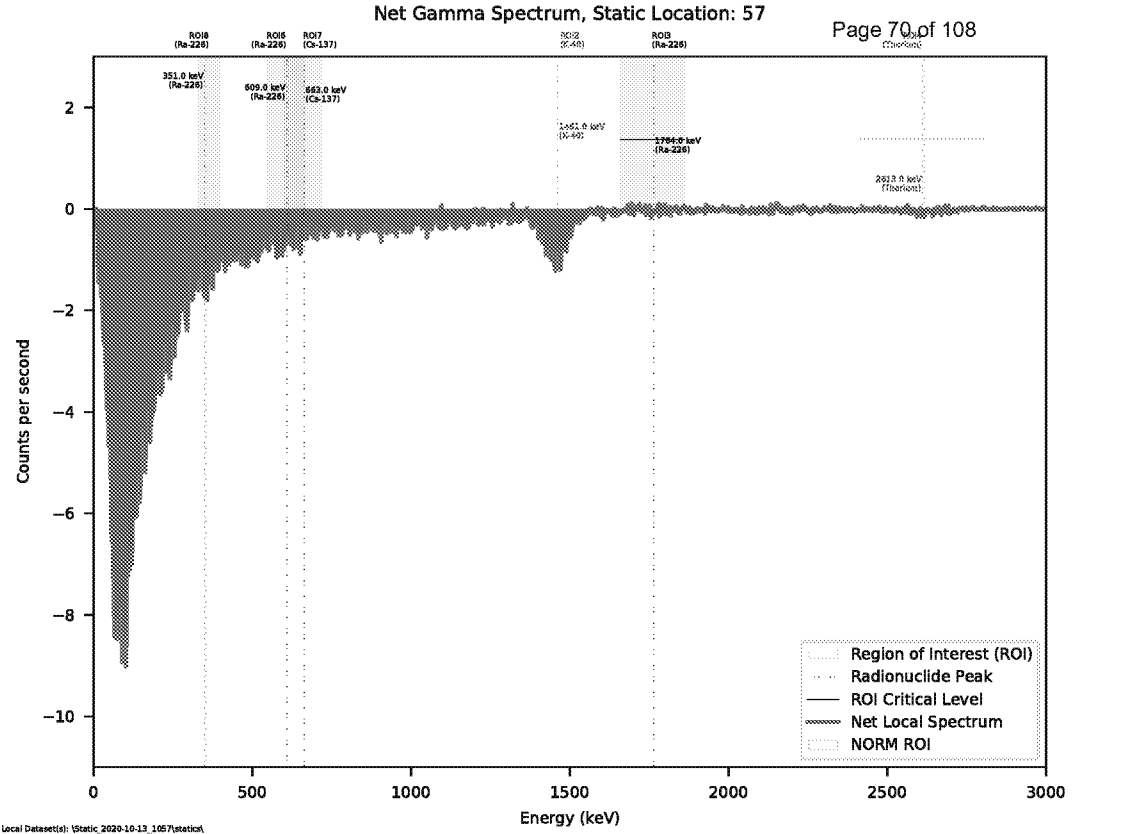
Net Gamma Spectrum, Static Location: 57
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
663.0 keV (Cs-137)
1461.0 keV (K-40)
1764.0 keV (Ra-226)
2614.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static_2020-10-13_1057\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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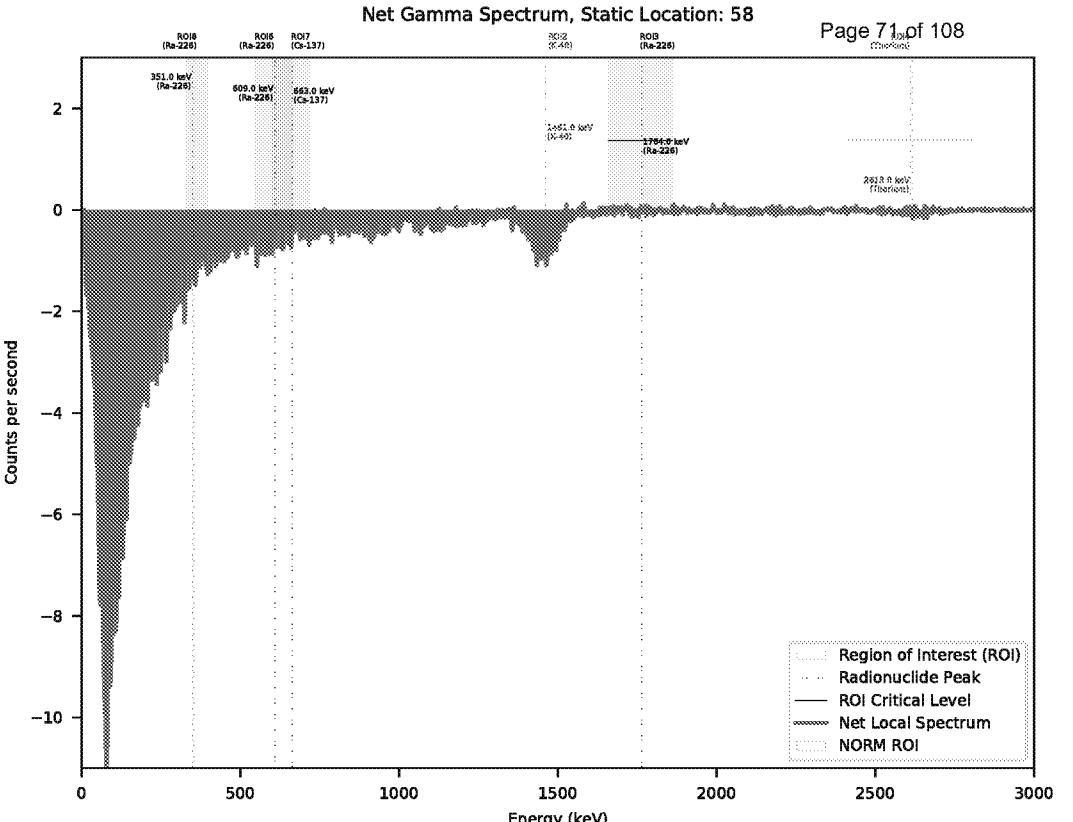

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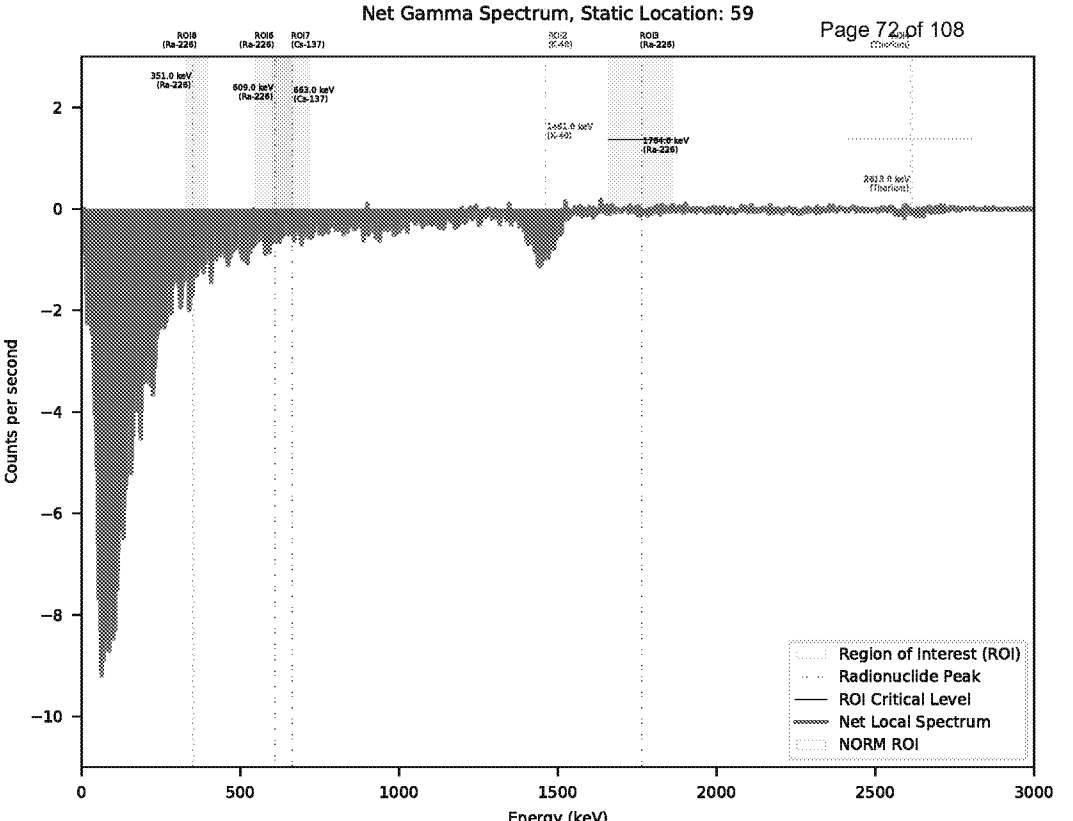

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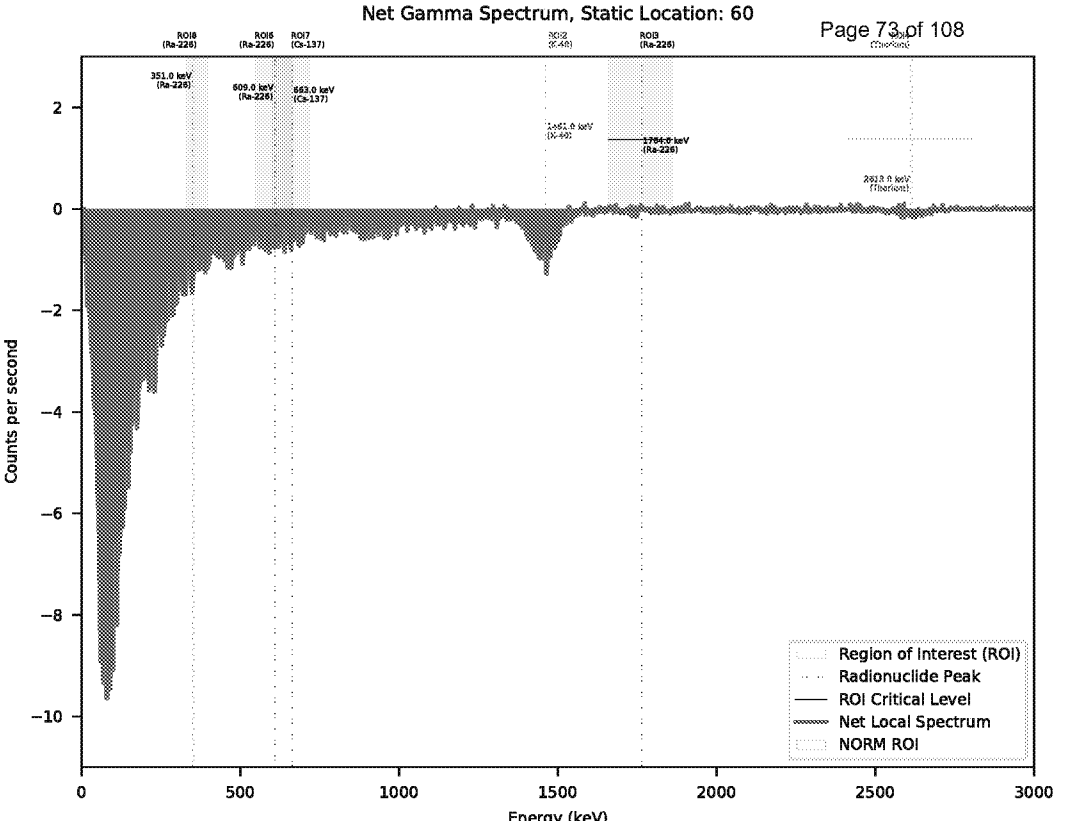

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Background Dataset(s): RSI2_SoilRBA_Static.csv

Local Coordinates (Longitude, Latitude): -122.36717977162152, 37.72380780810813

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40006-1
Laboratory Sample Delivery Group: GJ46599784
Client Project/Site: HPNS-Parcel G 501197
Revision: 1

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/13/2021 10:42:18 AM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

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Receipt Checklists 10
Definitions/Glossary 11
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QC Association Summary 33
Tracer Carrier Summary 35

Job ID: 160-40006-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40006-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Additional information requested in case narrative for total strontium

Job ID: 160-40006-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT
The samples were received on 10/21/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 17.8 C.

TOTAL BETA STRONTIUM (GFPC)
Samples HPPG-ESU-TU098C-001 (160-40006-1), HPPG-ESU-TU098C-011 (160-40006-11) and HPPG-ESU-TU098C-021 (160-40006-21) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/26/2020 and 10/27/2020, prepared on 11/06/2020 and analyzed on 11/26/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-ESU-TU098C-001 (160-40006-1), HPPG-ESU-TU098C-011 (160-40006-11) and HPPG-ESU-TU098C-021 (160-40006-21).

The method blank (MB) z-score is within limits and is stored in the level IV raw data.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Samples HPPG-ESU-TU098C-001 (160-40006-1), HPPG-ESU-TU098C-002 (160-40006-2), HPPG-ESU-TU098C-003 (160-40006-3), HPPG-ESU-TU098C-004 (160-40006-4), HPPG-ESU-TU098C-005 (160-40006-5), HPPG-ESU-TU098C-006 (160-40006-6), HPPG-ESU-TU098C-007 (160-40006-7), HPPG-ESU-TU098C-008 (160-40006-8), HPPG-ESU-TU098C-009 (160-40006-9), HPPG-ESU-TU098C-010 (160-40006-10), HPPG-ESU-TU098C-011 (160-40006-11), HPPG-ESU-TU098C-012 (160-40006-12), HPPG-ESU-TU098C-013 (160-40006-13), HPPG-ESU-TU098C-014 (160-40006-14), HPPG-ESU-TU098C-015 (160-40006-15), HPPG-ESU-TU098C-016 (160-40006-16), HPPG-ESU-TU098C-017 (160-40006-17), HPPG-ESU-TU098C-018 (160-40006-18), HPPG-ESU-TU098C-019 (160-40006-19), HPPG-ESU-TU098C-020 (160-40006-20), HPPG-ESU-TU098C-021 (160-40006-21), HPPG-ESU-TU098C-022 (160-40006-22), HPPG-ESU-TU098C-023 (160-40006-23), HPPG-ESU-TU098C-024 (160-40006-24), HPPG-ESU-TU098C-025 (160-40006-25), HPPG-ESU-TU098C-B-001 (160-40006-26), HPPG-F-009 (160-40006-27) and HPPG-F-010 (160-40006-28) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/26/2020 and 10/27/2020, prepared on 10/31/2020 and analyzed on 11/22/2020 and 11/23/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211

Job ID: 160-40006-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Bi-214 Ra-226

Gamma Prep batch 487565
The MB z-score for Co-60 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances. (MB 160-487565/1-A)

The replicate precision for K-40 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances. (160-40007-A-8-C DU)

Gamma Prep batch 487563
The method blank (MB) z-score associated with Prep Batch 160-487563 is within limits and is stored in the level IV raw data. (MB 160-487563/1-A)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU (40006-2; Pb-210 and 40006-26; Th-234): HPPG-ESU-TU098C-002 (160-40006-2). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-009

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s):

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/20/2020
Waybill Number: 4957 0225 2256
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

160-40006 Chain of Custody

	Collection Information						Analysis Requested								
Sample ID	Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-ESU-TU098C-001	10/13/2020	08:40	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599784	
HPPG-ESU-TU098C-002	10/13/2020	08:44	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-003	10/13/2020	08:50	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-004	10/13/2020	09:01	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-005	10/13/2020	09:09	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-006	10/13/2020	09:14	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-007	10/13/2020	09:19	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-008	10/13/2020	09:23	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	

Special Instructions:
21 day ingrowth results only
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g

Turanaround Time: 3-day ☐ 10-Day ☐ 28-day ☐ Other ☐

Level of QC Required: I | II | III | Project Specific

Method Codes C = Composite G = Grab **Matrix Codes:** DW = Drinking Water; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Devin Lewis		10/15/2020 17:00	Locked Storage (RKillpack)		10/15/2020 17:00
Locked Storage (RKillpack)		10/20/2020 13:29	Devin Lewis		10/20/2020 13:29
Devin Lewis		10/20/2020 14:42	SHIPPEDTOLAB	Leonel Magallegos	10/21/2020 0907

*** Last 3 transfers shown above - Complete list of transfers on last page ***

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-009

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s):

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/20/2020
Waybill Number: 4957 0225 2256
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

	Collection Information						Analysis Requested								
Sample ID	Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-ESU-TU098C-009	10/13/2020	09:28	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-010	10/13/2020	09:33	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-011	10/13/2020	09:39	G	SO	1	16 oz. plastic jar	X		X				4	GJ46599784	
HPPG-ESU-TU098C-012	10/13/2020	09:44	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-013	10/13/2020	09:50	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-014	10/13/2020	09:57	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-015	10/13/2020	10:03	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-016	10/13/2020	10:09	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-017	10/13/2020	10:14	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-018	10/13/2020	10:18	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-019	10/13/2020	10:20	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-020	10/13/2020	10:24	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-021	10/13/2020	10:27	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599784	
HPPG-ESU-TU098C-022	10/13/2020	10:31	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-ESU-TU098C-023	10/13/2020	10:35	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-024	10/13/2020	10:39	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-ESU-TU098C-025	10/13/2020	10:44	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-009

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin
Sample Tech(s):

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/20/2020
Waybill Number: 4957 0225 2256
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

Collection Information							Analysis Requested								
						Preservatives (water)	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)				Dose Rate uR/Hr	Evidence Bag ID	Comment
						Preservatives (soil)									
Sample ID	Date	Time	Method	Matrix	# of Containers	Container Type									
HPPG-ESU-TU098C-B-001	10/13/2020	10:55	G	SO	1	16 oz. plastic jar	X						5	GJ46599784	
HPPG-F-009	10/13/2020	09:44	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	
HPPG-F-010	10/13/2020	10:31	G	SO	1	16 oz. plastic jar	X						4	GJ46599784	

All Transfers for COC 501197RSY-009

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/13/2020 11:59	Locked Storage (RKillpack)		10/13/2020 11:59
Locked Storage (RKillpack)		10/15/2020 14:46	Devin Lewis		10/15/2020 14:46
Devin Lewis		10/15/2020 17:00	Locked Storage (RKillpack)		10/15/2020 17:00
Locked Storage (RKillpack)		10/20/2020 13:29	Devin Lewis		10/20/2020 13:29
Devin Lewis		10/20/2020 14:42	SHIPPEDTOLAB	Leonel Morales Eyus	10/21/2020 0907

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40006-1
SDG Number: GJ46599784

Login Number: 40006
List Number: 1
Creator: Korrinhizer, Micha L

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40006-1	HPPG-ESU-TU098C-001	Solid	10/13/20 08:40	10/21/20 09:07	
160-40006-2	HPPG-ESU-TU098C-002	Solid	10/13/20 08:44	10/21/20 09:07	
160-40006-3	HPPG-ESU-TU098C-003	Solid	10/13/20 08:50	10/21/20 09:07	
160-40006-4	HPPG-ESU-TU098C-004	Solid	10/13/20 09:01	10/21/20 09:07	
160-40006-5	HPPG-ESU-TU098C-005	Solid	10/13/20 09:09	10/21/20 09:07	
160-40006-6	HPPG-ESU-TU098C-006	Solid	10/13/20 09:14	10/21/20 09:07	
160-40006-7	HPPG-ESU-TU098C-007	Solid	10/13/20 09:19	10/21/20 09:07	
160-40006-8	HPPG-ESU-TU098C-008	Solid	10/13/20 09:23	10/21/20 09:07	
160-40006-9	HPPG-ESU-TU098C-009	Solid	10/13/20 09:28	10/21/20 09:07	
160-40006-10	HPPG-ESU-TU098C-010	Solid	10/13/20 09:33	10/21/20 09:07	
160-40006-11	HPPG-ESU-TU098C-011	Solid	10/13/20 09:39	10/21/20 09:07	
160-40006-12	HPPG-ESU-TU098C-012	Solid	10/13/20 09:44	10/21/20 09:07	
160-40006-13	HPPG-ESU-TU098C-013	Solid	10/13/20 09:50	10/21/20 09:07	
160-40006-14	HPPG-ESU-TU098C-014	Solid	10/13/20 09:57	10/21/20 09:07	
160-40006-15	HPPG-ESU-TU098C-015	Solid	10/13/20 10:03	10/21/20 09:07	
160-40006-16	HPPG-ESU-TU098C-016	Solid	10/13/20 10:09	10/21/20 09:07	
160-40006-17	HPPG-ESU-TU098C-017	Solid	10/13/20 10:14	10/21/20 09:07	
160-40006-18	HPPG-ESU-TU098C-018	Solid	10/13/20 10:18	10/21/20 09:07	
160-40006-19	HPPG-ESU-TU098C-019	Solid	10/13/20 10:20	10/21/20 09:07	
160-40006-20	HPPG-ESU-TU098C-020	Solid	10/13/20 10:24	10/21/20 09:07	
160-40006-21	HPPG-ESU-TU098C-021	Solid	10/13/20 10:27	10/21/20 09:07	
160-40006-22	HPPG-ESU-TU098C-022	Solid	10/13/20 10:31	10/21/20 09:07	
160-40006-23	HPPG-ESU-TU098C-023	Solid	10/13/20 10:35	10/21/20 09:07	
160-40006-24	HPPG-ESU-TU098C-024	Solid	10/13/20 10:39	10/21/20 09:07	
160-40006-25	HPPG-ESU-TU098C-025	Solid	10/13/20 10:44	10/21/20 09:07	
160-40006-26	HPPG-ESU-TU098C-B-001	Solid	10/13/20 10:55	10/21/20 09:07	
160-40006-27	HPPG-F-009	Solid	10/13/20 09:44	10/21/20 09:07	
160-40006-28	HPPG-F-010	Solid	10/13/20 10:31	10/21/20 09:07	

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-001

Lab Sample ID: 160-40006-1
Matrix: Solid

Date Collected: 10/13/20 08:40
Date Received: 10/21/20 09:07

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	**0.0770**		0.0687	0.0689	0.160	0.0508	pCi/g	11/06/20 11:01	11/26/20 10:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*91.9*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:43*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.311	U	0.549	0.551		0.358	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Actinium 228	**0.342**		0.132	0.137		0.0809	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Bismuth-212	0.0491	U	0.810	0.810		0.663	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Bismuth-214	**0.330**		0.103	0.109		0.0436	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Cesium-137	-0.0385	U	0.0773	0.0774	0.0700	0.0612	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Lead-210	0.162	U	1.21	1.21		0.830	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Lead-212	**0.283**		0.0841	0.0917		0.0505	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Lead-214	**0.346**		0.116	0.122		0.0526	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Potassium-40	**6.41**		1.12	1.30		0.267	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Protactinium-231	0.000	U	0.615	0.615		1.92	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Protactinium-234	0.0256	U	0.0573	0.0573		0.215	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Radium-226	**0.330**		0.103	0.109	0.200	0.0436	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Radium-228	**0.342**		0.132	0.137		0.0809	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thallium-208	**0.171**		0.0551	0.0579		0.0194	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thorium-232	**0.342**		0.132	0.137		0.0809	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thorium-234	**0.826**		0.692	0.698		0.419	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thorium 228	**0.283**		0.0841	0.0917		0.0505	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Uranium-235	0.0818	U	0.190	0.191		0.372	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Uranium-238	**0.826**		0.692	0.698		0.419	pCi/g	10/31/20 12:08	11/23/20 21:38	1

Client Sample ID: HPPG-ESU-TU098C-002

Lab Sample ID: 160-40006-2
Matrix: Solid

Date Collected: 10/13/20 08:44
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.259	U	0.364	0.365		0.315	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Actinium 228	**0.391**		0.227	0.230		0.0887	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Bismuth-212	0.000	U	0.204	0.204		0.731	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Bismuth-214	**0.556**		0.166	0.176		0.0599	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Cesium-137	0.0327	U	0.0614	0.0615	0.0700	0.0468	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Lead-210	-1.94	U	0.830	0.861		1.64	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Lead-212	**0.365**		0.112	0.122		0.0697	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Lead-214	**0.509**		0.122	0.133		0.0333	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Potassium-40	**6.93**		1.35	1.53		0.154	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Protactinium-231	-1.04	U	3.19	3.19		2.59	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Protactinium-234	-0.142	U	0.389	0.389		0.316	pCi/g	10/31/20 12:08	11/23/20 21:38	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-002

Lab Sample ID: 160-40006-2
Date Collected: 10/13/20 08:44
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.556**		0.166	0.176	0.200	0.0599	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Radium-228	**0.391**		0.227	0.230		0.0887	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thallium-208	**0.195**		0.0582	0.0616		0.0180	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thorium-232	**0.391**		0.227	0.230		0.0887	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thorium-234	-0.525	U	0.938	0.940		0.892	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Thorium 228	**0.365**		0.112	0.122		0.0697	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Uranium-235	0.209	U	0.457	0.457		0.442	pCi/g	10/31/20 12:08	11/23/20 21:38	1
Uranium-238	-0.525	U	0.938	0.940		0.892	pCi/g	10/31/20 12:08	11/23/20 21:38	1

Client Sample ID: HPPG-ESU-TU098C-003

Lab Sample ID: 160-40006-3
Date Collected: 10/13/20 08:50
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.165	U	0.401	0.402		0.231	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Actinium 228	**0.372**		0.121	0.127		0.0672	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Bismuth-212	0.167	U	0.406	0.406		0.314	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Bismuth-214	**0.397**		0.0958	0.104		0.0334	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Cesium-137	-0.0193	U	0.0579	0.0579	0.0700	0.0463	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Lead-210	-0.546	U	1.23	1.23		0.987	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Lead-212	**0.357**		0.0682	0.0824		0.0303	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Lead-214	**0.327**		0.0792	0.0862		0.0349	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Potassium-40	**5.22**		0.867	1.02		0.0839	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Protactinium-231	0.000	U	0.163	0.163		1.68	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Protactinium-234	0.0209	U	0.0352	0.0353		0.188	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Radium-226	**0.397**		0.0958	0.104	0.200	0.0334	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Radium-228	**0.372**		0.121	0.127		0.0672	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Thallium-208	**0.0357**		0.0652	0.0653		0.0337	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Thorium-232	**0.372**		0.121	0.127		0.0672	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Thorium-234	0.238	U	0.868	0.869		0.709	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Thorium 228	**0.357**		0.0682	0.0824		0.0303	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Uranium-235	0.0721	U	0.401	0.401		0.328	pCi/g	10/31/20 12:08	11/23/20 21:39	1
Uranium-238	0.238	U	0.868	0.869		0.709	pCi/g	10/31/20 12:08	11/23/20 21:39	1

Client Sample ID: HPPG-ESU-TU098C-004

Lab Sample ID: 160-40006-4
Date Collected: 10/13/20 09:01
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.147	U	0.635	0.635		0.389	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Actinium 228	**0.809**		0.259	0.271		0.0752	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Bismuth-212	0.361	U	1.31	1.31		1.06	pCi/g	10/31/20 12:08	11/23/20 21:40	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-004

Lab Sample ID: 160-40006-4
Date Collected: 10/13/20 09:01
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.547**		0.144	0.154		0.0499	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Cesium-137	-0.0117	U	0.0786	0.0787	0.0700	0.0638	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Lead-210	0.714	U	1.82	1.82		1.17	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Lead-212	**0.474**		0.0970	0.109		0.0422	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Lead-214	**0.338**		0.107	0.113		0.0578	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Potassium-40	**7.78**		1.32	1.54		0.130	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Protactinium-231	0.682	U	2.01	2.01		2.20	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Protactinium-234	-0.0705	U	0.329	0.329		0.269	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Radium-226	**0.547**		0.144	0.154	0.200	0.0499	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Radium-228	**0.809**		0.259	0.271		0.0752	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Thallium-208	**0.188**		0.0835	0.0857		0.0348	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Thorium-232	**0.809**		0.259	0.271		0.0752	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Thorium-234	-0.624	U	0.720	0.723		0.913	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Thorium 228	**0.474**		0.0970	0.109		0.0422	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Uranium-235	-0.204	U	0.625	0.626		0.509	pCi/g	10/31/20 12:08	11/23/20 21:40	1
Uranium-238	-0.624	U	0.720	0.723		0.913	pCi/g	10/31/20 12:08	11/23/20 21:40	1

Client Sample ID: HPPG-ESU-TU098C-005

Lab Sample ID: 160-40006-5
Date Collected: 10/13/20 09:09
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.114	U	0.339	0.339		0.263	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Actinium 228	**0.420**		0.132	0.139		0.0371	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Bismuth-212	0.241	U	0.503	0.504		0.390	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Bismuth-214	**0.362**		0.105	0.111		0.0424	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Cesium-137	0.00569	U	0.0391	0.0391	0.0700	0.0316	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Lead-210	0.491	U	1.01	1.02		0.808	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Lead-212	**0.344**		0.0690	0.0821		0.0322	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Lead-214	**0.327**		0.0853	0.0918		0.0430	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Potassium-40	**5.86**		0.966	1.14		0.236	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Protactinium-231	0.367	U	1.97	1.97		1.61	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Protactinium-234	0.0688	U	0.192	0.192		0.156	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Radium-226	**0.362**		0.105	0.111	0.200	0.0424	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Radium-228	**0.420**		0.132	0.139		0.0371	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Thallium-208	**0.128**		0.0349	0.0374		0.00664	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Thorium-232	**0.420**		0.132	0.139		0.0371	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Thorium-234	-0.335	U	0.343	0.345		0.761	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Thorium 228	**0.344**		0.0690	0.0821		0.0322	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Uranium-235	0.000	U	0.173	0.173		0.281	pCi/g	10/31/20 12:08	11/23/20 21:41	1
Uranium-238	-0.335	U	0.343	0.345		0.761	pCi/g	10/31/20 12:08	11/23/20 21:41	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-006

Lab Sample ID: 160-40006-6
Matrix: Solid

Date Collected: 10/13/20 09:14
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.0333	U	0.672	0.672		0.417	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Actinium 228	**0.611**		0.191	0.204		0.0667	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Bismuth-212	0.000	U	0.570	0.570		0.685	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Bismuth-214	**0.533**		0.137	0.150		0.0413	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Cesium-137	0.00807	U	0.0609	0.0609	0.0700	0.0492	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Lead-210	**2.48**		1.58	1.62		0.977	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Lead-212	**0.439**		0.107	0.119		0.0564	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Lead-214	**0.414**		0.107	0.117		0.0607	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Potassium-40	**9.66**		1.60	1.95		0.305	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Protactinium-231	0.000	U	0.391	0.391		2.53	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Protactinium-234	0.104	U	0.315	0.315		0.256	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Radium-226	**0.533**		0.137	0.150	0.200	0.0413	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Radium-228	**0.611**		0.191	0.204		0.0667	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thallium-208	**0.128**		0.138	0.139		0.0627	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thorium-232	**0.611**		0.191	0.204		0.0667	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thorium-234	0.430	U	0.586	0.588		0.504	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thorium 228	**0.439**		0.107	0.119		0.0564	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Uranium-235	-0.198	U	0.340	0.341		0.494	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Uranium-238	0.430	U	0.586	0.588		0.504	pCi/g	10/31/20 12:08	11/23/20 22:17	1

Client Sample ID: HPPG-ESU-TU098C-007

Lab Sample ID: 160-40006-7
Matrix: Solid

Date Collected: 10/13/20 09:19
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0608	U	0.487	0.487		0.301	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Actinium 228	**0.466**		0.183	0.189		0.0832	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Bismuth-212	0.270	U	0.527	0.528		0.401	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Bismuth-214	**0.323**		0.102	0.108		0.0445	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Cesium-137	0.0305	U	0.0535	0.0536	0.0700	0.0410	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Lead-210	**1.14**		1.43	1.44		0.866	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Lead-212	**0.294**		0.0792	0.0878		0.0430	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Lead-214	**0.363**		0.0970	0.104		0.0426	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Potassium-40	**6.09**		1.11	1.27		0.275	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Protactinium-231	-0.701	U	2.54	2.54		2.07	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Protactinium-234	0.0855	U	0.210	0.210		0.208	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Radium-226	**0.323**		0.102	0.108	0.200	0.0445	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Radium-228	**0.466**		0.183	0.189		0.0832	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thallium-208	**0.0944**		0.0374	0.0387		0.0137	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thorium-232	**0.466**		0.183	0.189		0.0832	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thorium-234	-0.439	U	0.845	0.847		0.709	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Thorium 228	**0.294**		0.0792	0.0878		0.0430	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Uranium-235	0.0662	U	0.0658	0.0661		0.443	pCi/g	10/31/20 12:08	11/23/20 22:17	1
Uranium-238	-0.439	U	0.845	0.847		0.709	pCi/g	10/31/20 12:08	11/23/20 22:17	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-008

Lab Sample ID: 160-40006-8
Matrix: Solid

Date Collected: 10/13/20 09:23
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0957	U	0.221	0.221		0.387	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Actinium 228	**0.297**		0.291	0.293		0.164	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Bismuth-212	-0.377	U	0.968	0.969		0.765	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Bismuth-214	**0.404**		0.117	0.124		0.0421	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Cesium-137	0.0312	U	0.0575	0.0576	0.0700	0.0436	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Lead-210	-1.40	U	0.977	0.991		1.40	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Lead-212	**0.289**		0.0983	0.105		0.0610	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Lead-214	**0.493**		0.143	0.152		0.0510	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Potassium-40	**7.07**		1.34	1.52		0.148	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Protactinium-231	0.364	U	1.43	1.43		2.23	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Protactinium-234	0.164	U	0.147	0.148		0.212	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Radium-226	**0.404**		0.117	0.124	0.200	0.0421	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Radium-228	**0.297**		0.291	0.293		0.164	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Thallium-208	**0.160**		0.0532	0.0557		0.0174	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Thorium-232	**0.297**		0.291	0.293		0.164	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Thorium-234	-0.132	U	1.23	1.23		1.01	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Thorium 228	**0.289**		0.0983	0.105		0.0610	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Uranium-235	0.118	U	0.214	0.215		0.399	pCi/g	10/31/20 12:08	11/23/20 22:18	1
Uranium-238	-0.132	U	1.23	1.23		1.01	pCi/g	10/31/20 12:08	11/23/20 22:18	1

Client Sample ID: HPPG-ESU-TU098C-009

Lab Sample ID: 160-40006-9
Matrix: Solid

Date Collected: 10/13/20 09:28
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.114	U	0.238	0.238		0.234	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Actinium 228	**0.264**		0.152	0.154		0.0627	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Bismuth-212	-0.160	U	0.543	0.543		0.434	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Bismuth-214	**0.338**		0.0965	0.103		0.0367	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Cesium-137	-0.00227	U	0.0444	0.0444	0.0700	0.0364	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Lead-210	-0.191	U	1.05	1.05		0.855	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Lead-212	**0.340**		0.0631	0.0769		0.0268	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Lead-214	**0.219**		0.0713	0.0749		0.0333	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Potassium-40	**4.94**		0.814	0.958		0.0782	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Protactinium-231	-0.813	U	2.59	2.60		2.12	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Protactinium-234	-0.0249	U	0.0663	0.0664		0.174	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Radium-226	**0.338**		0.0965	0.103	0.200	0.0367	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Radium-228	**0.264**		0.152	0.154		0.0627	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Thallium-208	**0.0305**		0.0562	0.0563		0.0256	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Thorium-232	**0.264**		0.152	0.154		0.0627	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Thorium-234	-0.264	U	0.865	0.866		0.707	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Thorium 228	**0.340**		0.0631	0.0769		0.0268	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Uranium-235	-0.0330	U	0.0635	0.0636		0.312	pCi/g	10/31/20 12:08	11/23/20 22:19	1
Uranium-238	-0.264	U	0.865	0.866		0.707	pCi/g	10/31/20 12:08	11/23/20 22:19	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-010

Lab Sample ID: 160-40006-10
Date Collected: 10/13/20 09:33
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.111	U	0.304	0.305		0.327	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Actinium 228	**0.692**		0.211	0.222		0.0375	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Bismuth-212	0.437	U	0.876	0.877		0.677	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Bismuth-214	**0.423**		0.151	0.157		0.0658	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Cesium-137	-0.0503	U	0.0866	0.0868	0.0700	0.0671	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Lead-210	**2.31**		1.99	2.01		1.23	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Lead-212	**0.487**		0.107	0.119		0.0507	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Lead-214	**0.592**		0.142	0.154		0.0704	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Potassium-40	**8.04**		1.42	1.63		0.145	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Protactinium-231	-0.957	U	3.63	3.63		2.96	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Protactinium-234	0.0874	U	0.266	0.266		0.244	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Radium-226	**0.423**		0.151	0.157	0.200	0.0658	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Radium-228	**0.692**		0.211	0.222		0.0375	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Thallium-208	**0.0736**		0.101	0.102		0.0612	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Thorium-232	**0.692**		0.211	0.222		0.0375	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Thorium-234	**0.652**		0.714	0.718		0.548	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Thorium 228	**0.487**		0.107	0.119		0.0507	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Uranium-235	-0.219	U	0.679	0.679		0.553	pCi/g	10/31/20 12:08	11/23/20 22:20	1
Uranium-238	**0.652**		0.714	0.718		0.548	pCi/g	10/31/20 12:08	11/23/20 22:20	1

Client Sample ID: HPPG-ESU-TU098C-011

Lab Sample ID: 160-40006-11
Date Collected: 10/13/20 09:39
Matrix: Solid
Date Received: 10/21/20 09:07

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0113	U	0.0648	0.0648	0.160	0.0524	pCi/g	11/06/20 11:01	11/26/20 10:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*85.3*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:43*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0700	U	0.218	0.218		0.272	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Actinium 228	**0.254**		0.114	0.117		0.101	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Bismuth-212	0.259	U	0.407	0.408		0.299	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Bismuth-214	**0.313**		0.118	0.123		0.0526	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Cesium-137	-0.0292	U	0.0555	0.0556	0.0700	0.0433	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Lead-210	0.579	U	1.10	1.10		0.869	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Lead-212	**0.323**		0.0815	0.0915		0.0376	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Lead-214	**0.425**		0.107	0.116		0.0340	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Potassium-40	**6.77**		1.09	1.30		0.264	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Protactinium-231	0.474	U	1.39	1.39		1.52	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Protactinium-234	0.123	U	0.206	0.206		0.156	pCi/g	10/31/20 12:08	11/23/20 22:21	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-011

Lab Sample ID: 160-40006-11
Date Collected: 10/13/20 09:39
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.313**		0.118	0.123	0.200	0.0526	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Radium-228	**0.254**		0.114	0.117		0.101	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thallium-208	**0.134**		0.0551	0.0568		0.0218	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thorium-232	**0.254**		0.114	0.117		0.101	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thorium-234	0.226	U	0.890	0.890		0.727	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thorium 228	**0.323**		0.0815	0.0915		0.0376	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Uranium-235	0.115	U	0.327	0.327		0.265	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Uranium-238	0.226	U	0.890	0.890		0.727	pCi/g	10/31/20 12:08	11/23/20 22:21	1

Client Sample ID: HPPG-ESU-TU098C-012

Lab Sample ID: 160-40006-12
Date Collected: 10/13/20 09:44
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.171	U	0.372	0.372		0.351	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Actinium 228	**0.512**		0.236	0.241		0.151	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Bismuth-212	0.562	U	1.23	1.23		0.962	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Bismuth-214	**0.361**		0.163	0.167		0.0791	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Cesium-137	-0.0214	U	0.0735	0.0735	0.0700	0.0626	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Lead-210	-0.0663	U	1.56	1.56		1.11	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Lead-212	**0.427**		0.108	0.121		0.0514	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Lead-214	**0.442**		0.130	0.138		0.0595	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Potassium-40	**8.28**		1.71	1.91		0.325	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Protactinium-231	0.393	U	1.16	1.16		1.91	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Protactinium-234	0.102	U	0.129	0.130		0.203	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Radium-226	**0.361**		0.163	0.167	0.200	0.0791	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Radium-228	**0.512**		0.236	0.241		0.151	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thallium-208	**0.177**		0.0600	0.0628		0.0114	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thorium-232	**0.512**		0.236	0.241		0.151	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thorium-234	**0.812**		0.574	0.581		0.425	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Thorium 228	**0.427**		0.108	0.121		0.0514	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Uranium-235	-0.0147	U	0.0260	0.0261		0.302	pCi/g	10/31/20 12:08	11/23/20 22:21	1
Uranium-238	**0.812**		0.574	0.581		0.425	pCi/g	10/31/20 12:08	11/23/20 22:21	1

Client Sample ID: HPPG-ESU-TU098C-013

Lab Sample ID: 160-40006-13
Date Collected: 10/13/20 09:50
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.168	U	0.710	0.710		0.433	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Actinium 228	**0.518**		0.205	0.211		0.0454	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Bismuth-212	-0.444	U	1.17	1.17		0.927	pCi/g	10/31/20 13:27	11/22/20 22:09	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-013

Lab Sample ID: 160-40006-13

Date Collected: 10/13/20 09:50
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.287**		0.137	0.140		0.0674	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Cesium-137	0.000688	U	0.0629	0.0629	0.0700	0.0513	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Lead-210	**1.29**		1.56	1.57		0.923	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Lead-212	**0.373**		0.0961	0.108		0.0438	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Lead-214	**0.375**		0.129	0.135		0.0707	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Potassium-40	**5.53**		1.37	1.49		0.307	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Protactinium-231	0.000	U	0.798	0.798		2.33	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Protactinium-234	0.133	U	0.301	0.301		0.166	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Radium-226	**0.287**		0.137	0.140	0.200	0.0674	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Radium-228	**0.518**		0.205	0.211		0.0454	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Thallium-208	**0.185**		0.0611	0.0640		0.0107	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Thorium-232	**0.518**		0.205	0.211		0.0454	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Thorium-234	-0.749	U	0.854	0.858		0.827	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Thorium 228	**0.373**		0.0961	0.108		0.0438	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Uranium-235	-0.0126	U	0.353	0.353		0.287	pCi/g	10/31/20 13:27	11/22/20 22:09	1
Uranium-238	-0.749	U	0.854	0.858		0.827	pCi/g	10/31/20 13:27	11/22/20 22:09	1

Client Sample ID: HPPG-ESU-TU098C-014

Lab Sample ID: 160-40006-14

Date Collected: 10/13/20 09:57
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.323	U	0.661	0.662		0.400	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Actinium 228	**0.146**		0.172	0.173		0.133	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Bismuth-212	0.329	U	0.559	0.560		0.423	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Bismuth-214	0.127	U	0.0636	0.0650		0.161	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Cesium-137	0.0176	U	0.0411	0.0411	0.0700	0.0316	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Lead-210	0.596	U	1.11	1.11		0.758	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Lead-212	0.00508	U	0.105	0.105		0.0862	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Lead-214	**0.358**		0.0999	0.107		0.0372	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Potassium-40	**5.57**		1.05	1.19		0.269	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Protactinium-231	-0.535	U	2.98	2.98		2.44	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Protactinium-234	0.00719	U	0.0139	0.0139		0.165	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Radium-226	0.127	U	0.0636	0.0650	0.200	0.161	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Radium-228	**0.146**		0.172	0.173		0.133	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Thallium-208	**0.0927**		0.0429	0.0440		0.0200	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Thorium-232	**0.146**		0.172	0.173		0.133	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Thorium-234	0.0818	U	0.427	0.427		0.345	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Thorium 228	0.00508	U	0.105	0.105		0.0862	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Uranium-235	0.0604	U	0.266	0.266		0.267	pCi/g	10/31/20 13:27	11/22/20 22:11	1
Uranium-238	0.0818	U	0.427	0.427		0.345	pCi/g	10/31/20 13:27	11/22/20 22:11	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-015

Lab Sample ID: 160-40006-15

Date Collected: 10/13/20 10:03
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0852	U	0.149	0.149		0.360	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Actinium 228	**0.631**		0.197	0.207		0.0365	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Bismuth-212	**1.31**		0.597	0.612		0.189	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Bismuth-214	**0.462**		0.143	0.150		0.0441	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Cesium-137	0.0257	U	0.0811	0.0812	0.0700	0.0646	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Lead-210	-0.723	U	1.74	1.74		1.46	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Lead-212	**0.483**		0.0930	0.106		0.0411	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Lead-214	**0.455**		0.119	0.127		0.0552	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Potassium-40	**8.44**		1.50	1.73		0.227	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Protactinium-231	-0.760	U	2.82	2.82		2.29	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Protactinium-234	-0.100	U	0.318	0.318		0.259	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Radium-226	**0.462**		0.143	0.150	0.200	0.0441	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Radium-228	**0.631**		0.197	0.207		0.0365	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Thallium-208	**0.118**		0.0584	0.0596		0.0238	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Thorium-232	**0.631**		0.197	0.207		0.0365	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Thorium-234	0.219	U	0.217	0.218		0.735	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Thorium 228	**0.483**		0.0930	0.106		0.0411	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Uranium-235	**0.176**		0.174	0.175		0.106	pCi/g	10/31/20 13:27	11/22/20 22:08	1
Uranium-238	0.219	U	0.217	0.218		0.735	pCi/g	10/31/20 13:27	11/22/20 22:08	1

Client Sample ID: HPPG-ESU-TU098C-016

Lab Sample ID: 160-40006-16

Date Collected: 10/13/20 10:09
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	**0.315**		0.347	0.350		0.191	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Actinium 228	**0.451**		0.123	0.131		0.0195	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Bismuth-212	-0.373	U	0.674	0.675		0.530	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Bismuth-214	**0.280**		0.0815	0.0866		0.0345	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Cesium-137	-0.0272	U	0.0507	0.0507	0.0700	0.0397	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Lead-210	**1.03**		0.766	0.775		0.412	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Lead-212	**0.418**		0.0691	0.0878		0.0291	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Lead-214	**0.374**		0.0818	0.0905		0.0402	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Potassium-40	**6.26**		0.909	1.11		0.0768	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Protactinium-231	-0.729	U	2.27	2.27		1.85	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Protactinium-234	0.00503	U	0.00929	0.00931		0.176	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Radium-226	**0.280**		0.0815	0.0866	0.200	0.0345	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Radium-228	**0.451**		0.123	0.131		0.0195	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Thallium-208	**0.0876**		0.0623	0.0629		0.0291	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Thorium-232	**0.451**		0.123	0.131		0.0195	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Thorium-234	-0.113	U	0.372	0.372		0.786	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Thorium 228	**0.418**		0.0691	0.0878		0.0291	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Uranium-235	0.0665	U	0.133	0.133		0.322	pCi/g	10/31/20 13:27	11/22/20 22:46	1
Uranium-238	-0.113	U	0.372	0.372		0.786	pCi/g	10/31/20 13:27	11/22/20 22:46	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-017

Lab Sample ID: 160-40006-17

Date Collected: 10/13/20 10:14
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	**0.184**		0.346	0.346		0.168	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Actinium 228	**0.368**		0.173	0.177		0.109	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Bismuth-212	-0.279	U	0.659	0.659		0.520	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Bismuth-214	**0.352**		0.0970	0.104		0.0386	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Cesium-137	-0.0221	U	0.0648	0.0649	0.0700	0.0519	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Lead-210	-0.0735	U	1.32	1.32		1.09	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Lead-212	**0.422**		0.0797	0.0966		0.0379	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Lead-214	**0.462**		0.101	0.112		0.0434	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Potassium-40	**7.43**		1.12	1.35		0.253	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Protactinium-231	0.000	U	0.329	0.329		1.95	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Protactinium-234	0.0297	U	0.0513	0.0514		0.198	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Radium-226	**0.352**		0.0970	0.104	0.200	0.0386	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Radium-228	**0.368**		0.173	0.177		0.109	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Thallium-208	**0.164**		0.0532	0.0558		0.0179	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Thorium-232	**0.368**		0.173	0.177		0.109	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Thorium-234	0.346	U	0.742	0.743		0.771	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Thorium 228	**0.422**		0.0797	0.0966		0.0379	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Uranium-235	0.0608	U	0.153	0.153		0.347	pCi/g	10/31/20 13:27	11/22/20 22:47	1
Uranium-238	0.346	U	0.742	0.743		0.771	pCi/g	10/31/20 13:27	11/22/20 22:47	1

Client Sample ID: HPPG-ESU-TU098C-018

Lab Sample ID: 160-40006-18

Date Collected: 10/13/20 10:18
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.0502	U	0.545	0.545		0.336	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Actinium 228	**0.499**		0.190	0.197		0.0407	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Bismuth-212	0.0185	U	0.612	0.612		0.501	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Bismuth-214	**0.478**		0.164	0.171		0.0626	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Cesium-137	0.00956	U	0.0697	0.0697	0.0700	0.0560	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Lead-210	0.691	U	1.21	1.21		0.820	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Lead-212	**0.438**		0.102	0.117		0.0502	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Lead-214	**0.316**		0.106	0.111		0.0589	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Potassium-40	**6.93**		1.44	1.61		0.275	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Protactinium-231	0.671	U	2.10	2.10		1.69	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Protactinium-234	0.0996	U	0.228	0.228		0.158	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Radium-226	**0.478**		0.164	0.171	0.200	0.0626	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Radium-228	**0.499**		0.190	0.197		0.0407	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thallium-208	**0.191**		0.0571	0.0604		0.00961	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thorium-232	**0.499**		0.190	0.197		0.0407	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thorium-234	**0.399**		0.505	0.507		0.388	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thorium 228	**0.438**		0.102	0.117		0.0502	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Uranium-235	0.151	U	0.291	0.291		0.230	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Uranium-238	**0.399**		0.505	0.507		0.388	pCi/g	10/31/20 13:27	11/22/20 22:48	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-019

Lab Sample ID: 160-40006-19

Date Collected: 10/13/20 10:20
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.0761	U	0.424	0.424		0.260	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Actinium 228	**0.364**		0.194	0.198		0.0804	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Bismuth-212	0.178	U	0.555	0.555		0.438	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Bismuth-214	**0.417**		0.108	0.116		0.0354	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Cesium-137	0.0346	U	0.0632	0.0633	0.0700	0.0494	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Lead-210	0.637	U	1.07	1.07		0.745	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Lead-212	**0.390**		0.0810	0.0954		0.0394	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Lead-214	**0.327**		0.122	0.126		0.0543	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Potassium-40	**6.73**		1.10	1.30		0.253	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Protactinium-231	0.0000000457	U	2.36	2.36		1.95	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Protactinium-234	0.0127	U	0.217	0.217		0.138	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Radium-226	**0.417**		0.108	0.116	0.200	0.0354	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Radium-228	**0.364**		0.194	0.198		0.0804	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thallium-208	**0.135**		0.0475	0.0495		0.0207	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thorium-232	**0.364**		0.194	0.198		0.0804	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thorium-234	**0.699**		0.425	0.432		0.310	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Thorium 228	**0.390**		0.0810	0.0954		0.0394	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Uranium-235	0.0553	U	0.174	0.174		0.271	pCi/g	10/31/20 13:27	11/22/20 22:48	1
Uranium-238	**0.699**		0.425	0.432		0.310	pCi/g	10/31/20 13:27	11/22/20 22:48	1

Client Sample ID: HPPG-ESU-TU098C-020

Lab Sample ID: 160-40006-20

Date Collected: 10/13/20 10:24
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0200	U	0.0479	0.0479		0.322	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Actinium 228	**0.587**		0.197	0.205		0.0788	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Bismuth-212	0.000	U	0.562	0.562		0.725	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Bismuth-214	**0.289**		0.112	0.115		0.0479	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Cesium-137	-0.00272	U	0.0349	0.0349	0.0700	0.0221	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Lead-210	0.349	U	1.62	1.63		1.11	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Lead-212	**0.414**		0.0917	0.101		0.0461	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Lead-214	**0.313**		0.108	0.113		0.0510	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Potassium-40	**7.42**		1.71	1.86		0.541	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Protactinium-231	0.000	U	0.552	0.552		2.19	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Protactinium-234	0.118	U	0.260	0.260		0.184	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Radium-226	**0.289**		0.112	0.115	0.200	0.0479	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Radium-228	**0.587**		0.197	0.205		0.0788	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Thallium-208	**0.245**		0.0765	0.0805		0.0257	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Thorium-232	**0.587**		0.197	0.205		0.0788	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Thorium-234	**0.604**		0.487	0.492		0.363	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Thorium 228	**0.414**		0.0917	0.101		0.0461	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Uranium-235	-0.212	U	0.266	0.267		0.441	pCi/g	10/31/20 13:27	11/22/20 22:50	1
Uranium-238	**0.604**		0.487	0.492		0.363	pCi/g	10/31/20 13:27	11/22/20 22:50	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-021

Lab Sample ID: 160-40006-21
Date Collected: 10/13/20 10:27
Matrix: Solid
Date Received: 10/21/20 09:07

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0145	U	0.0575	0.0575	0.160	0.0460	pCi/g	11/06/20 11:01	11/26/20 10:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*88.2*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:43*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.316	U	0.677	0.678		0.407	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Actinium 228	0.142	U	0.202	0.202		0.193	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Bismuth-212	-0.266	U	0.897	0.898		0.712	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Bismuth-214	**0.357**		0.154	0.158		0.0754	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Cesium-137	0.00928	U	0.0641	0.0641	0.0700	0.0514	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Lead-210	-0.508	U	1.40	1.40		1.01	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Lead-212	**0.477**		0.0955	0.114		0.0368	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Lead-214	**0.473**		0.124	0.134		0.0654	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Potassium-40	**6.23**		1.53	1.66		0.455	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Protactinium-231	0.591	U	1.87	1.87		2.05	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Protactinium-234	0.0670	U	0.0904	0.0907		0.173	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Radium-226	**0.357**		0.154	0.158	0.200	0.0754	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Radium-228	0.142	U	0.202	0.202		0.193	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thallium-208	**0.157**		0.0552	0.0576		0.0158	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thorium-232	0.142	U	0.202	0.202		0.193	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thorium-234	-0.132	U	0.859	0.859		0.711	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thorium 228	**0.477**		0.0955	0.114		0.0368	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Uranium-235	0.144	U	0.267	0.268		0.215	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Uranium-238	-0.132	U	0.859	0.859		0.711	pCi/g	10/31/20 13:27	11/23/20 11:46	1

Client Sample ID: HPPG-ESU-TU098C-022

Lab Sample ID: 160-40006-22
Date Collected: 10/13/20 10:31
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.172	U	0.337	0.338		0.263	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Actinium 228	**0.480**		0.144	0.152		0.0712	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Bismuth-212	0.336	U	0.578	0.579		0.441	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Bismuth-214	**0.290**		0.100	0.105		0.0436	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Cesium-137	0.00788	U	0.0396	0.0396	0.0700	0.0316	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Lead-210	-0.540	U	1.20	1.20		0.960	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Lead-212	**0.381**		0.0808	0.0946		0.0396	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Lead-214	**0.358**		0.0894	0.0968		0.0502	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Potassium-40	**6.19**		1.08	1.26		0.279	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Protactinium-231	0.000	U	0.336	0.336		1.83	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Protactinium-234	0.0709	U	0.203	0.204		0.165	pCi/g	10/31/20 13:27	11/23/20 11:44	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-022

Lab Sample ID: 160-40006-22
Date Collected: 10/13/20 10:31
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.290**		0.100	0.105	0.200	0.0436	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Radium-228	**0.480**		0.144	0.152		0.0712	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Thallium-208	**0.151**		0.0454	0.0480		0.0135	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Thorium-232	**0.480**		0.144	0.152		0.0712	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Thorium-234	0.341	U	0.720	0.721		0.779	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Thorium 228	**0.381**		0.0808	0.0946		0.0396	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Uranium-235	-0.149	U	0.427	0.427		0.347	pCi/g	10/31/20 13:27	11/23/20 11:44	1
Uranium-238	0.341	U	0.720	0.721		0.779	pCi/g	10/31/20 13:27	11/23/20 11:44	1

Client Sample ID: HPPG-ESU-TU098C-023

Lab Sample ID: 160-40006-23
Date Collected: 10/13/20 10:35
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.204	U	0.394	0.395		0.225	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Actinium 228	**0.561**		0.139	0.150		0.0485	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Bismuth-212	0.340	U	0.532	0.533		0.405	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Bismuth-214	**0.432**		0.112	0.121		0.0447	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Cesium-137	0.00606	U	0.0377	0.0377	0.0700	0.0304	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Lead-210	0.537	U	0.983	0.985		0.778	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Lead-212	**0.456**		0.0747	0.0951		0.0296	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Lead-214	**0.305**		0.0841	0.0899		0.0461	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Potassium-40	**7.09**		1.02	1.25		0.0856	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Protactinium-231	0.000	U	0.289	0.289		1.78	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Protactinium-234	0.000503	U	0.000872	0.000873		0.198	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Radium-226	**0.432**		0.112	0.121	0.200	0.0447	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Radium-228	**0.561**		0.139	0.150		0.0485	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thallium-208	**0.154**		0.0398	0.0428		0.00839	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thorium-232	**0.561**		0.139	0.150		0.0485	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thorium-234	**0.549**		0.347	0.353		0.283	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Thorium 228	**0.456**		0.0747	0.0951		0.0296	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Uranium-235	-0.175	U	0.465	0.465		0.379	pCi/g	10/31/20 13:27	11/23/20 11:46	1
Uranium-238	**0.549**		0.347	0.353		0.283	pCi/g	10/31/20 13:27	11/23/20 11:46	1

Client Sample ID: HPPG-ESU-TU098C-024

Lab Sample ID: 160-40006-24
Date Collected: 10/13/20 10:39
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0629	U	0.319	0.319		0.221	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Actinium 228	**0.468**		0.136	0.144		0.0369	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Bismuth-212	0.209	U	0.637	0.637		0.508	pCi/g	10/31/20 13:27	11/23/20 13:49	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-024

Lab Sample ID: 160-40006-24

Date Collected: 10/13/20 10:39
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.101**		0.0642	0.0650		0.0957	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Cesium-137	0.0131	U	0.0390	0.0390	0.0700	0.0307	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Lead-210	0.427	U	1.00	1.00		0.802	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Lead-212	**0.326**		0.0691	0.0810		0.0341	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Lead-214	**0.393**		0.0840	0.0934		0.0327	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Potassium-40	**7.74**		1.09	1.35		0.235	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Protactinium-231	-0.216	U	2.08	2.08		1.70	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Protactinium-234	0.0359	U	0.212	0.212		0.174	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Radium-226	**0.101**		0.0642	0.0650	0.200	0.0957	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Radium-228	**0.468**		0.136	0.144		0.0369	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Thallium-208	**0.142**		0.0464	0.0487		0.0173	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Thorium-232	**0.468**		0.136	0.144		0.0369	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Thorium-234	-0.337	U	0.355	0.357		0.912	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Thorium 228	**0.326**		0.0691	0.0810		0.0341	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Uranium-235	-0.0160	U	0.0284	0.0284		0.332	pCi/g	10/31/20 13:27	11/23/20 13:49	1
Uranium-238	-0.337	U	0.355	0.357		0.912	pCi/g	10/31/20 13:27	11/23/20 13:49	1

Client Sample ID: HPPG-ESU-TU098C-025

Lab Sample ID: 160-40006-25

Date Collected: 10/13/20 10:44
Matrix: Solid
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	**0.381**		0.383	0.385		0.359	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Actinium 228	**0.503**		0.205	0.211		0.0672	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Bismuth-212	0.000	U	0.641	0.641		0.658	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Bismuth-214	**0.340**		0.133	0.137		0.0599	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Cesium-137	0.0313	U	0.0561	0.0562	0.0700	0.0429	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Lead-210	-2.41	U	1.51	1.54		1.86	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Lead-212	0.0548	U	0.138	0.138		0.112	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Lead-214	**0.475**		0.122	0.131		0.0463	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Potassium-40	**9.10**		1.35	1.63		0.117	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Protactinium-231	-0.926	U	3.11	3.11		2.53	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Protactinium-234	0.0933	U	0.283	0.283		0.230	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Radium-226	**0.340**		0.133	0.137	0.200	0.0599	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Radium-228	**0.503**		0.205	0.211		0.0672	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Thallium-208	**0.156**		0.0814	0.0829		0.0380	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Thorium-232	**0.503**		0.205	0.211		0.0672	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Thorium-234	**0.820**		0.673	0.679		0.425	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Thorium 228	0.0548	U	0.138	0.138		0.112	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Uranium-235	0.0998	U	0.0798	0.0805		0.441	pCi/g	10/31/20 13:27	11/23/20 13:48	1
Uranium-238	**0.820**		0.673	0.679		0.425	pCi/g	10/31/20 13:27	11/23/20 13:48	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-ESU-TU098C-B-001

Lab Sample ID: 160-40006-26
Matrix: Solid

Date Collected: 10/13/20 10:55
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.177	U	0.379	0.380		0.217	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Actinium 228	**0.499**		0.123	0.133		0.0210	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Bismuth-212	-0.0194	U	0.527	0.527		0.432	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Bismuth-214	**0.312**		0.0928	0.0983		0.0410	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Cesium-137	-0.00184	U	0.0425	0.0425	0.0700	0.0348	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Lead-210	0.461	U	1.01	1.01		0.804	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Lead-212	**0.378**		0.0660	0.0821		0.0251	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Lead-214	**0.373**		0.0794	0.0884		0.0283	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Potassium-40	**7.18**		1.01	1.25		0.0828	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Protactinium-231	0.352	U	1.95	1.95		1.60	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Protactinium-234	0.0737	U	0.207	0.207		0.168	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Radium-226	**0.312**		0.0928	0.0983	0.200	0.0410	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Radium-228	**0.499**		0.123	0.133		0.0210	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Thallium-208	**0.115**		0.0315	0.0336		0.00513	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Thorium-232	**0.499**		0.123	0.133		0.0210	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Thorium-234	-0.0252	U	0.0544	0.0545		0.754	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Thorium 228	**0.378**		0.0660	0.0821		0.0251	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Uranium-235	-0.0231	U	0.0425	0.0426		0.338	pCi/g	10/31/20 13:27	11/23/20 13:50	1
Uranium-238	-0.0252	U	0.0544	0.0545		0.754	pCi/g	10/31/20 13:27	11/23/20 13:50	1

Client Sample ID: HPPG-F-009

Lab Sample ID: 160-40006-27
Matrix: Solid

Date Collected: 10/13/20 09:44
Date Received: 10/21/20 09:07

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.105	U	0.688	0.688		0.423	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Actinium 228	**0.612**		0.179	0.189		0.0463	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Bismuth-212	0.156	U	0.795	0.795		0.634	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Bismuth-214	**0.339**		0.182	0.185		0.0798	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Cesium-137	0.0109	U	0.0671	0.0671	0.0700	0.0534	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Lead-210	**0.844**		1.23	1.23		0.809	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Lead-212	**0.551**		0.104	0.126		0.0294	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Lead-214	**0.387**		0.121	0.128		0.0588	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Potassium-40	**8.05**		1.65	1.85		0.313	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Protactinium-231	0.345	U	1.47	1.48		2.35	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Protactinium-234	-0.114	U	0.310	0.310		0.235	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Radium-226	**0.339**		0.182	0.185	0.200	0.0798	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Radium-228	**0.612**		0.179	0.189		0.0463	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Thallium-208	**0.161**		0.0766	0.0784		0.0323	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Thorium-232	**0.612**		0.179	0.189		0.0463	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Thorium-234	0.265	U	0.366	0.367		0.820	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Thorium 228	**0.551**		0.104	0.126		0.0294	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Uranium-235	0.158	U	0.304	0.305		0.239	pCi/g	10/31/20 13:27	11/23/20 17:53	1
Uranium-238	0.265	U	0.366	0.367		0.820	pCi/g	10/31/20 13:27	11/23/20 17:53	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Client Sample ID: HPPG-F-010

Date Collected: 10/13/20 10:31
Date Received: 10/21/20 09:07

Lab Sample ID: 160-40006-28

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.267	U	0.518	0.519		0.299	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Actinium 228	**0.256**		0.167	0.169		0.0770	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Bismuth-212	-0.521	U	0.809	0.811		0.634	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Bismuth-214	**0.303**		0.0942	0.0993		0.0402	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Cesium-137	0.0155	U	0.0488	0.0488	0.0700	0.0389	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Lead-210	0.310	U	1.07	1.07		0.863	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Lead-212	**0.335**		0.0699	0.0822		0.0342	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Lead-214	**0.361**		0.0919	0.0993		0.0346	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Potassium-40	**7.39**		1.08	1.31		0.237	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Protactinium-231	-0.708	U	2.23	2.23		1.82	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Protactinium-234	0.101	U	0.177	0.177		0.156	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Radium-226	**0.303**		0.0942	0.0993	0.200	0.0402	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Radium-228	**0.256**		0.167	0.169		0.0770	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Thallium-208	**0.118**		0.0380	0.0399		0.0110	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Thorium-232	**0.256**		0.167	0.169		0.0770	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Thorium-234	-0.290	U	0.393	0.394		0.636	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Thorium 228	**0.335**		0.0699	0.0822		0.0342	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Uranium-235	0.000	U	0.107	0.107		0.275	pCi/g	10/31/20 13:27	11/23/20 17:56	1
Uranium-238	-0.290	U	0.393	0.394		0.636	pCi/g	10/31/20 13:27	11/23/20 17:56	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-488460/24-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490292 — **Prep Batch: 488460**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.01989	U	0.0586	0.0586	0.160	0.0499	pCi/g	11/06/20 11:01	11/26/20 10:48	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*86.4*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:48*	*1*

Lab Sample ID: LCS 160-488460/1-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490302 — **Prep Batch: 488460**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	7.77	6.487		0.537	0.160	0.0549	pCi/g	83	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*89.5*		*40 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-487563/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 489963 — **Prep Batch: 487563**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.03654	U	0.0895	0.0897		0.311	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Actinium 228	-0.02197	U	0.0434	0.0435		0.137	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Bismuth-212	-0.5732	U	0.947	0.949		0.728	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Bismuth-214	0.005591	U	0.00730	0.00733		0.152	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Cesium-137	-0.04570	U	0.0814	0.0816	0.0700	0.0631	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Lead-210	0.5695	U	1.56	1.57		1.02	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Lead-212	-0.007227	U	0.0816	0.0816		0.0674	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Lead-214	-0.09487	U	0.123	0.123		0.110	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Potassium-40	-0.2454	U	0.750	0.750		0.494	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Protactinium-231	0.0000	U	0.748	0.748		2.54	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Protactinium-234	-0.08399	U	0.269	0.269		0.218	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Radium-226	0.005591	U	0.00730	0.00733	0.200	0.152	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Radium-228	-0.02197	U	0.0434	0.0435		0.137	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Thallium-208	-0.03789	U	0.0628	0.0629		0.0456	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Thorium-232	-0.02197	U	0.0434	0.0435		0.137	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Thorium-234	-1.207	U	0.802	0.813		0.802	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Thorium 228	-0.007227	U	0.0816	0.0816		0.0674	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Uranium-235	0.1218	U	0.395	0.395		0.319	pCi/g	10/31/20 12:08	11/23/20 21:02	1
Uranium-238	-1.207	U	0.802	0.813		0.802	pCi/g	10/31/20 12:08	11/23/20 21:02	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-487563/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 489982 — **Prep Batch: 487563**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	97.02		10.2		0.616	pCi/g	101	87 - 116
Cesium-137	26.8	27.03		2.92	0.0700	0.116	pCi/g	101	87 - 120
Cobalt-60	9.53	9.349		1.01		0.0186	pCi/g	98	87 - 115

Lab Sample ID: 160-40006-12 DU — **Client Sample ID: HPPG-ESU-TU098C-012**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490082 — **Prep Batch: 487563**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium-227	0.171	U	0.08668	U	0.319		0.330	pCi/g	0.12	1
Actinium 228	0.512		0.4862		0.165		0.0448	pCi/g	0.06	1
Bismuth-212	0.562	U	0.1846	U	0.856		0.692	pCi/g	0.18	1
Bismuth-214	0.361		0.3102		0.112		0.0485	pCi/g	0.18	1
Cesium-137	-0.0214	U	-0.03887	U	0.0606	0.0700	0.0466	pCi/g	0.13	1
Lead-210	-0.0663	U	0.6600	U	1.46		1.17	pCi/g	0.24	1
Lead-212	0.427		0.4772		0.111		0.0466	pCi/g	0.22	1
Lead-214	0.442		0.2995		0.0999		0.0557	pCi/g	0.60	1
Potassium-40	8.28		7.699		1.45		0.286	pCi/g	0.17	1
Protactinium-231	0.393	U	0.2104	U	2.24		1.84	pCi/g	0.05	1
Protactinium-234	0.102	U	-0.09437	U	0.274		0.222	pCi/g	0.49	1
Radium-226	0.361		0.3102		0.112	0.200	0.0485	pCi/g	0.18	1
Radium-228	0.512		0.4862		0.165		0.0448	pCi/g	0.06	1
Thallium-208	0.177		0.1752		0.0542		0.0147	pCi/g	0.02	1
Thorium-232	0.512		0.4862		0.165		0.0448	pCi/g	0.06	1
Thorium-234	0.812		-0.3699	U	0.836		0.998	pCi/g	0.83	1
Thorium 228	0.427		0.4772		0.111		0.0466	pCi/g	0.22	1
Uranium-235	-0.0147	U	-0.1618	U	0.508		0.414	pCi/g	0.28	1
Uranium-238	0.812		-0.3699	U	0.836		0.998	pCi/g	0.83	1

Lab Sample ID: MB 160-487565/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 489932 — **Prep Batch: 487565**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.04708	U	0.540	0.540		0.333	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Actinium 228	-0.08762	U	0.256	0.256		0.129	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Bismuth-212	-0.01906	U	0.784	0.784		0.644	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Bismuth-214	-0.08202	U	0.170	0.170		0.188	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Cesium-137	-0.04247	U	0.0808	0.0810	0.0700	0.0624	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Lead-210	0.2498	U	1.66	1.66		1.16	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Lead-212	-0.008224	U	0.131	0.131		0.107	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Lead-214	0.002487	U	0.123	0.123		0.100	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Potassium-40	0.06795	U	0.815	0.815		0.388	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Protactinium-231	0.0000	U	0.538	0.538		2.65	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Protactinium-234	0.003889	U	0.243	0.243		0.200	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Radium-226	-0.08202	U	0.170	0.170	0.200	0.188	pCi/g	10/31/20 13:27	11/22/20 22:06	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-487565/1-A
Matrix: Solid
Analysis Batch: 489932

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 487565

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.08762	U	0.256	0.256		0.129	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Thallium-208	-0.02464	U	0.0852	0.0852		0.0472	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Thorium-232	-0.08762	U	0.256	0.256		0.129	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Thorium-234	-1.154	U	0.561	0.575		0.826	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Thorium 228	-0.008224	U	0.131	0.131		0.107	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Uranium-235	0.1199	U	0.347	0.347		0.261	pCi/g	10/31/20 13:27	11/22/20 22:06	1
Uranium-238	-1.154	U	0.561	0.575		0.826	pCi/g	10/31/20 13:27	11/22/20 22:06	1

Lab Sample ID: LCS 160-487565/2-A
Matrix: Solid
Analysis Batch: 489956

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 487565

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	95.18		9.98		0.479	pCi/g	99	87 - 116
Cesium-137	26.8	25.34		2.70	0.0700	0.0919	pCi/g	95	87 - 120
Cobalt-60	9.54	8.970		0.942		0.00975	pCi/g	94	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Rad

Leach Batch: 486856

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40006-1	HPPG-ESU-TU098C-001	Total/NA	Solid	Dry and Grind	
160-40006-2	HPPG-ESU-TU098C-002	Total/NA	Solid	Dry and Grind	
160-40006-3	HPPG-ESU-TU098C-003	Total/NA	Solid	Dry and Grind	
160-40006-4	HPPG-ESU-TU098C-004	Total/NA	Solid	Dry and Grind	
160-40006-5	HPPG-ESU-TU098C-005	Total/NA	Solid	Dry and Grind	
160-40006-6	HPPG-ESU-TU098C-006	Total/NA	Solid	Dry and Grind	
160-40006-7	HPPG-ESU-TU098C-007	Total/NA	Solid	Dry and Grind	
160-40006-8	HPPG-ESU-TU098C-008	Total/NA	Solid	Dry and Grind	
160-40006-9	HPPG-ESU-TU098C-009	Total/NA	Solid	Dry and Grind	
160-40006-10	HPPG-ESU-TU098C-010	Total/NA	Solid	Dry and Grind	
160-40006-11	HPPG-ESU-TU098C-011	Total/NA	Solid	Dry and Grind	
160-40006-12	HPPG-ESU-TU098C-012	Total/NA	Solid	Dry and Grind	
160-40006-13	HPPG-ESU-TU098C-013	Total/NA	Solid	Dry and Grind	
160-40006-14	HPPG-ESU-TU098C-014	Total/NA	Solid	Dry and Grind	
160-40006-15	HPPG-ESU-TU098C-015	Total/NA	Solid	Dry and Grind	
160-40006-16	HPPG-ESU-TU098C-016	Total/NA	Solid	Dry and Grind	
160-40006-17	HPPG-ESU-TU098C-017	Total/NA	Solid	Dry and Grind	
160-40006-18	HPPG-ESU-TU098C-018	Total/NA	Solid	Dry and Grind	
160-40006-19	HPPG-ESU-TU098C-019	Total/NA	Solid	Dry and Grind	
160-40006-20	HPPG-ESU-TU098C-020	Total/NA	Solid	Dry and Grind	
160-40006-12 DU	HPPG-ESU-TU098C-012	Total/NA	Solid	Dry and Grind	

Leach Batch: 486956

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40006-21	HPPG-ESU-TU098C-021	Total/NA	Solid	Dry and Grind	
160-40006-22	HPPG-ESU-TU098C-022	Total/NA	Solid	Dry and Grind	
160-40006-23	HPPG-ESU-TU098C-023	Total/NA	Solid	Dry and Grind	
160-40006-24	HPPG-ESU-TU098C-024	Total/NA	Solid	Dry and Grind	
160-40006-25	HPPG-ESU-TU098C-025	Total/NA	Solid	Dry and Grind	
160-40006-26	HPPG-ESU-TU098C-B-001	Total/NA	Solid	Dry and Grind	
160-40006-27	HPPG-F-009	Total/NA	Solid	Dry and Grind	
160-40006-28	HPPG-F-010	Total/NA	Solid	Dry and Grind	

Prep Batch: 487563

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40006-1	HPPG-ESU-TU098C-001	Total/NA	Solid	Fill_Geo-21	486856
160-40006-2	HPPG-ESU-TU098C-002	Total/NA	Solid	Fill_Geo-21	486856
160-40006-3	HPPG-ESU-TU098C-003	Total/NA	Solid	Fill_Geo-21	486856
160-40006-4	HPPG-ESU-TU098C-004	Total/NA	Solid	Fill_Geo-21	486856
160-40006-5	HPPG-ESU-TU098C-005	Total/NA	Solid	Fill_Geo-21	486856
160-40006-6	HPPG-ESU-TU098C-006	Total/NA	Solid	Fill_Geo-21	486856
160-40006-7	HPPG-ESU-TU098C-007	Total/NA	Solid	Fill_Geo-21	486856
160-40006-8	HPPG-ESU-TU098C-008	Total/NA	Solid	Fill_Geo-21	486856
160-40006-9	HPPG-ESU-TU098C-009	Total/NA	Solid	Fill_Geo-21	486856
160-40006-10	HPPG-ESU-TU098C-010	Total/NA	Solid	Fill_Geo-21	486856
160-40006-11	HPPG-ESU-TU098C-011	Total/NA	Solid	Fill_Geo-21	486856
160-40006-12	HPPG-ESU-TU098C-012	Total/NA	Solid	Fill_Geo-21	486856
MB 160-487563/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-487563/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40006-12 DU	HPPG-ESU-TU098C-012	Total/NA	Solid	Fill_Geo-21	486856

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Rad

Prep Batch: 487565

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40006-13	HPPG-ESU-TU098C-013	Total/NA	Solid	Fill_Geo-21	486856
160-40006-14	HPPG-ESU-TU098C-014	Total/NA	Solid	Fill_Geo-21	486856
160-40006-15	HPPG-ESU-TU098C-015	Total/NA	Solid	Fill_Geo-21	486856
160-40006-16	HPPG-ESU-TU098C-016	Total/NA	Solid	Fill_Geo-21	486856
160-40006-17	HPPG-ESU-TU098C-017	Total/NA	Solid	Fill_Geo-21	486856
160-40006-18	HPPG-ESU-TU098C-018	Total/NA	Solid	Fill_Geo-21	486856
160-40006-19	HPPG-ESU-TU098C-019	Total/NA	Solid	Fill_Geo-21	486856
160-40006-20	HPPG-ESU-TU098C-020	Total/NA	Solid	Fill_Geo-21	486856
160-40006-21	HPPG-ESU-TU098C-021	Total/NA	Solid	Fill_Geo-21	486956
160-40006-22	HPPG-ESU-TU098C-022	Total/NA	Solid	Fill_Geo-21	486956
160-40006-23	HPPG-ESU-TU098C-023	Total/NA	Solid	Fill_Geo-21	486956
160-40006-24	HPPG-ESU-TU098C-024	Total/NA	Solid	Fill_Geo-21	486956
160-40006-25	HPPG-ESU-TU098C-025	Total/NA	Solid	Fill_Geo-21	486956
160-40006-26	HPPG-ESU-TU098C-B-001	Total/NA	Solid	Fill_Geo-21	486956
160-40006-27	HPPG-F-009	Total/NA	Solid	Fill_Geo-21	486956
160-40006-28	HPPG-F-010	Total/NA	Solid	Fill_Geo-21	486956
MB 160-487565/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-487565/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 488460

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40006-1	HPPG-ESU-TU098C-001	Total/NA	Solid	DPS-0	486856
160-40006-11	HPPG-ESU-TU098C-011	Total/NA	Solid	DPS-0	486856
160-40006-21	HPPG-ESU-TU098C-021	Total/NA	Solid	DPS-0	486956
MB 160-488460/24-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-488460/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40006-1
SDG: GJ46599784

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**Sr (40-110)**
160-40006-1	HPPG-ESU-TU098C-001	91.9
160-40006-11	HPPG-ESU-TU098C-011	85.3
160-40006-21	HPPG-ESU-TU098C-021	88.2
LCS 160-488460/1-A	Lab Control Sample	89.5
MB 160-488460/24-A	Method Blank	86.4

Tracer/Carrier Legend

Sr = Sr Carrier