From: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) [elizabeth.roddy@navy.mil]
Sent: Tuesday, November 24, 2020 11:50 AM
To: Liscio, Matthew P CIV USN NAVSEA DET RASO VA (USA) [matthew.liscio@navy.mil]
CC: Stoick, Paul T CIV USN NAVFAC SW SAN CA (USA) [paul.stoick@navy.mil]
Subject: FW: HPNS Parcel G RSY 18 Use 1 Data Package
Attachments: CTO5065_RSY18Use1_DataPackage_11202020.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hi Matt,

Wanted to see if you have any questions or comments on your review of the attached?

Very Respectfully,

Liz Roddy
Remedial Project Manager
NAVFAC BRAC PMO West
33000 Nixie Way
Bldg. 50, Floor 2
San Diego, CA 92147
(619) 524-5755
elizabeth.roddy@navy.mil

From: Mangel, Amy <amy.mangel@aptim.com>
Sent: Friday, November 20, 2020 2:50 PM
To: Liscio, Matthew P CIV USN NAVSEA DET RASO VA (USA) <matthew.liscio@navy.mil>
Cc: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.roddy@navy.mil>; Bercik, Lisa M. <lisa.bercik@aptim.com>; Hackett, John <John.Hackett@aptim.com>; Schul, Raymond <raymond.schul@aptim.com>; Click, James <james.click@aptim.com>; Killpack, Randall <randall.killpack@aptim.com>; Ramirez, Joaquin <Joaquin.Ramirez@aptim.com>
Subject: [Non-DoD Source] HPNS Parcel G RSY 18 Use 1 Data Package

Mr. Liscio,

Attached is the RSY data package for Parcel G RSY 18 Use 1 for your review. The Parcel G RSY data packages include additional statistical charts, in accordance with the Parcel G Work Plan, such as histograms, box plots, and normal Q-Q plots.

If there are any questions or if additional data is required, please contact me.

Thank you,

AMY MANGEL
Scientist 3

APTIM | Radiation Safety

(b) (6) [redacted]
E amy.mangel@aptim.com

Richland, WA

APTIM.com

Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO 5065 RSY Pad Data Report	
RSY Pad: RSY 18 Lift 1	Soil Origin: TU-098B ESU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 11/20/2020

Systematic Soil Sample Data: RSY 18 Lift 1

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-TU098B-001	1	Systematic	10,747	15,658	0.281	-0.00123	-0.0124
HPPG-ESU-TU098B-002	2	Systematic	10,419	15,658	0.356	-0.0492	N/A
HPPG-ESU-TU098B-003	3	Systematic	11,013	15,658	0.370	0.021	N/A
HPPG-ESU-TU098B-004	4	Systematic	10,992	15,658	0.414	-0.0573	N/A
HPPG-ESU-TU098B-005	5	Systematic	10,065	15,658	0.288	0.017	N/A
HPPG-ESU-TU098B-006	6	Systematic	10,264	15,658	0.149	-0.0164	N/A
HPPG-ESU-TU098B-007	7	Systematic	11,021	15,658	0.373	-0.0274	N/A
HPPG-ESU-TU098B-008	8	Systematic	11,179	15,658	0.411	0.0285	N/A
HPPG-ESU-TU098B-009	9	Systematic	11,869	15,658	0.711	-0.00518	N/A
HPPG-ESU-TU098B-010	10	Systematic	10,352	15,658	0.311	-0.0163	N/A
HPPG-ESU-TU098B-011	11	Systematic	10,201	15,658	0.355	0.00783	-0.0347
HPPG-ESU-TU098B-012	12	Systematic	11,348	15,658	0.402	0.00485	N/A
HPPG-ESU-TU098B-013	13	Systematic	11,018	15,658	0.298	0.000646	N/A
HPPG-ESU-TU098B-014	14	Systematic	11,171	15,658	0.420	-0.00653	N/A
HPPG-ESU-TU098B-015	15	Systematic	10,944	15,658	0.435	0.0322	N/A
HPPG-ESU-TU098B-016	16	Systematic	10,671	15,658	0.092	0.00734	N/A
HPPG-ESU-TU098B-017	17	Systematic	10,608	15,658	0.290	-0.0016	N/A
HPPG-ESU-TU098B-018	18	Systematic	10,486	15,658	0.507	-0.0387	N/A
HPPG-ESU-TU098B-019	19	Systematic	10,822	15,658	0.406	-0.0276	N/A
HPPG-ESU-TU098B-020	20	Systematic	11,405	15,658	0.390	-0.0175	N/A
HPPG-ESU-TU098B-021	21	Systematic	10,739	15,658	0.418	-0.0237	-0.0168
HPPG-ESU-TU098B-022	22	Systematic	10,564	15,658	0.127	0.0316	N/A
HPPG-ESU-TU098B-023	23	Systematic	11,753	15,658	-0.0409	0.000615	N/A
HPPG-ESU-TU098B-024	24	Systematic	10,616	15,658	0.0536	-0.00127	N/A
HPPG-ESU-TU098B-025	25	Systematic	10,297	15,658	0.277	-0.045	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					0.7110	0.0322	-0.0124
Mean					0.3237	-0.0073	N/A
Median					0.3560	-0.0016	N/A
Minimum					-0.0409	-0.0573	-0.0347
Standard Deviation					0.1568	0.0247	N/A

Biased Soil Sample Data: RSY 18 Lift 1

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-TU098B-B-001	1	Biased	12,111	15,658	0.548	0.018	0.085

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-10022020-PG-ROV-141	10/02/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-10052020-PG-JSS-144	10/05/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-10052020-PG-JSS-142	10/05/2020	3x3	08/06/2021	108853
Biased Sample Survey	HPRS-10062020-PG-JSS-145	10/06/2020	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 (251 keV)
ROI 10	Gross Gamma

Summary: RSY 18 Lift 1

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, 44 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 44 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 8. The net follow-up static spectra are presented on pages 13-56.

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 9). TestAmerica sample results are attached (pages 57-91). 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 57-91).

Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 11-12. 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 f ollow-up static measurements were below the ROC-specific critical levels. TestAmerica sample results are attached (pages 92-106). A map of the biased sample location is presented on page 10. 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 18 Lift 1 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-098B 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-18-U1				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	4.01	34.07	15.65	15.04	4.09
ROI-06	63.15	148.34	99.17	98.22	11.59
ROI-07	43.10	109.26	75.65	75.16	9.71
ROI-08	83.18	192.43	124.14	123.27	13.19
ROI-10	2,234.51	3,066.03	2,560.26	2,541.90	124.12

Statistical Summary Reference Background

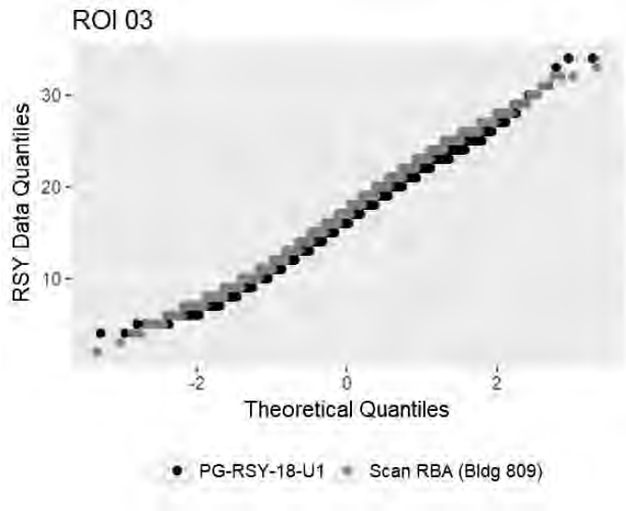
TYPE	Scan RBA (Bldg 809)				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64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

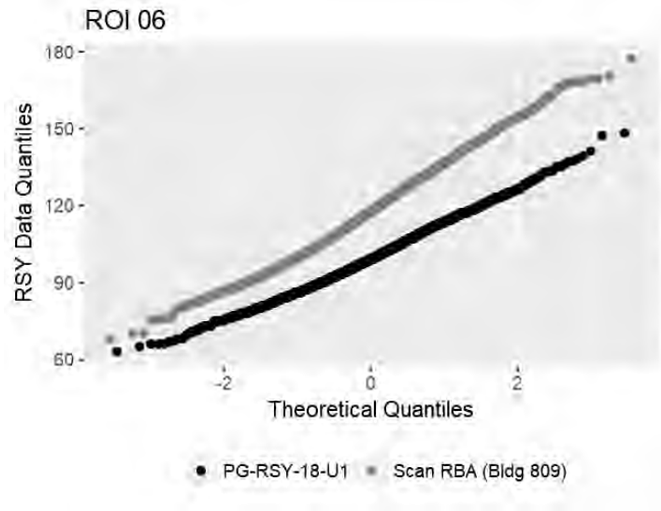
cps = counts per second

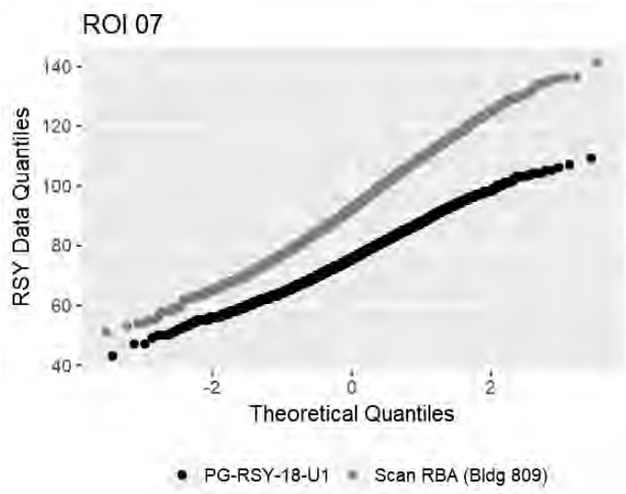
Dataset	Number of Data Points
PG-RSY-18-U1	3283
Scan RBA (Bldg 809)	4632

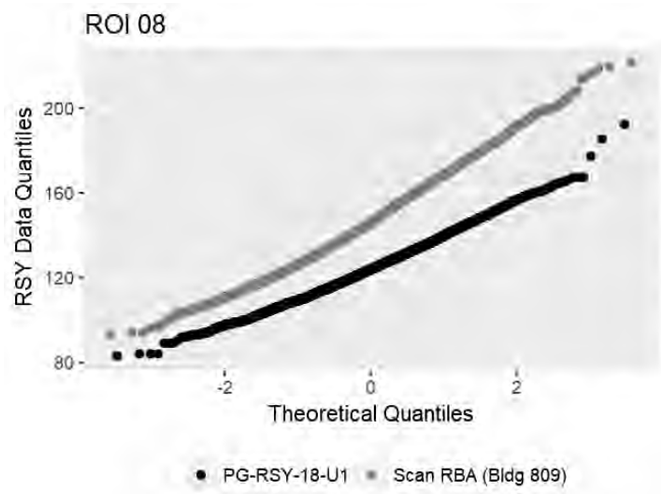
Soil Scan Statistics

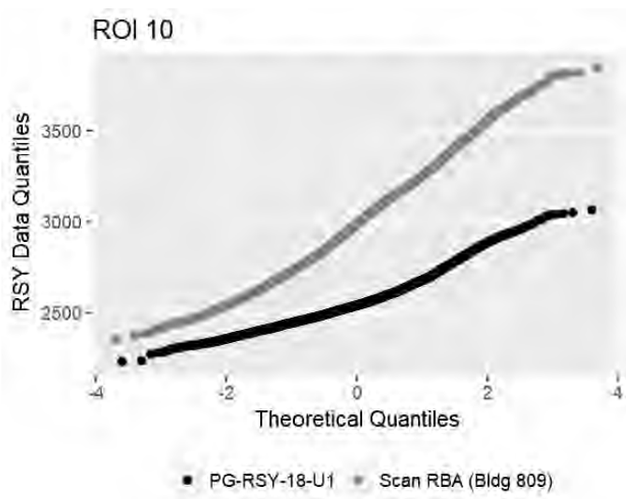
Normal Q-Q Plots





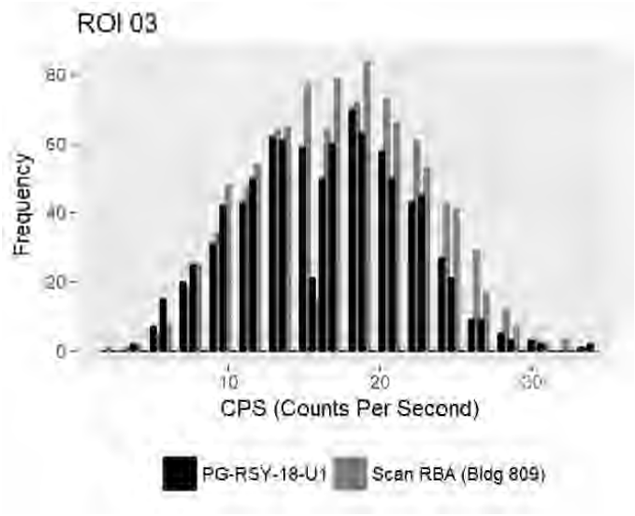


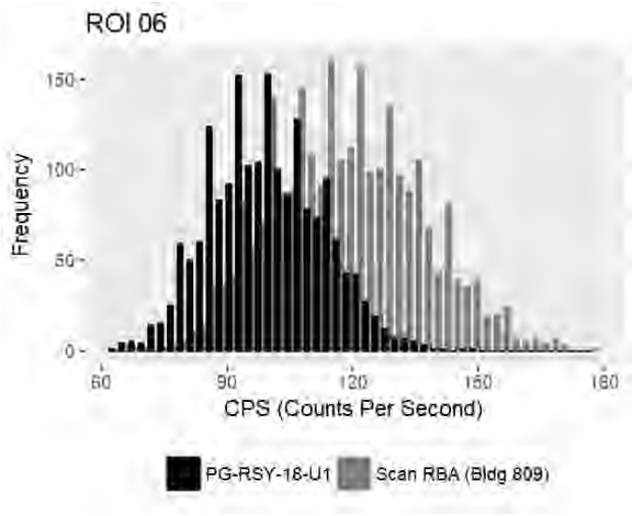


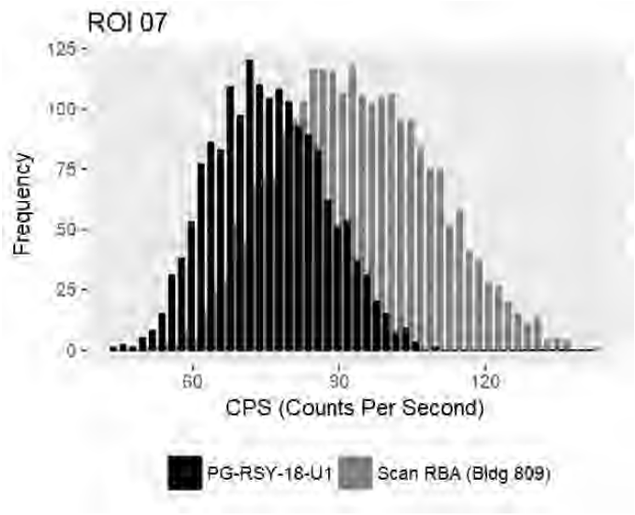


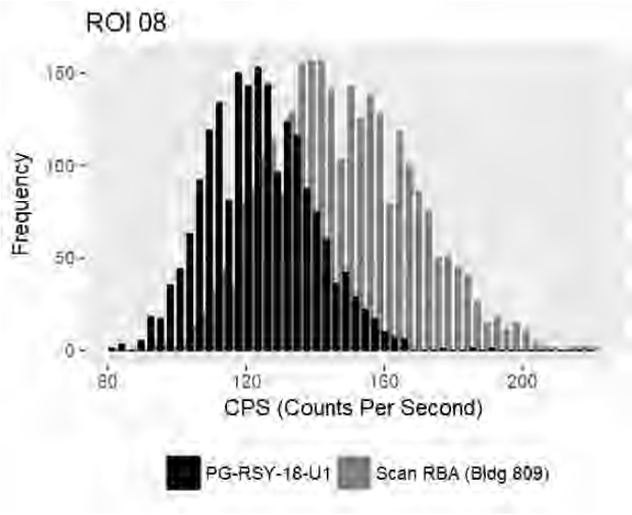
Soil Scan Statistics

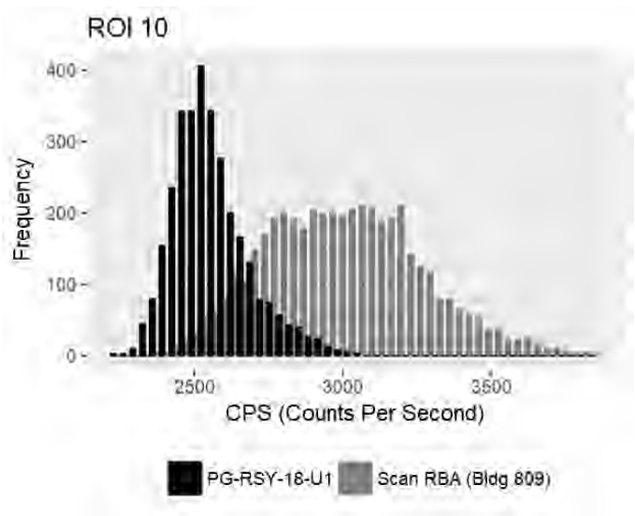
Histograms







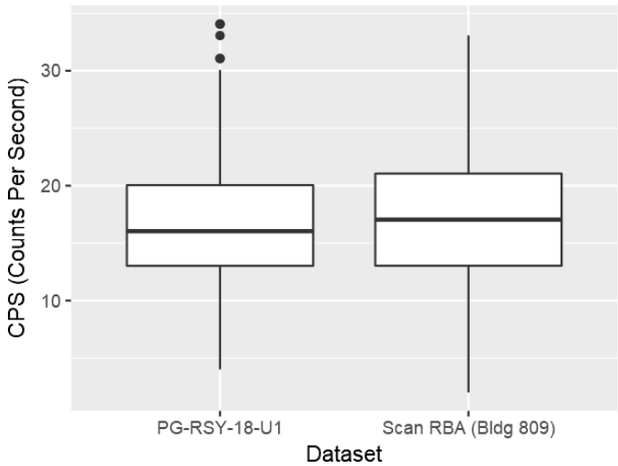




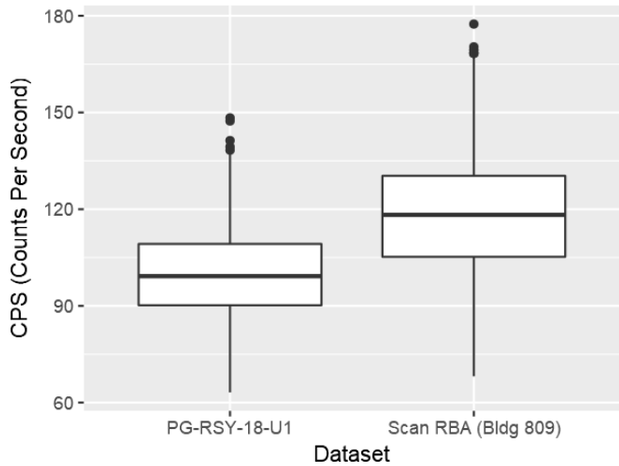
Soil Scan Statistics

Box Plots

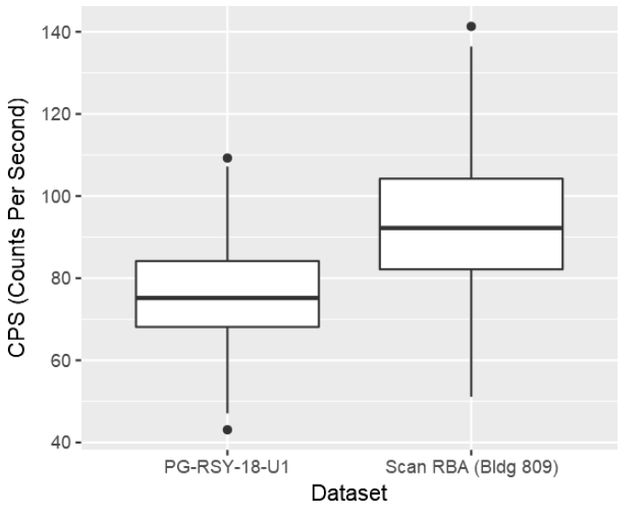
ROI 03



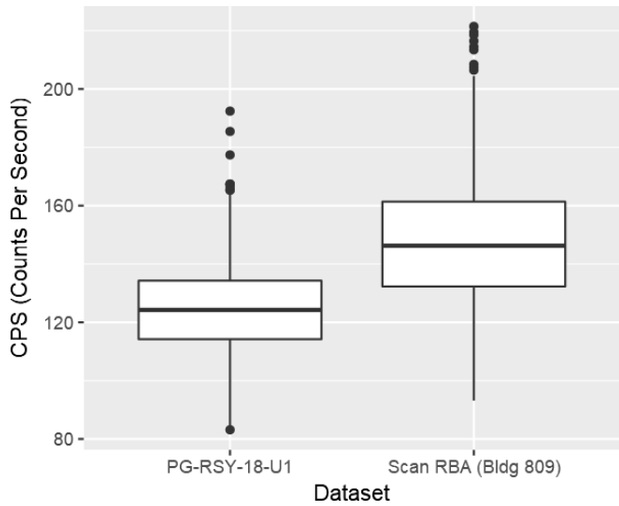
ROI 06



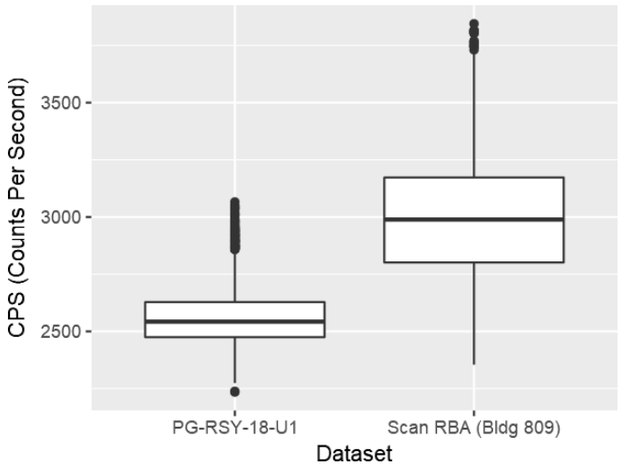
ROI 07



ROI 08

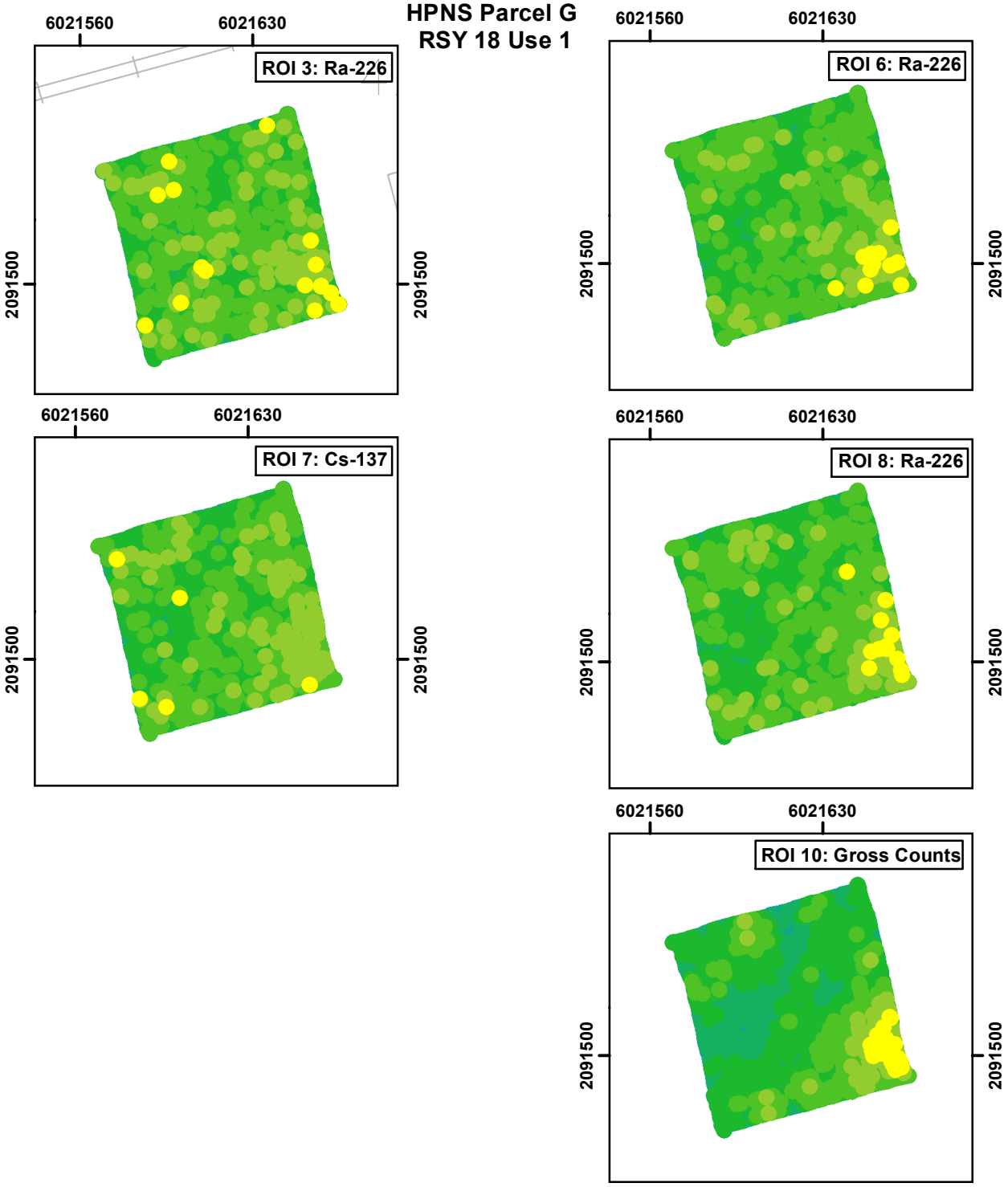


ROI 10



TU-098B ESU

RSI Data Plots
HPNS Parcel G
RSY 18 Use 1



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

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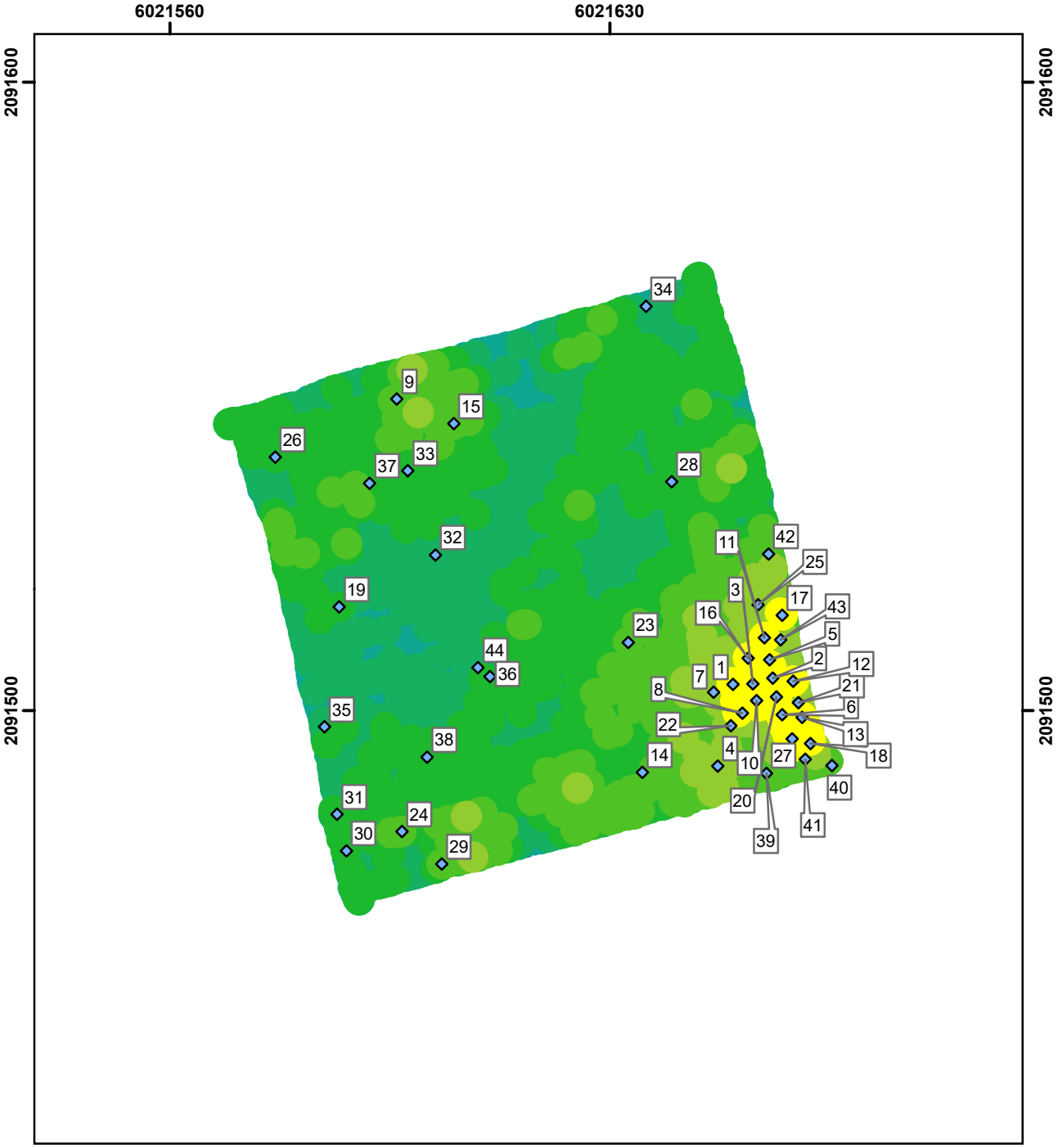
TU-098B ESU

Follow-Up Static Survey
HPNS Parcel G
RSY 18 Use 1



RSY 18 Use 1 (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

CSP Zone III. NAD83, US Survey Foot

N

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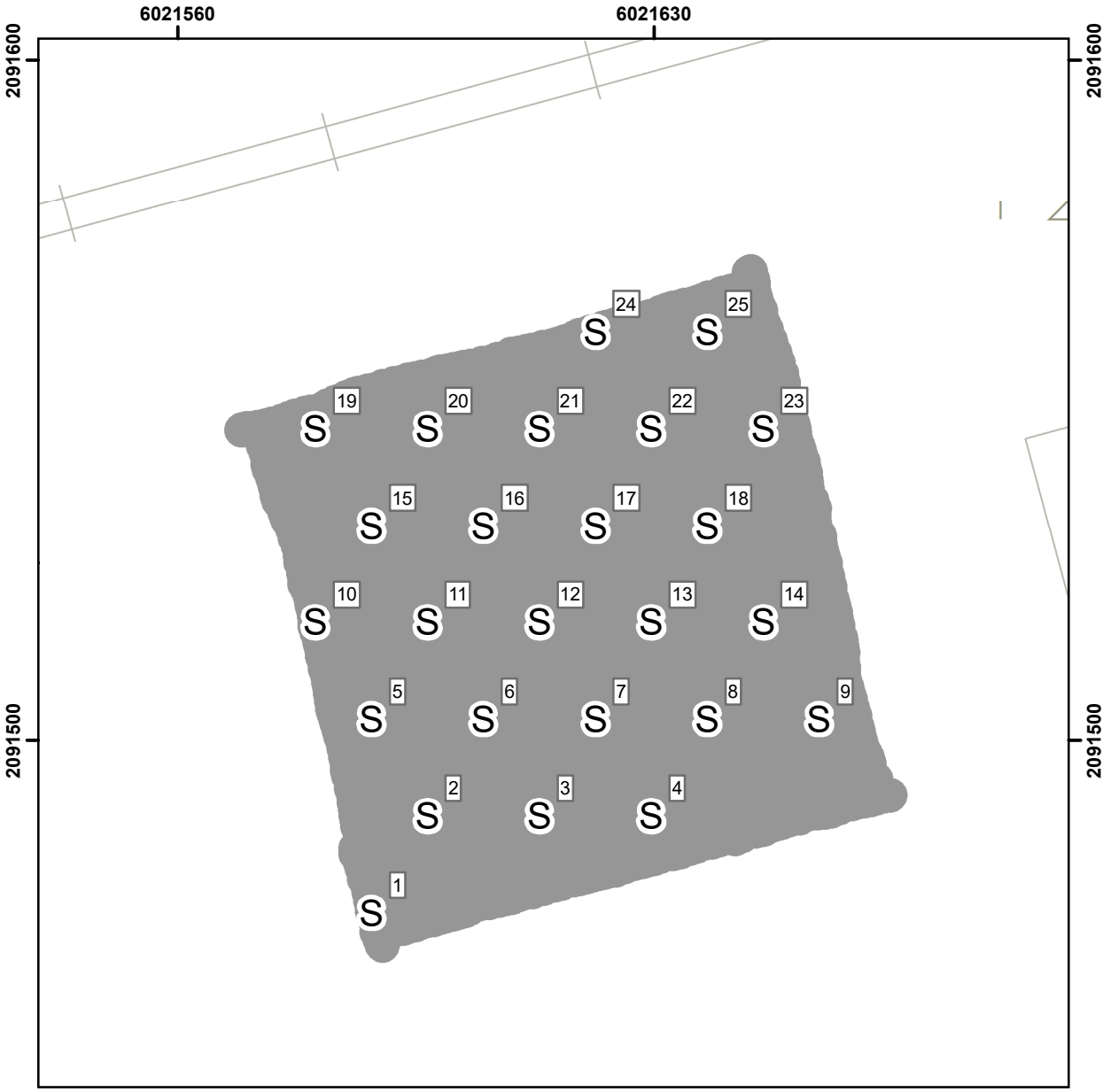
TU-098B ESU

Systematic Sampling
HPNS Parcel G
RSY 18 Use 1



RSY 18 Use 1

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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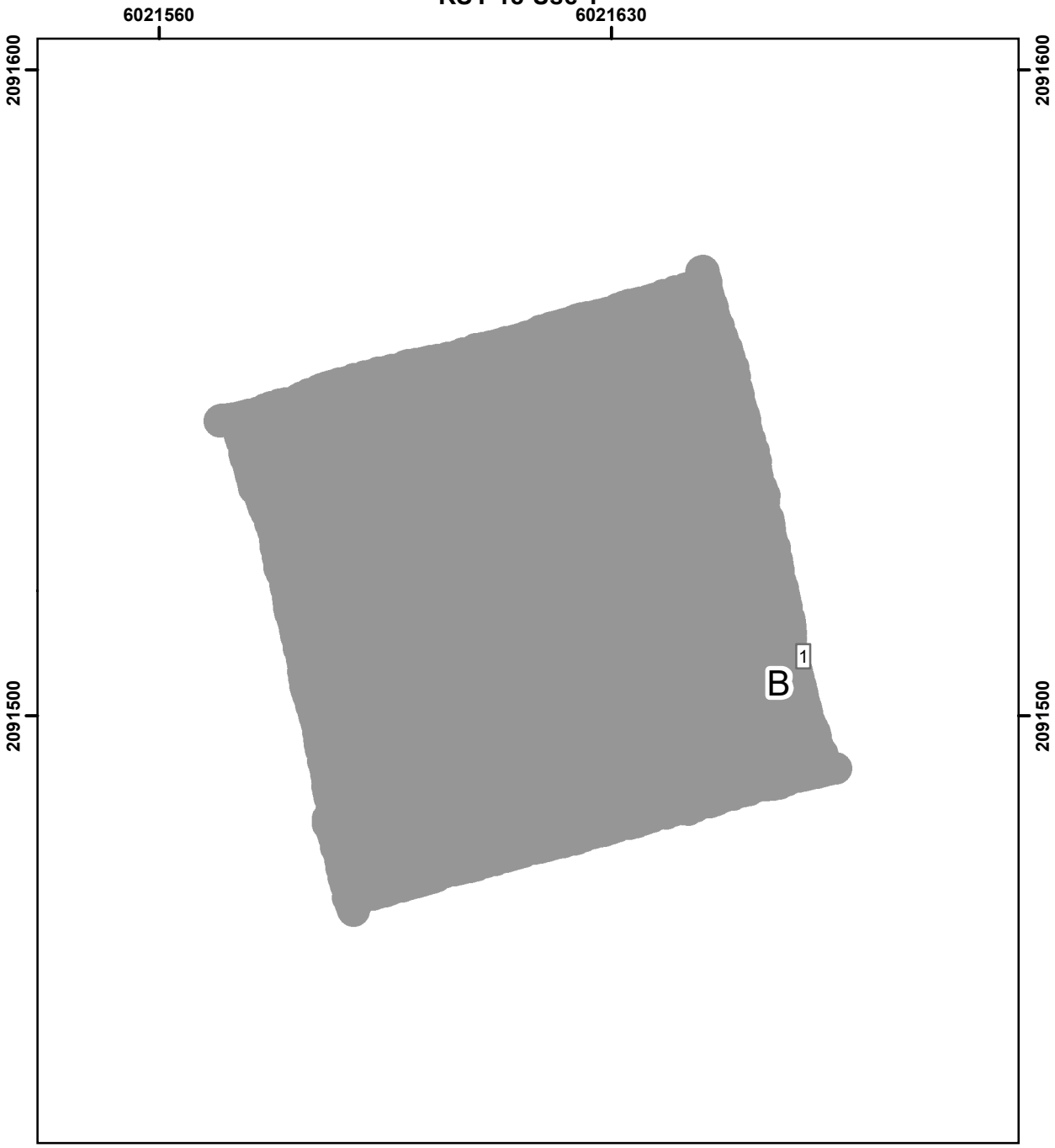
TU-098B ESU

Biased Sampling
HPNS Parcel G
RSY 18 Use 1



RSY 18 Use 1

B Biased Sample Locations

RS-700 GWS Coverage

20 10 0 20 Feet

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

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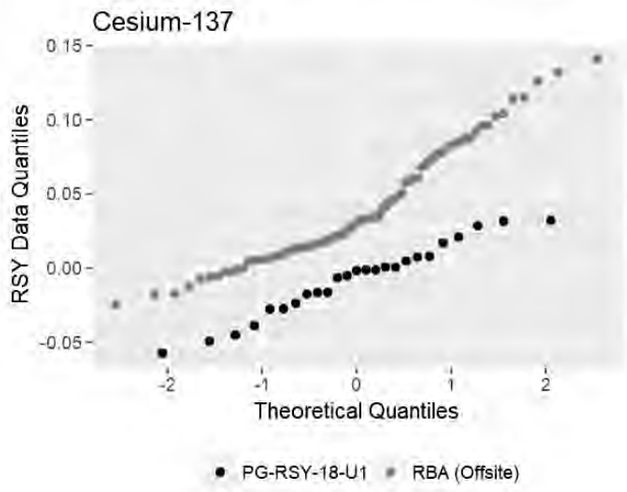
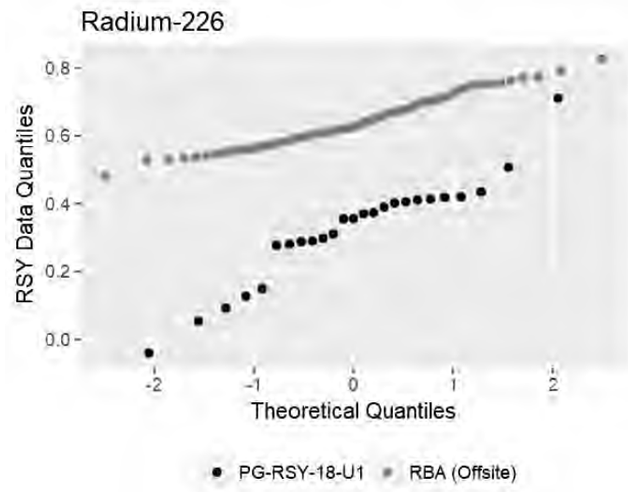
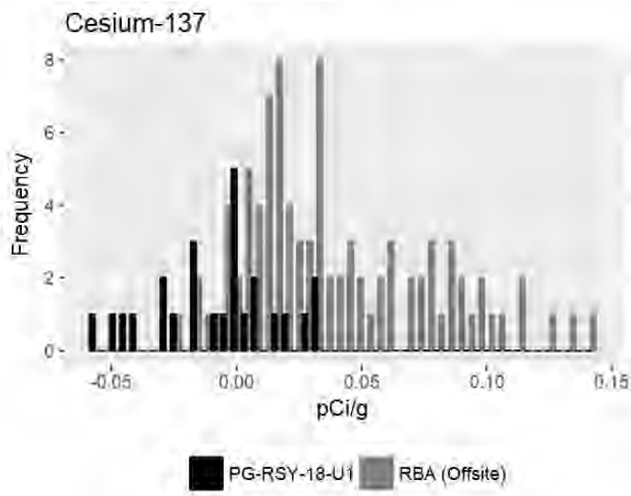
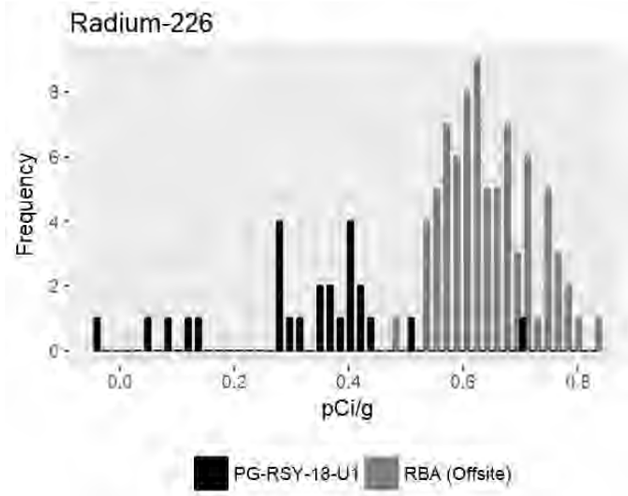
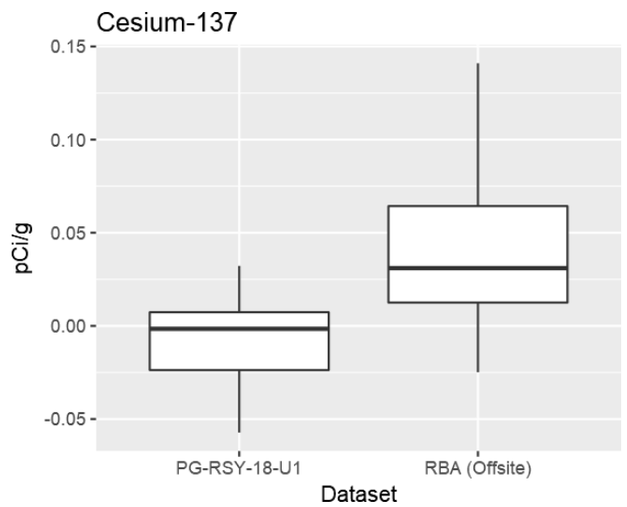
Soil Sample Statistics

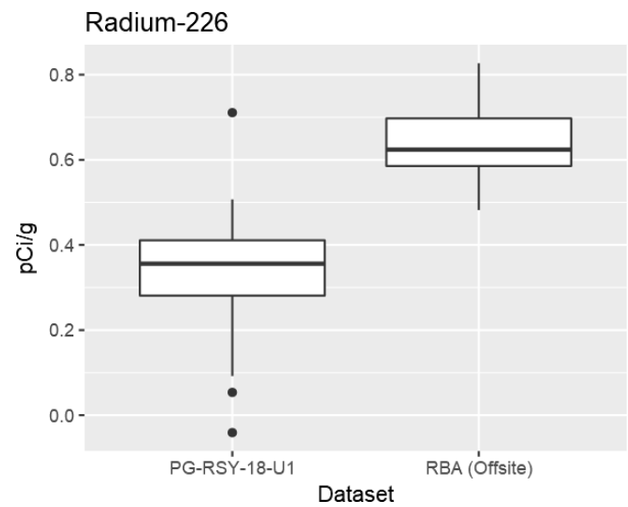












WILCOXON RANK SUM TEST

Nuclide: Ra-226 Location: RSY 18 Use 1

LBGR: 0.356 pCi/g

DCGL 1

LBGR = Median SU Data

LBGR = 0.356

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT RANKS	Sorted Ranks	Location Associated with Sorted Rank
0.59	R	0.588	48.5	0	1	S
0.69	R	0.687	101	0	2	S
0.57	R	0.566	40	0	3	S
0.64	R	0.635	78.5	0	4	S
0.61	R	0.606	58	0	5	S
0.65	R	0.653	87.5	0	6	S
0.61	R	0.613	62	0	7	S
0.71	R	0.711	109	0	8	S
0.68	R	0.68	99.5	0	9	S
0.61	R	0.608	59	0	10	S
0.54	R	0.541	31	0	11	S
0.59	R	0.588	48.5	0	12	S
0.67	R	0.673	96	0	13	S
0.67	R	0.674	97	0	14	S
0.48	R	0.482	26	0	15	S
0.76	R	0.763	121	0	16	S
0.75	R	0.748	115	0	17	S
0.56	R	0.56	37.5	0	18	S
0.61	R	0.614	64	0	19	S
0.53	R	0.529	27	0	20	S
0.61	R	0.605	57	0	21	S
0.58	R	0.575	44	0	22	S
0.67	R	0.672	95	0	23	S
0.56	R	0.559	36	0	24	S
0.66	R	0.664	90.5	0	25	R
0.55	R	0.546	32	0	26	S
0.74	R	0.739	114	0	27	R
0.74	R	0.736	113	0	28	R
0.60	R	0.604	56	0	29	R
0.70	R	0.701	105	0	30	R
0.59	R	0.59	50.5	0	31	R
0.70	R	0.699	104	0	32	R
0.62	R	0.624	73.5	0	33	R
0.58	R	0.583	47	0	34	R
0.57	R	0.573	43	0	35	R
0.62	R	0.623	71	0	36	R
0.60	R	0.598	55	0	37.5	R
0.64	R	0.643	84	0	37.5	R
0.55	R	0.553	34	0	39	R
0.75	R	0.751	116.5	0	40	R
0.77	R	0.771	122	0	41.5	R
0.72	R	0.715	110.5	0	41.5	R
0.62	R	0.62	68	0	43	R
0.71	R	0.71	108	0	44	R
0.58	R	0.581	46	0	45	R
0.60	R	0.595	53	0	46	R
0.56	R	0.56	37.5	0	47	R
0.75	R	0.751	116.5	0	48.5	R
0.67	R	0.669	93.5	0	48.5	R
0.62	R	0.619	67	0	50.5	R
0.64	R	0.641	82.5	0	50.5	R
0.59	R	0.59	50.5	0	52	R
0.61	R	0.614	64	0	53	R
0.65	R	0.653	87.5	0	54	R
0.58	R	0.576	45	0	55	R
0.62	R	0.622	69.5	0	56	R
0.57	R	0.565	39	0	57	R
0.63	R	0.629	76.5	0	58	R
0.64	R	0.641	82.5	0	59	R
0.61	R	0.614	64	0	60	R
0.66	R	0.664	90.5	0	61	R
0.77	R	0.772	123	0	62	R
0.64	R	0.639	80.5	0	64	R
0.62	R	0.624	73.5	0	64	R
0.61	R	0.612	61	0	64	R
0.65	R	0.648	85	0	66	R
0.55	R	0.552	33	0	67	R
0.62	R	0.624	73.5	0	68	R
0.62	R	0.615	66	0	69.5	R
0.64	R	0.635	78.5	0	69.5	R
0.70	R	0.703	107	0	71	R
0.53	R	0.53	28	0	73.5	R
0.73	R	0.727	112	0	73.5	R
0.62	R	0.624	73.5	0	73.5	R
0.65	R	0.65	86	0	73.5	R
0.67	R	0.668	92	0	76.5	R
0.54	R	0.538	30	0	76.5	R
0.57	R	0.568	41.5	0	78.5	R
0.60	R	0.596	54	0	78.5	R
0.59	R	0.591	52	0	80.5	R
0.68	R	0.678	98	0	80.5	R
0.67	R	0.669	93.5	0	82.5	R
0.79	R	0.792	124	0	82.5	R
0.75	R	0.752	118	0	84	R
0.56	R	0.557	35	0	85	R
0.62	R	0.622	69.5	0	86	R
0.70	R	0.702	106	0	87.5	R
0.64	R	0.639	80.5	0	87.5	R
0.76	R	0.756	120	0	89	R
0.70	R	0.696	102.5	0	90.5	R
0.72	R	0.715	110.5	0	90.5	R
0.66	R	0.659	89	0	92	R
0.70	R	0.696	102.5	0	93.5	R
0.63	R	0.629	76.5	0	93.5	R
0.68	R	0.68	99.5	0	95	R
0.53	R	0.534	29	0	96	R
0.61	R	0.61	60	0	97	R
0.83	R	0.827	125	0	98	R
0.75	R	0.753	119	0	99.5	R
0.57	R	0.568	41.5	0	99.5	R
0.281	S	-0.075	7	7	101	R
0.356	S	0	13	13	102.5	R
0.37	S	0.014	14	14	102.5	R
0.414	S	0.058	20	20	104	R
0.288	S	-0.068	8	8	105	R
0.149	S	-0.207	5	5	106	R
0.373	S	0.017	15	15	107	R
0.411	S	0.055	19	19	108	R
0.711	S	0.355	25	25	109	R
0.311	S	-0.045	11	11	110.5	R
0.355	S	-0.001	12	12	110.5	R
0.402	S	0.046	17	17	112	R
0.298	S	-0.058	10	10	113	R
0.42	S	0.064	22	22	114	R
0.435	S	0.079	23	23	115	R
0.092	S	-0.264	3	3	116.5	R
0.29	S	-0.066	9	9	116.5	R
0.507	S	0.151	24	24	118	R
0.406	S	0.05	18	18	119	R
0.39	S	0.034	16	16	120	R
0.418	S	0.062	21	21	121	R
0.127	S	-0.229	4	4	122	R
-0.0409	S	-0.3969	1	1	123	R
0.0536	S	-0.3024	2	2	124	R
0.277	S	-0.079	6	6	125	R
	Sum =		7875	325		

SU Stats		
Count	25	*m*
SD	0.157	
Median	0.356	

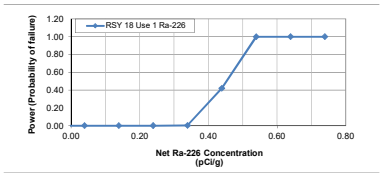
Ref Stats		
Count	100	*n*
SD	0.073	

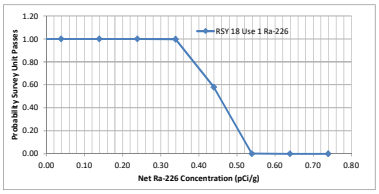
Critical Value 1951.9

Number of Samples	
σ	0.157
LBGR	0.356
Δ/σ	4.11
Pr	1
N	25.23
N/2	13
Actual N	25
SU σ	0.157
Z(1-alpha)	2.326
Z(1-beta)	1.645

POWER CURVE CALCULATION

Concentration	above Background (C)	(C-LBGR)/ SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing
0.5	-0.36	-4.6	0.00020	0.00001	0.51	3.572099	1.89	860.236	0.00	1.00
0.6	-0.26	-3.9	0.00234	0.00017	5.8475	57.65651	7.593189	213.416	0.00	1.00
0.7	-0.16	-3.3	0.00666	0.00074	16.66	229.8282	15.16009	106.18	0.00	1.00
0.8	-0.06	-2.7	0.03855	0.00847	96.375	2238.671	47.31459	32.3363	0.00	1.00
0.9	0.04	-2.0	0.07865	0.02307	196.625	5371.815	73.29267	19.5071	0.00	1.00
1	0.14	-1.4	0.16110	0.06390	402.748	12005.68	109.5704	11.1673	0.00	1.00
1.1	0.24	-0.7	0.31031	0.16469	775.773	21567.84	146.8599	5.7918	0.00	1.00
1.2	0.34	-0.1	0.47181	0.30561	1179.54	26144.76	161.6934	2.76338	0.00	1.00
1.3	0.44	0.5	0.63816	0.48259	1595.41	23744.63	154.0929	0.20084	0.42	0.58
1.4	0.54	1.2	0.80193	0.68980	2004.82	14760.88	121.4944	-3.1151	1.00	0.00
1.5	0.64	1.8	0.89845	0.83002	2246.14	7239.827	85.08717	-7.2841	1.00	0.00
1.6	0.74	2.4	0.95516	0.92078	2387.89	2706.103	52.02021	-14.639	1.00	0.00





QUANTILE TEST

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

25 n (number of survey unit measurements)

100 m (number of reference area measurements)

Use:

m = 100

n = 25

4 r

3 k

0.025 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.

0 of the largest 4 adjusted measurements are from S.	The null hypothesis is accepted.

# of R: 100 *n*

# of S: 25 *m*

Avg Rank R: 75.5

Avg Rank S: 13

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

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

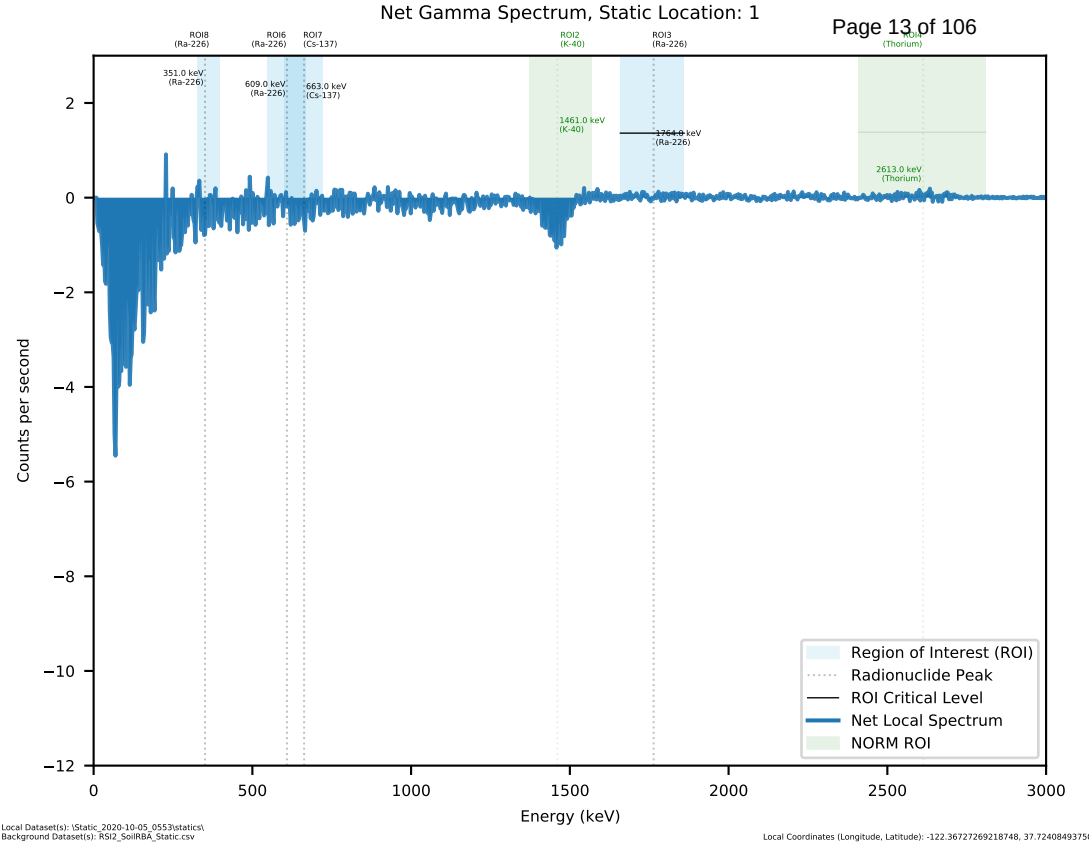
z = 99.0% percentile of standard normal distribution = 2.

k = 1951.9

$\alpha_W = \alpha/2 =$ 0.01

β = 0.05

Since the sum of survey unit ranks is less than the critical value, the null hypothesis that the survey unit concentrations do not exceed the LBGR is accepted (i.e., survey unit passes). Scenario B



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Background Dataset(s): RSI2_SoilRBA_Static.csv

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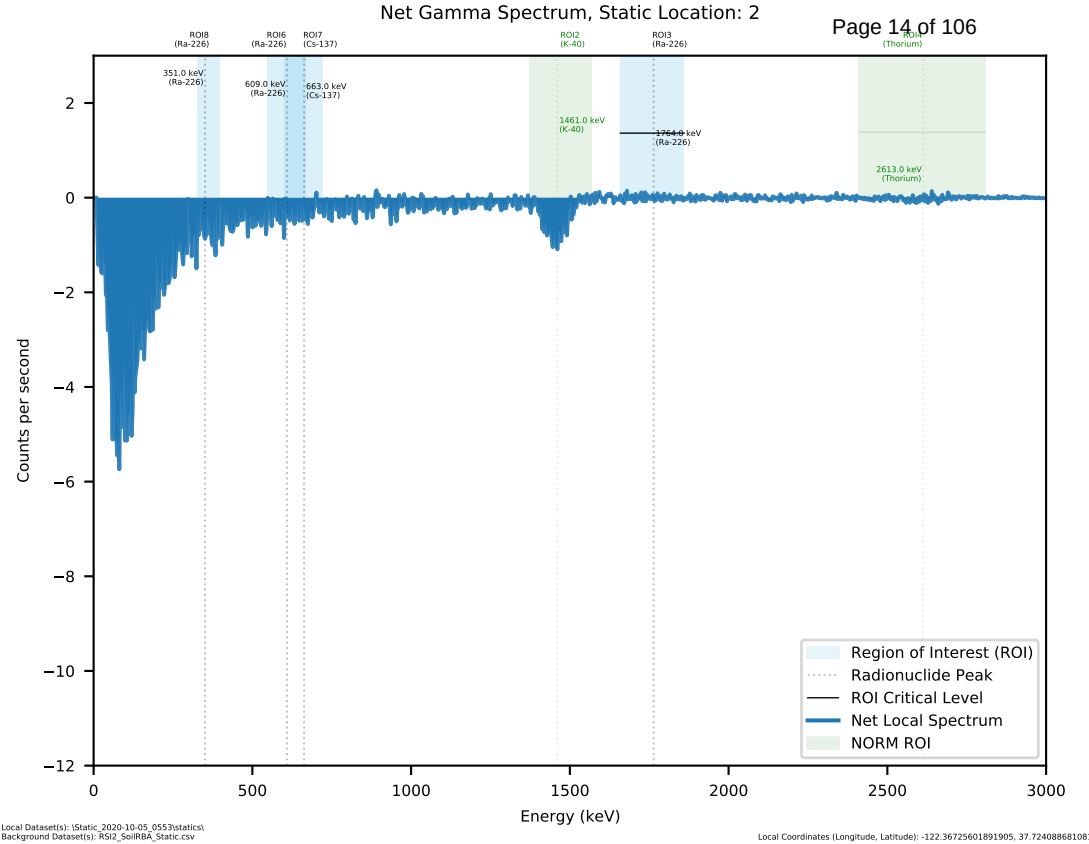

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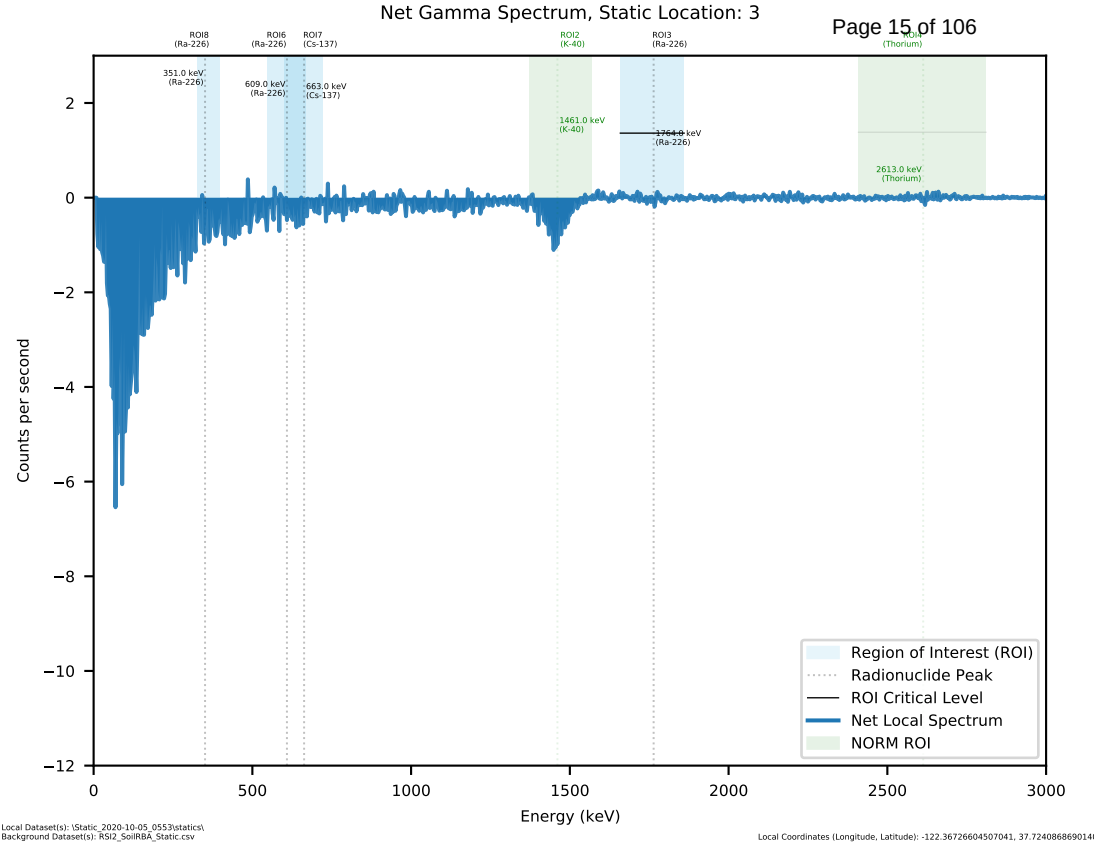

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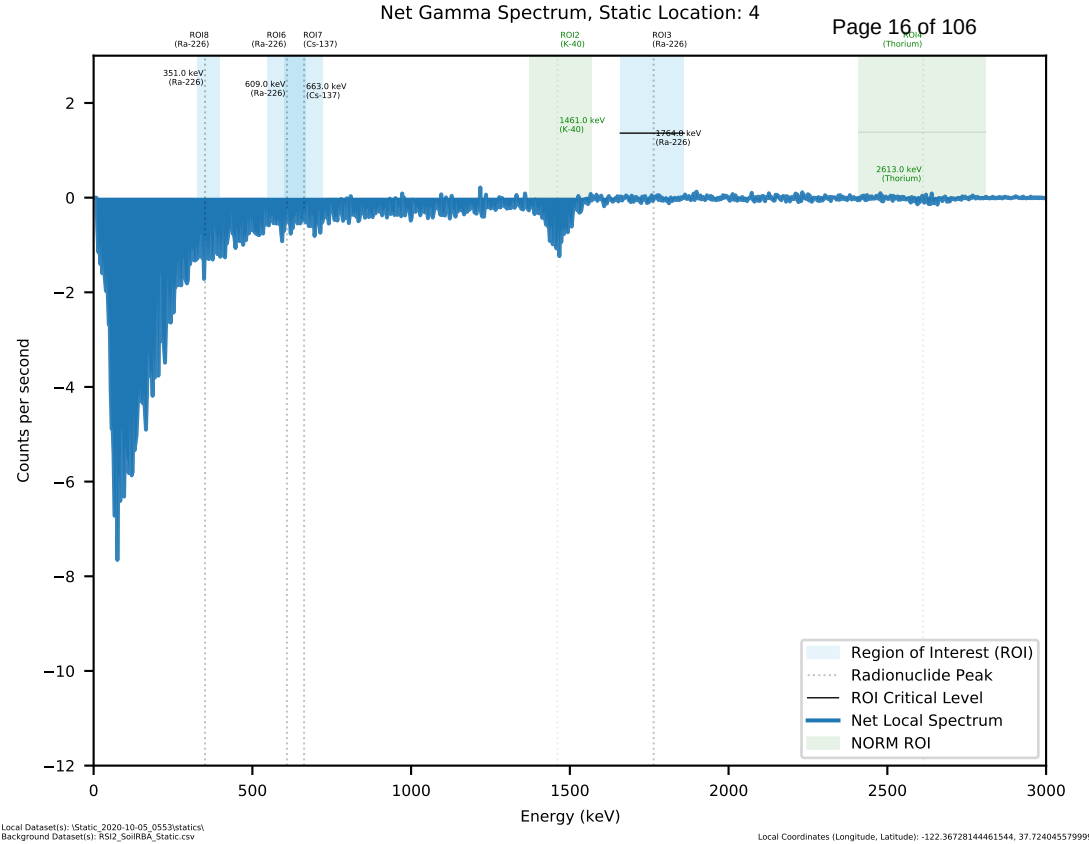

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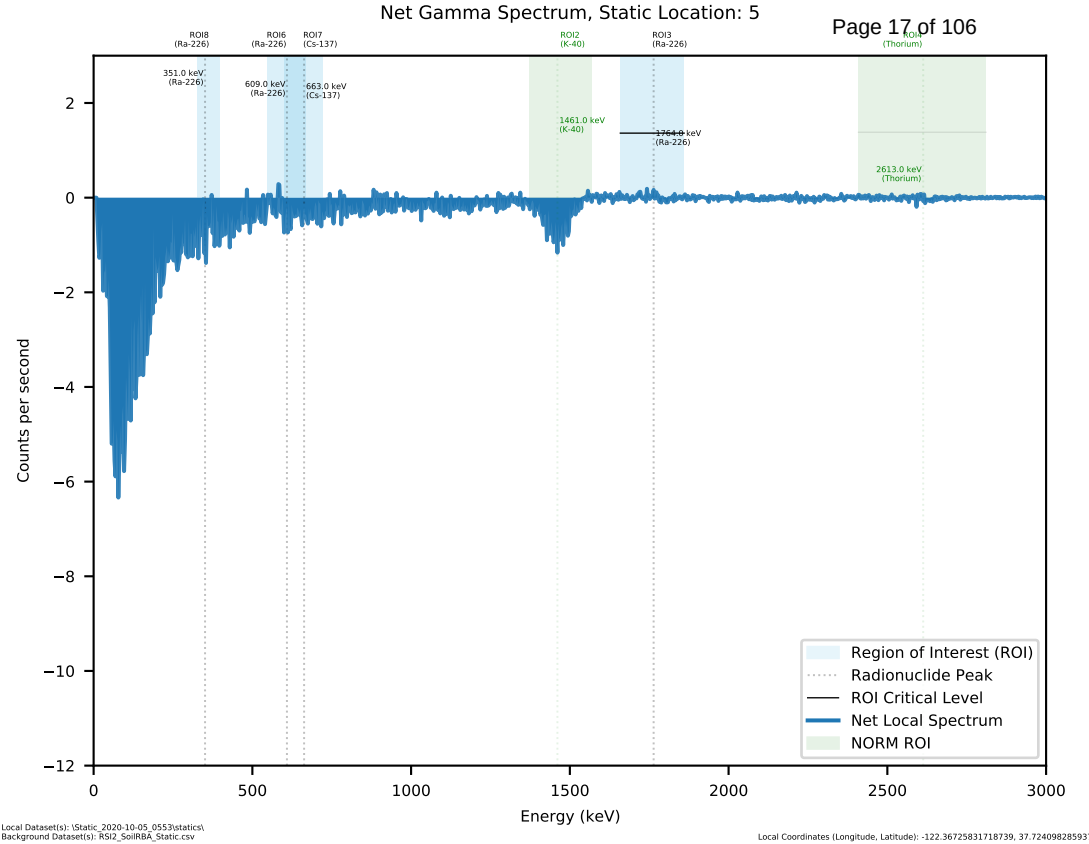

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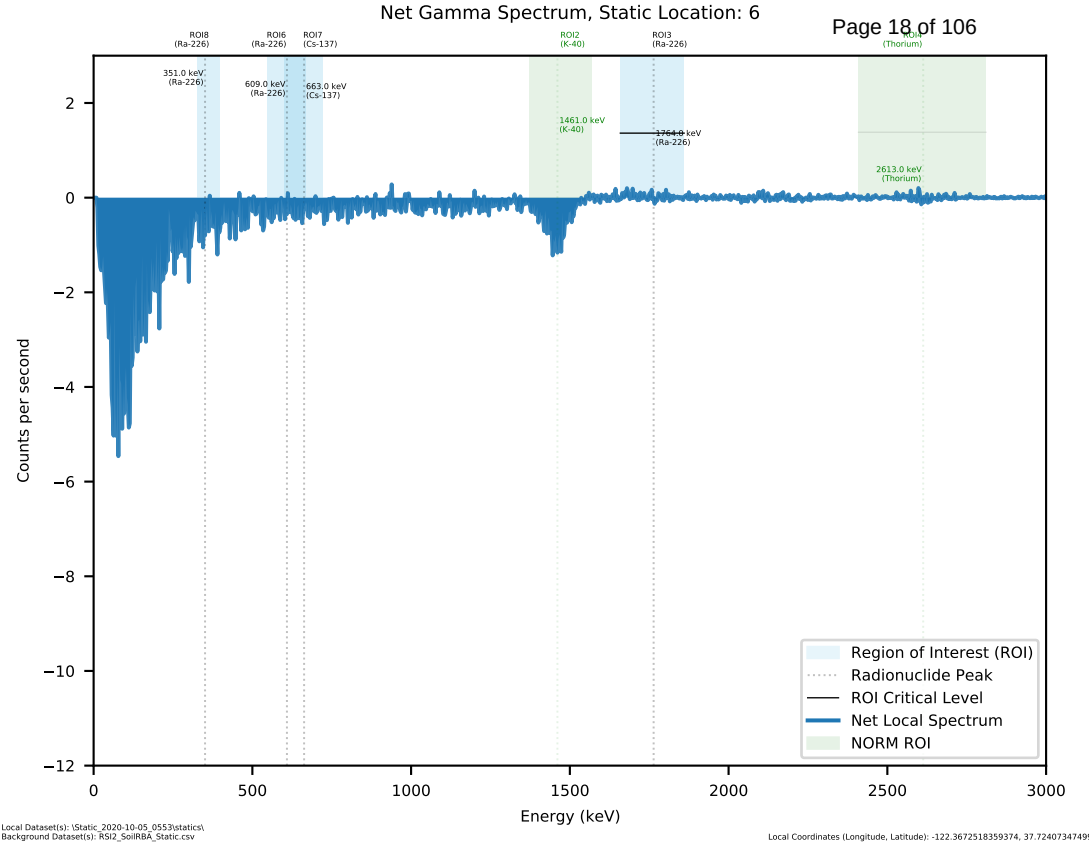

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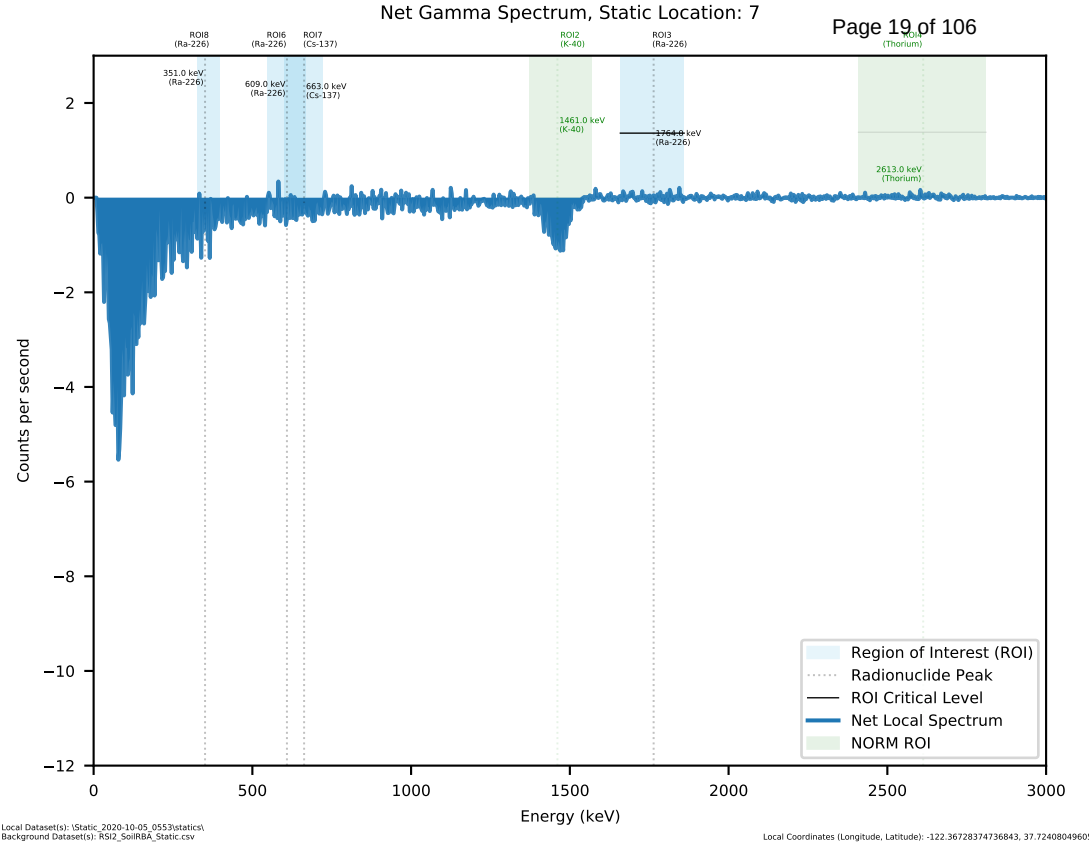

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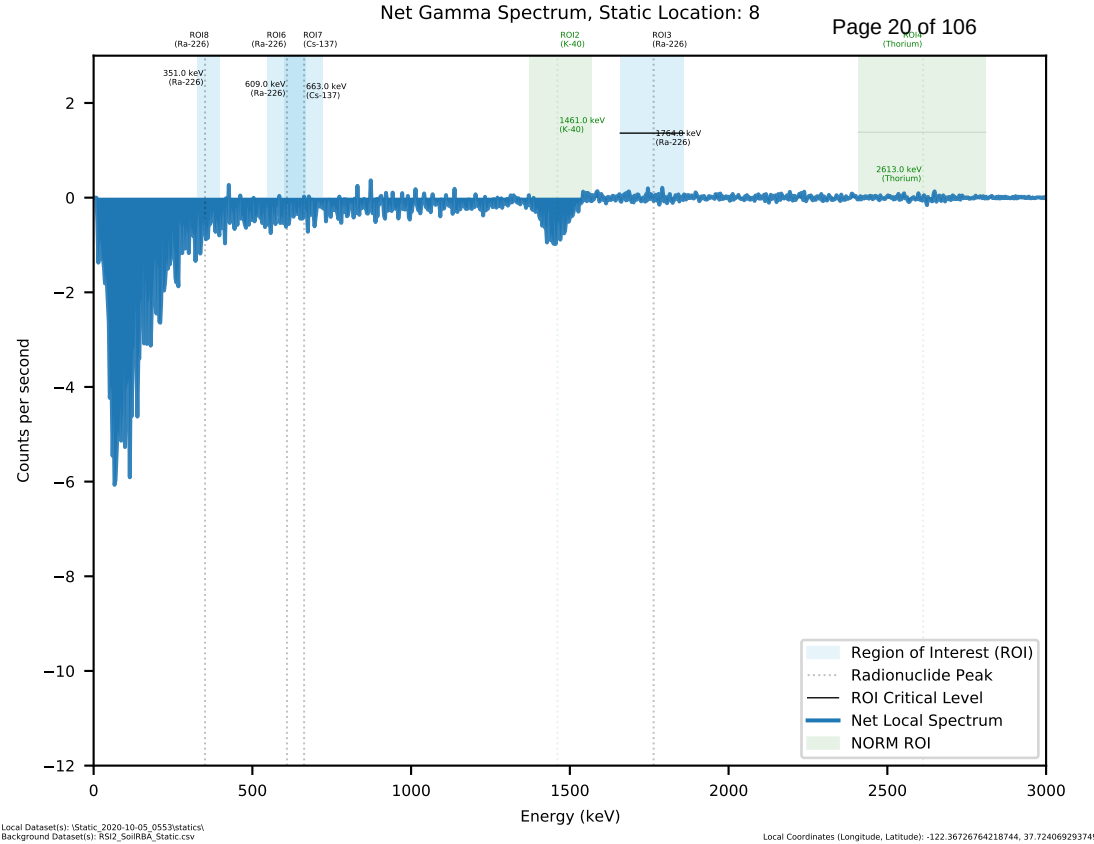

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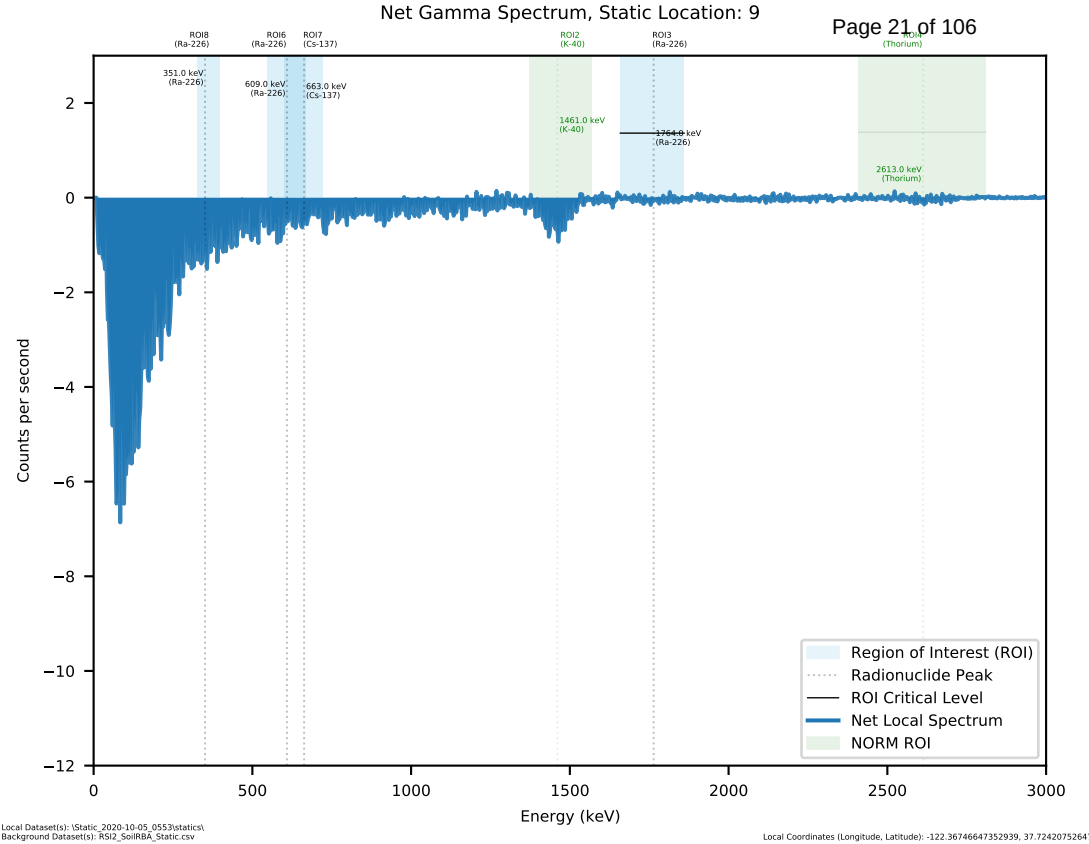

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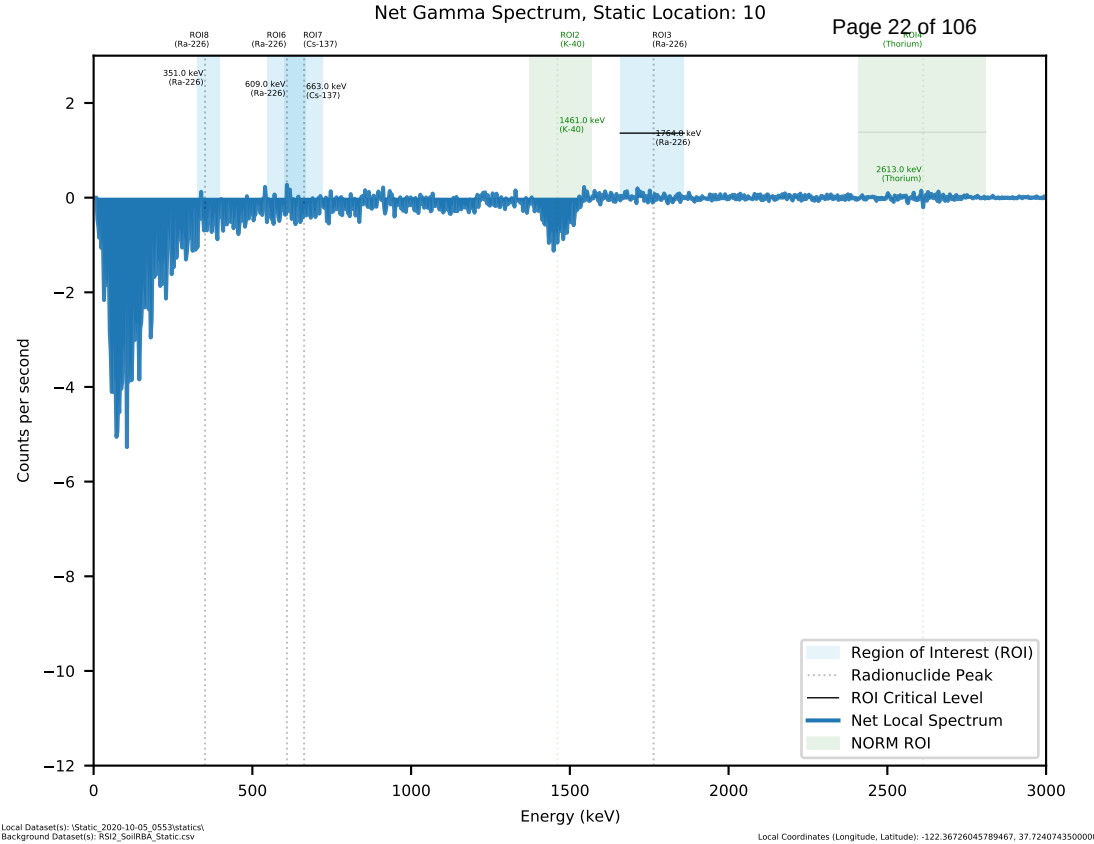

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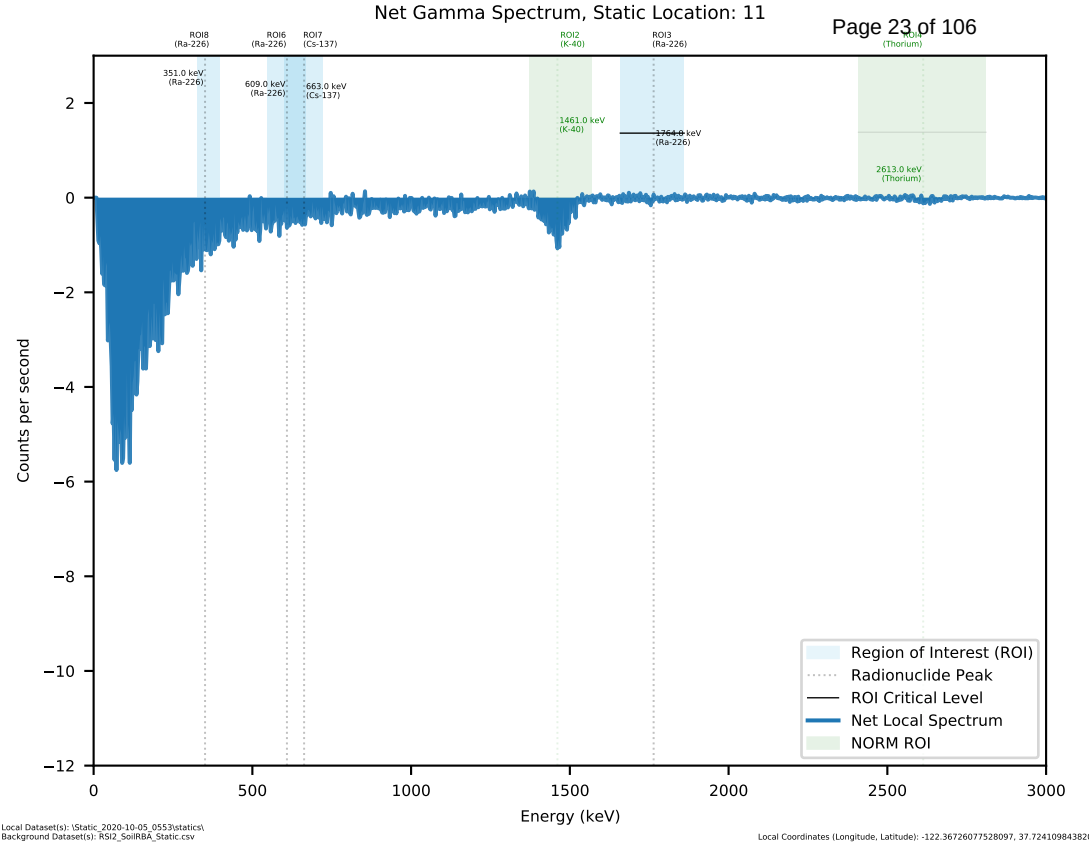

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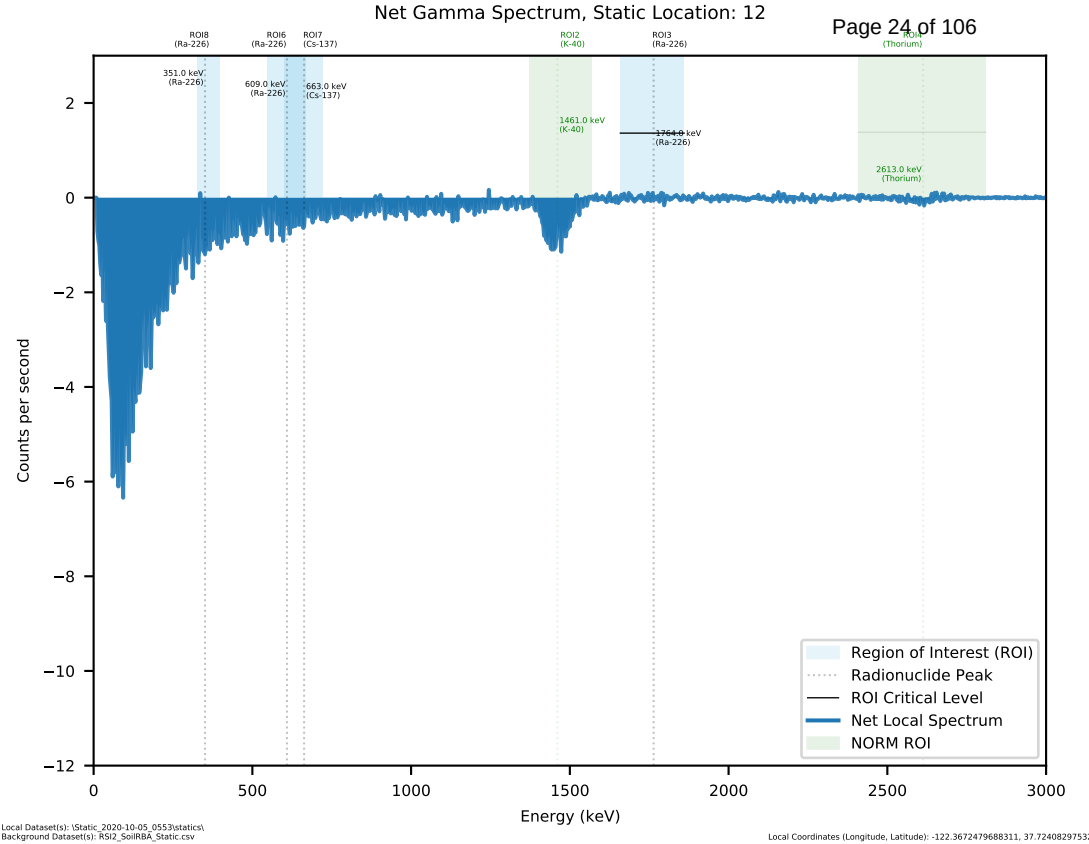

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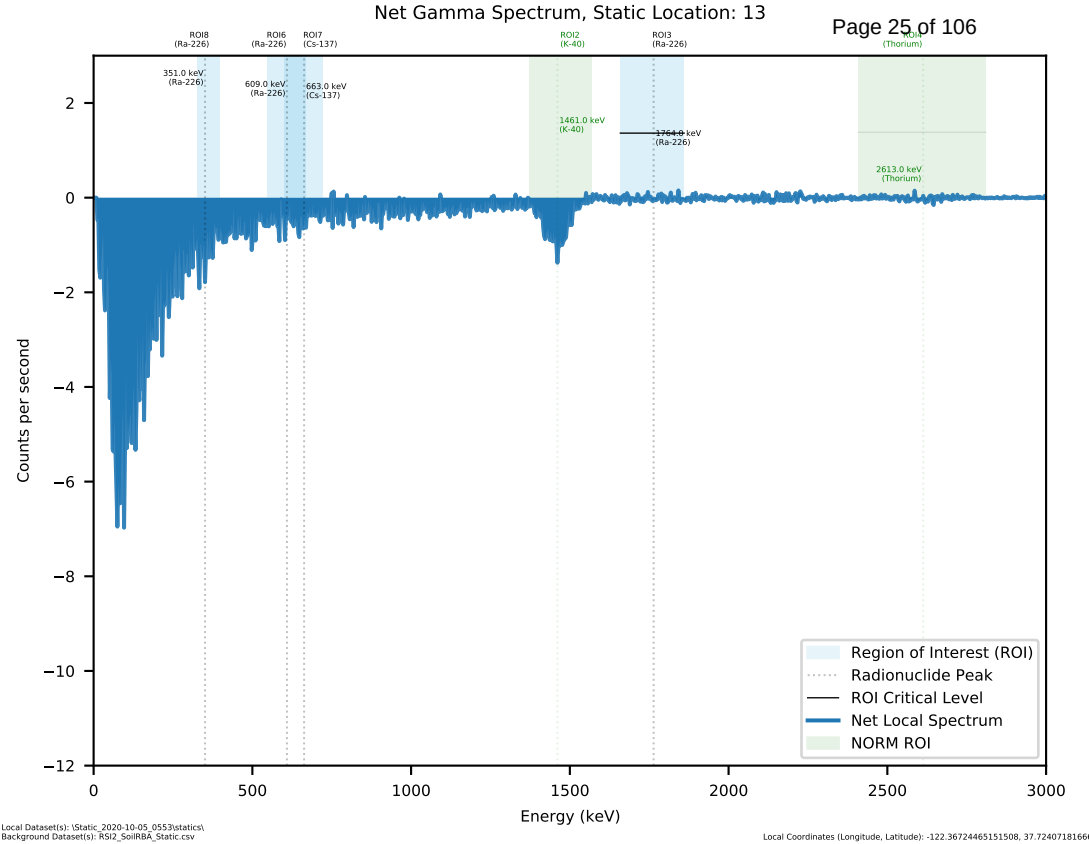

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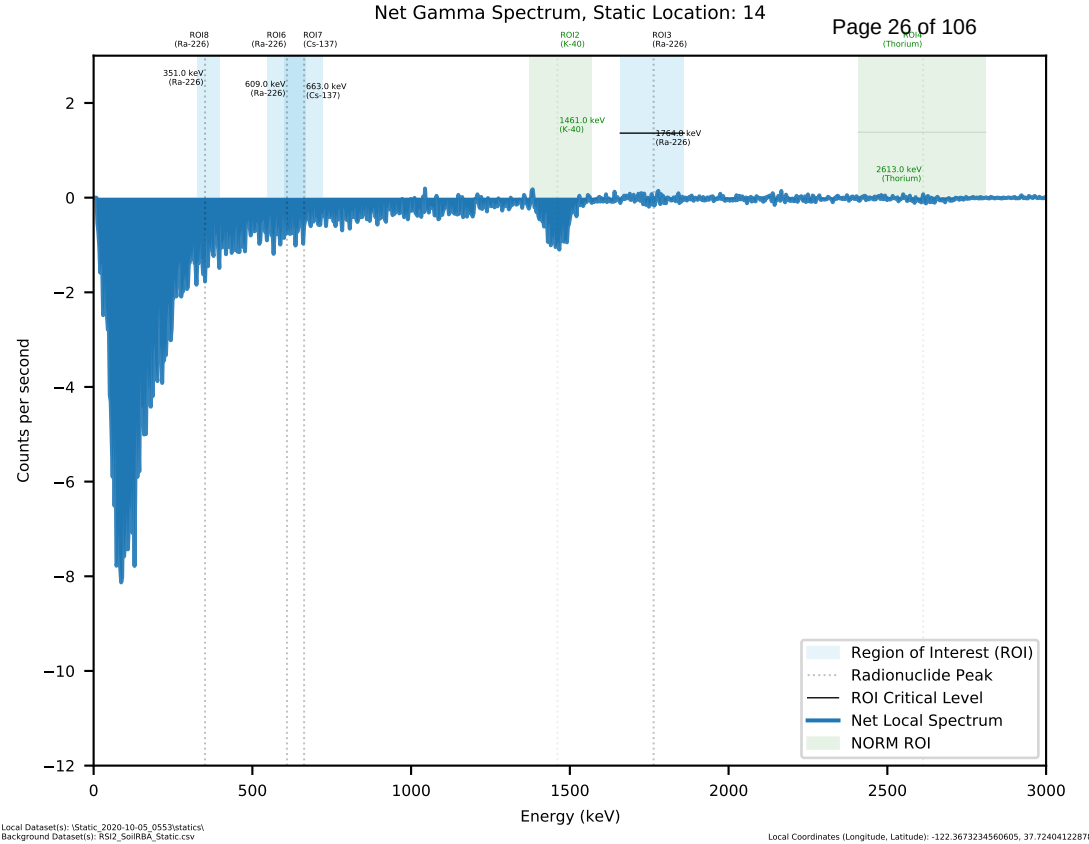

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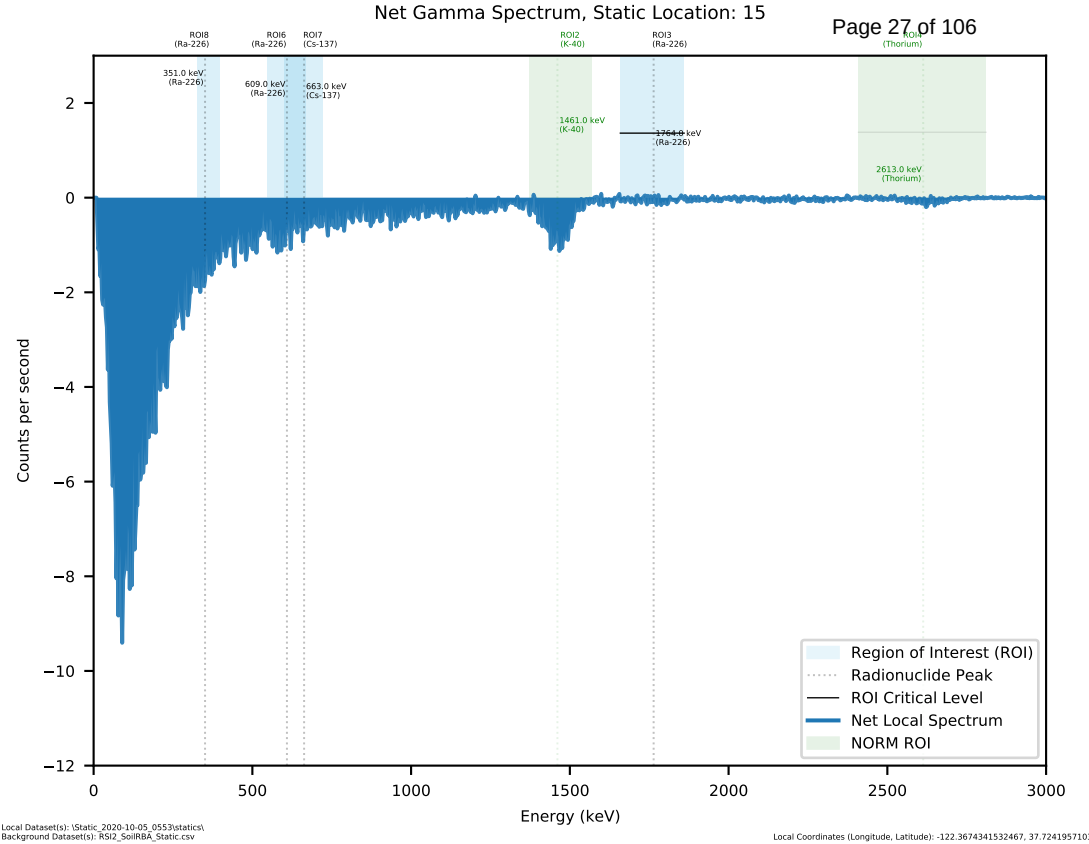

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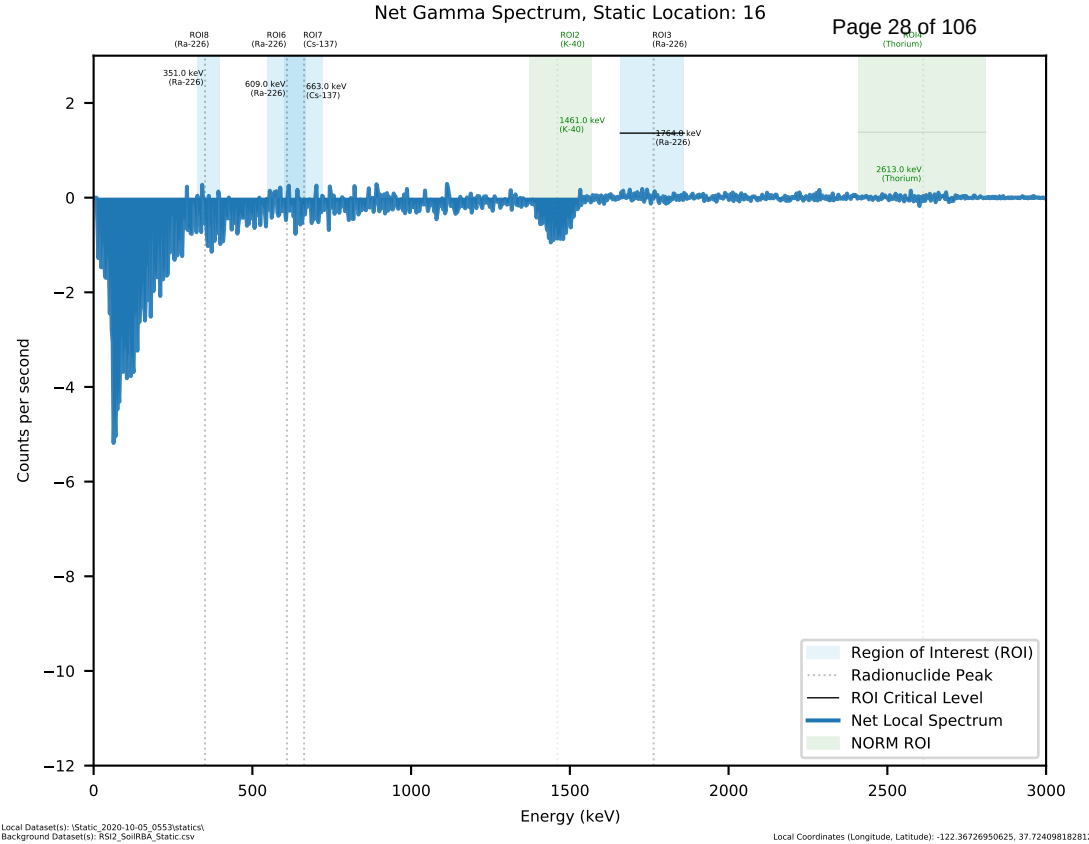

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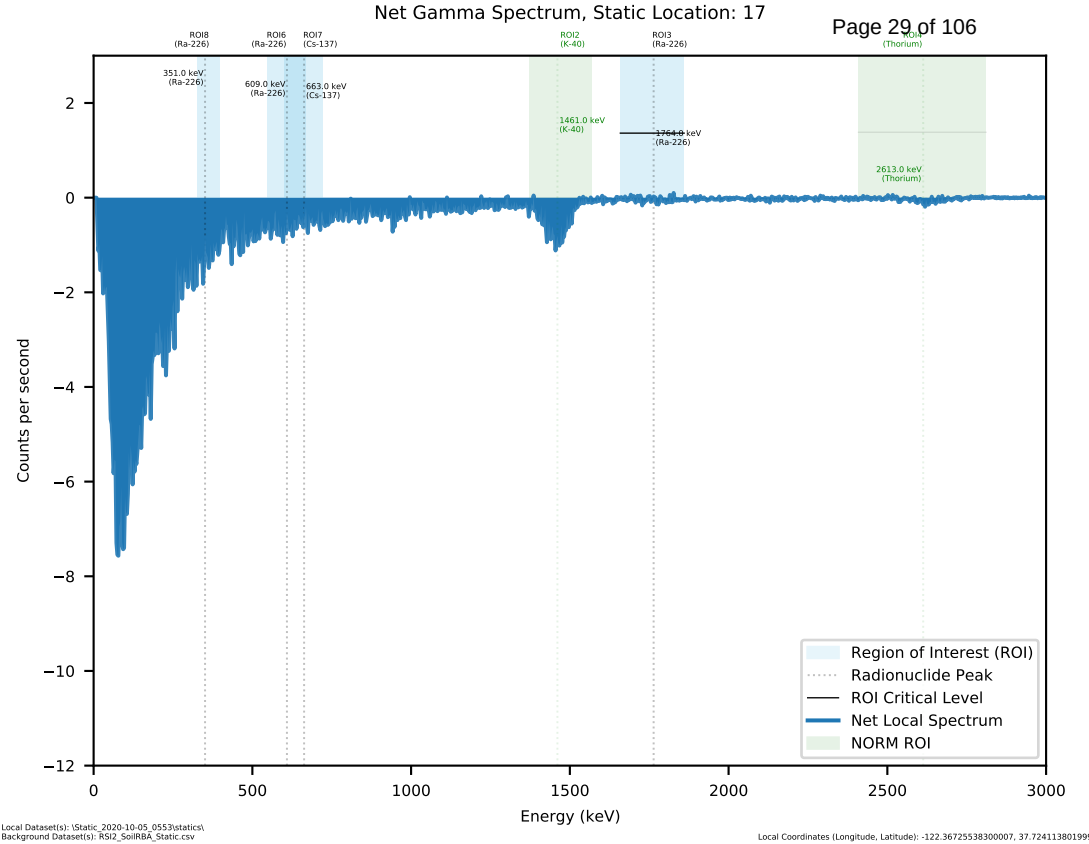

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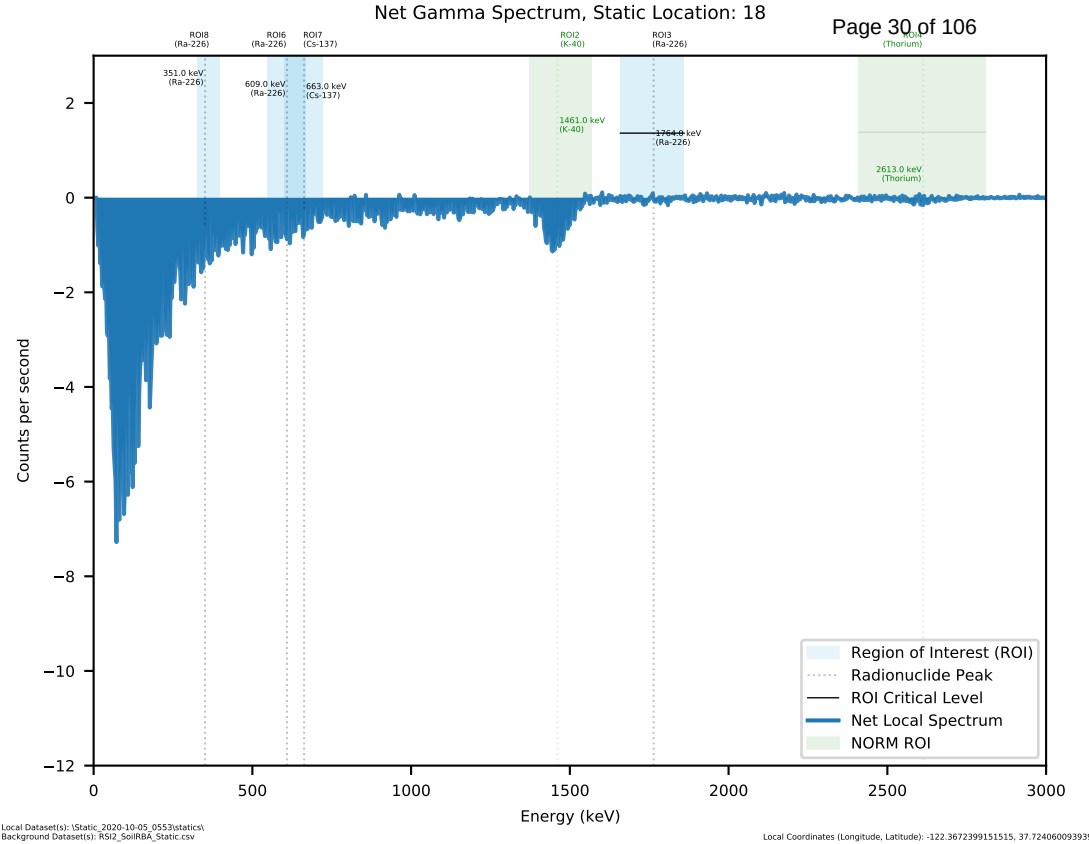

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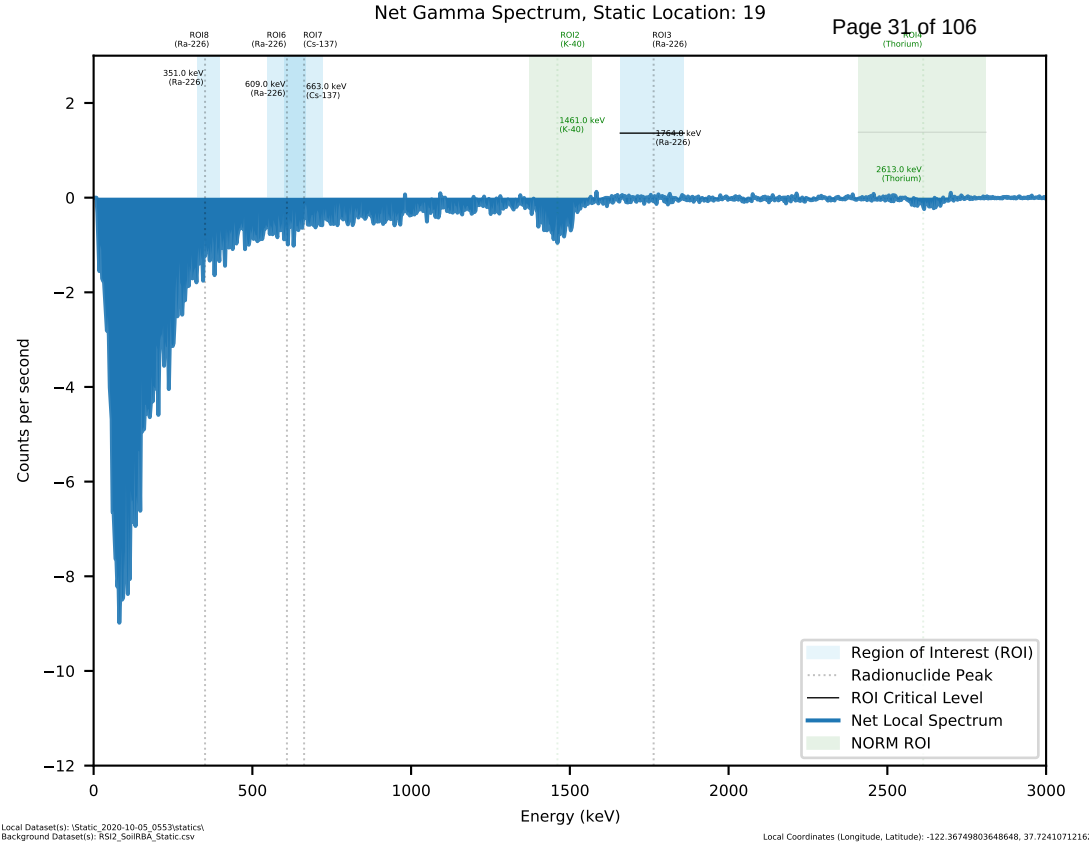

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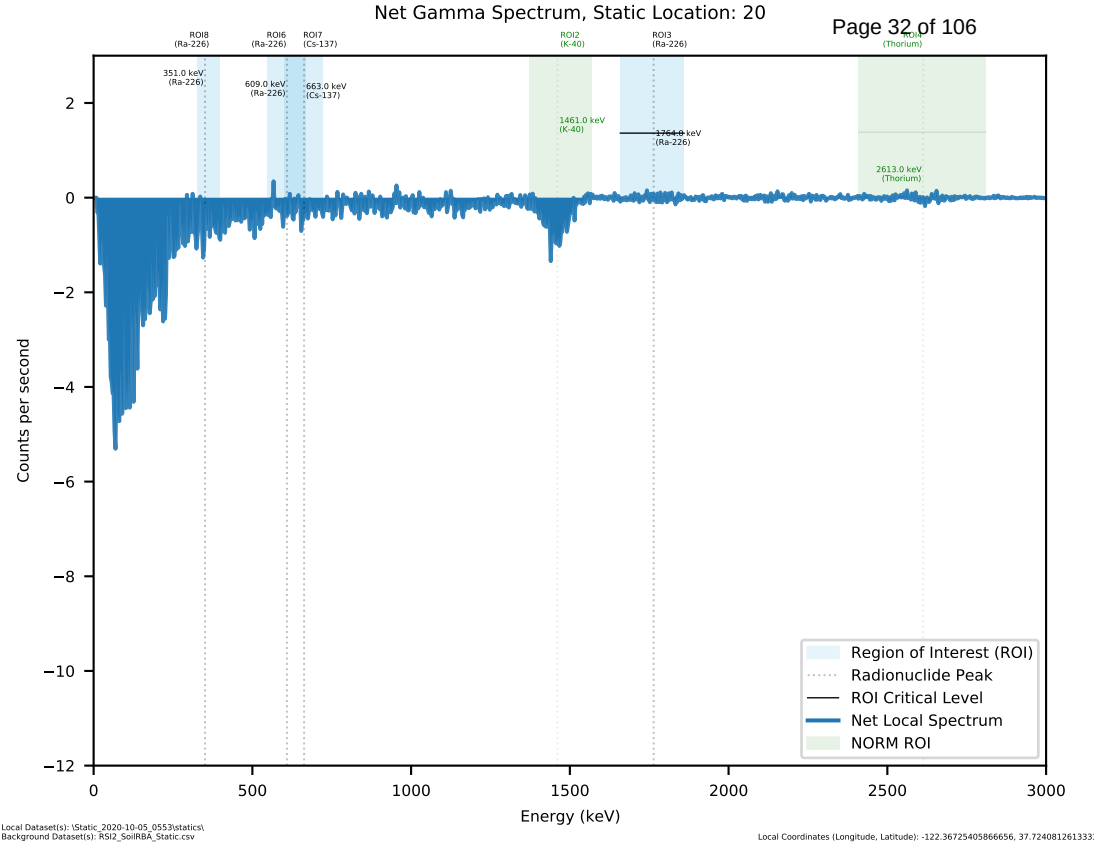

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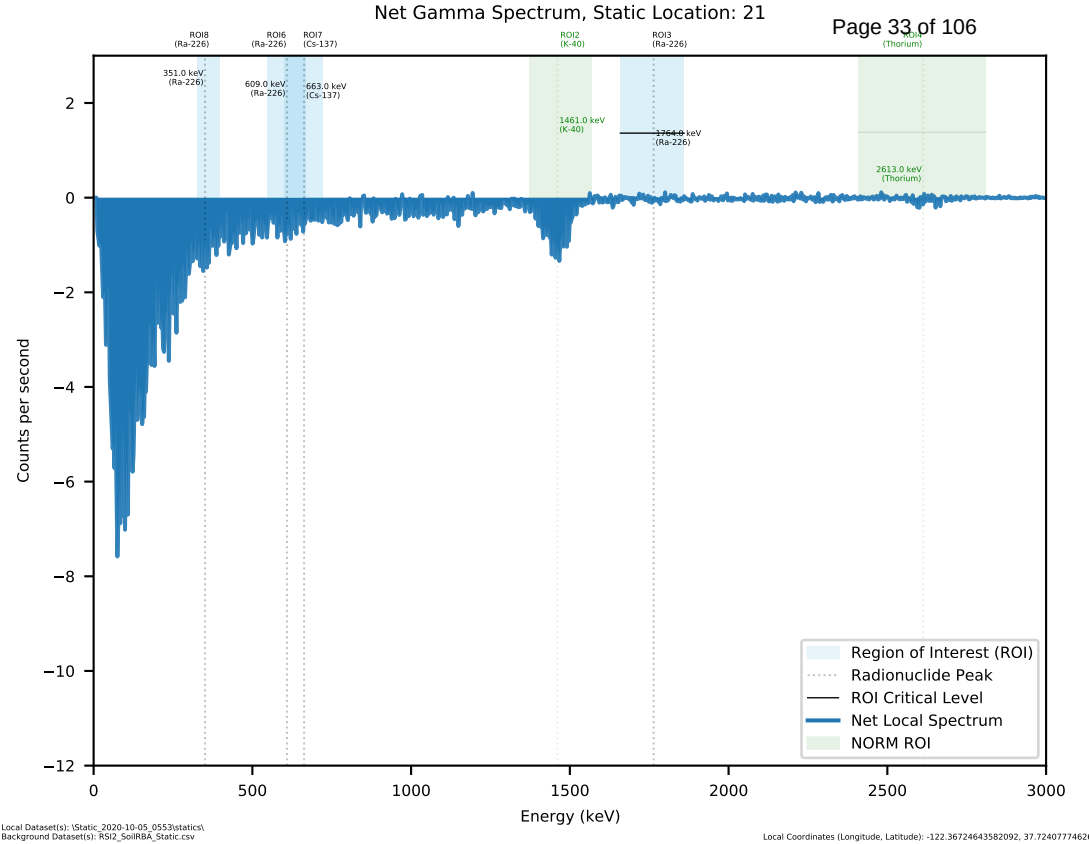

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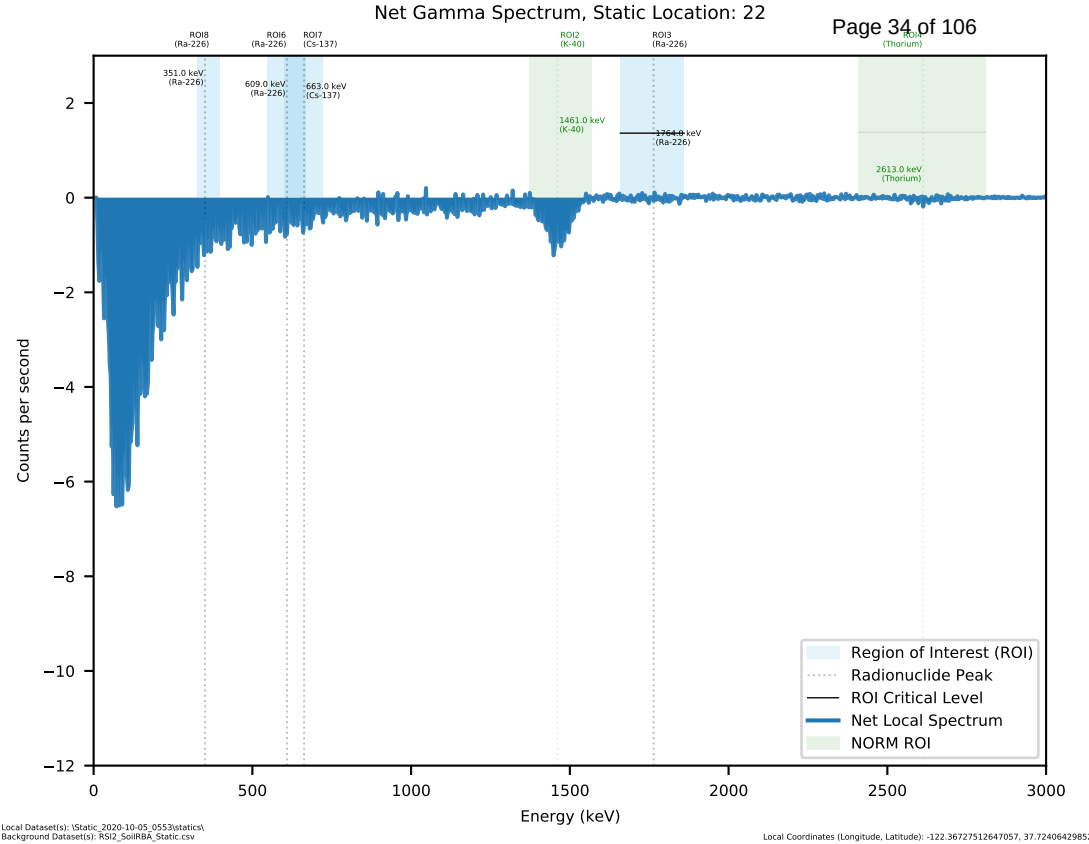

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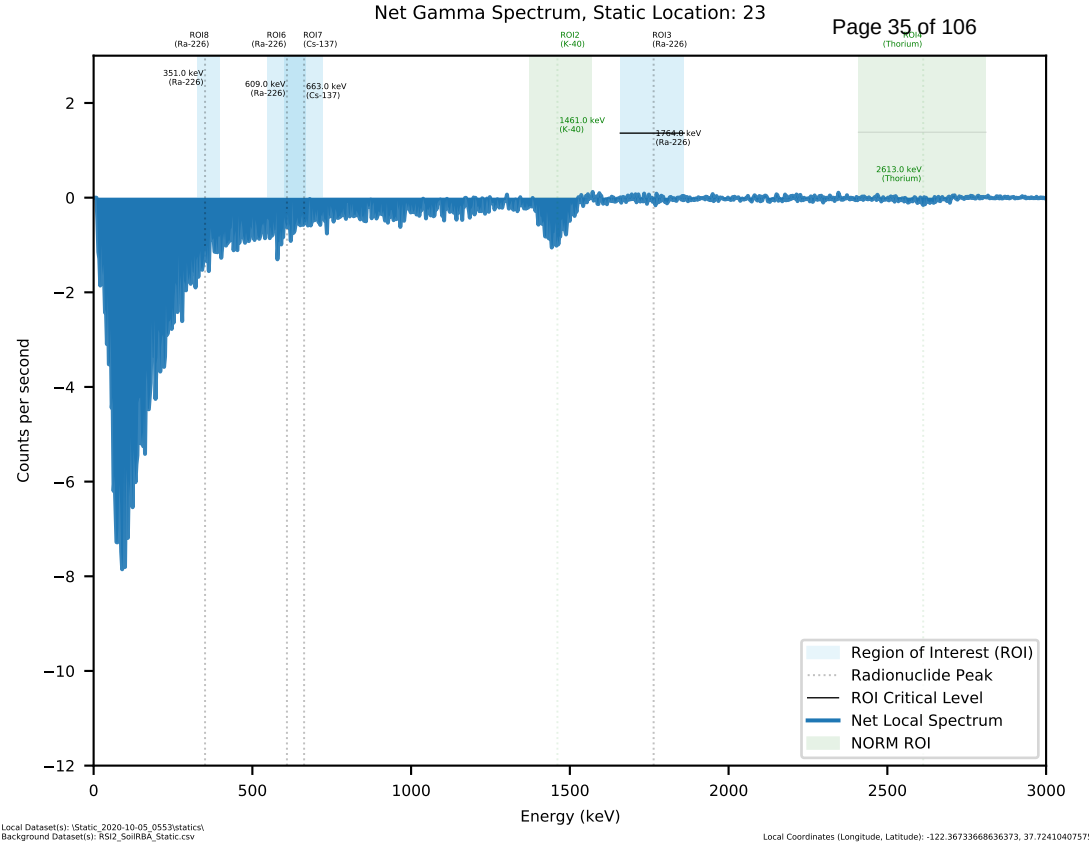

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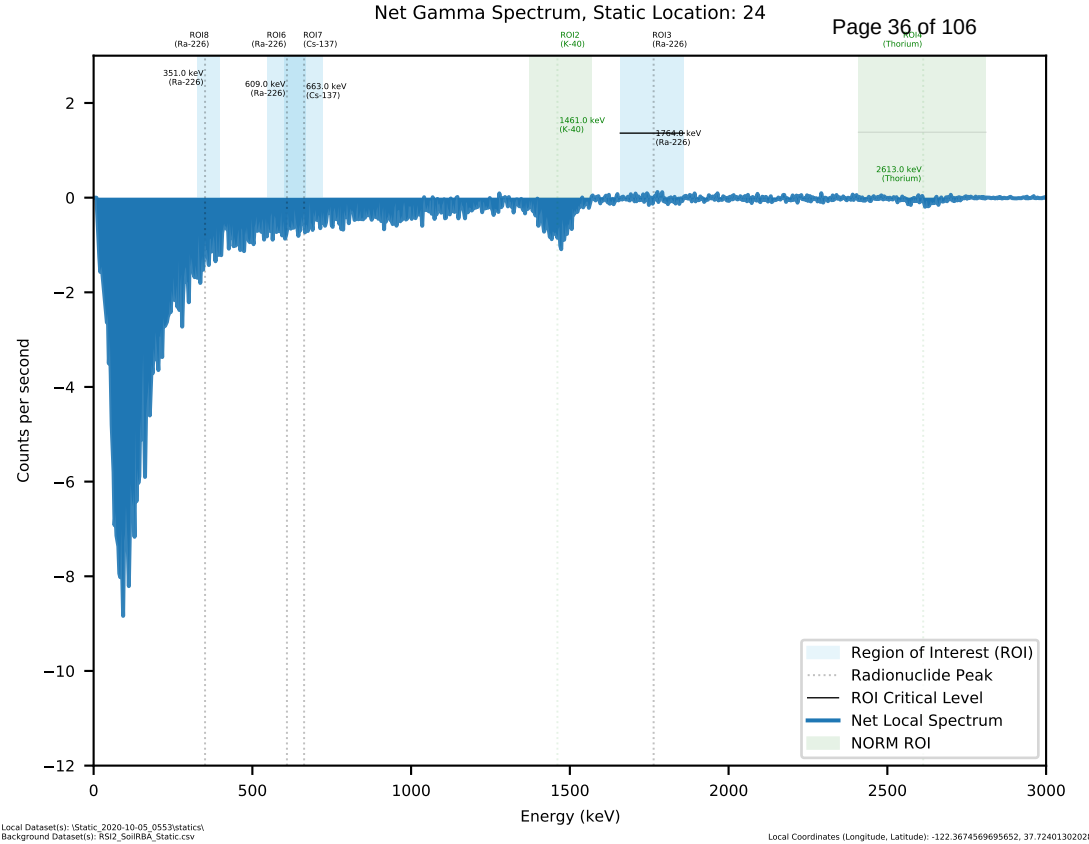

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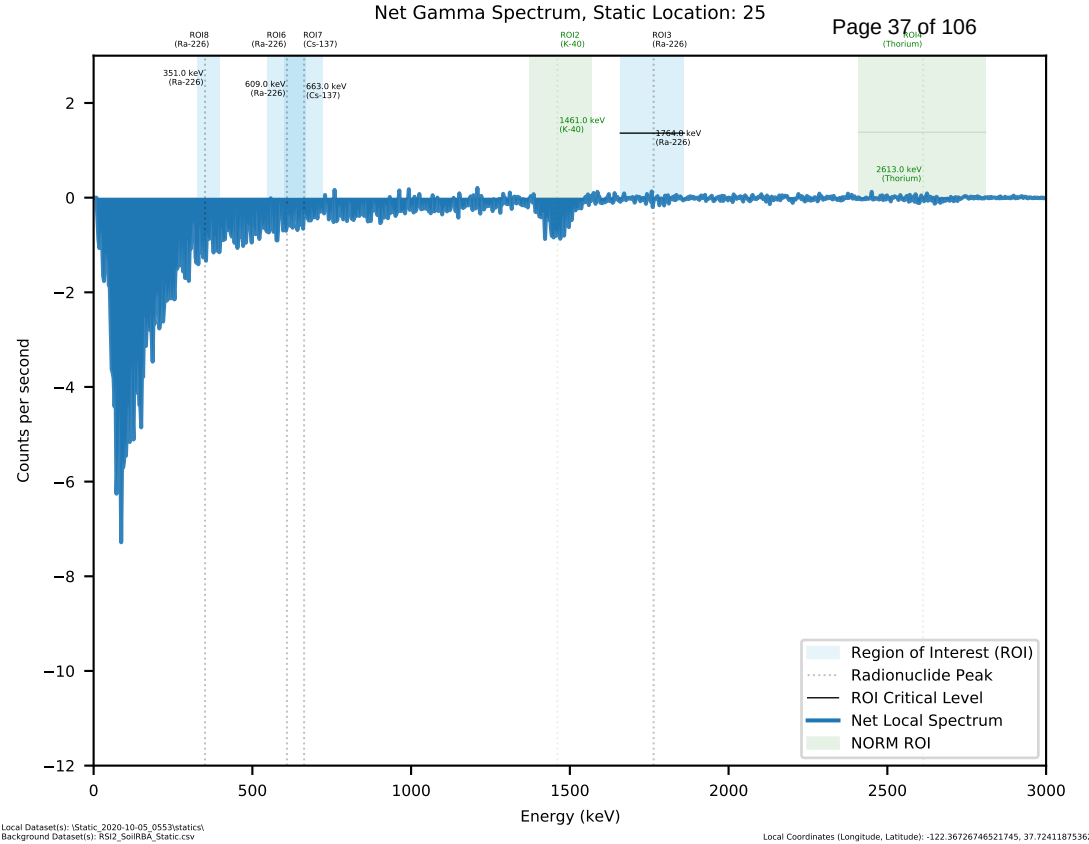

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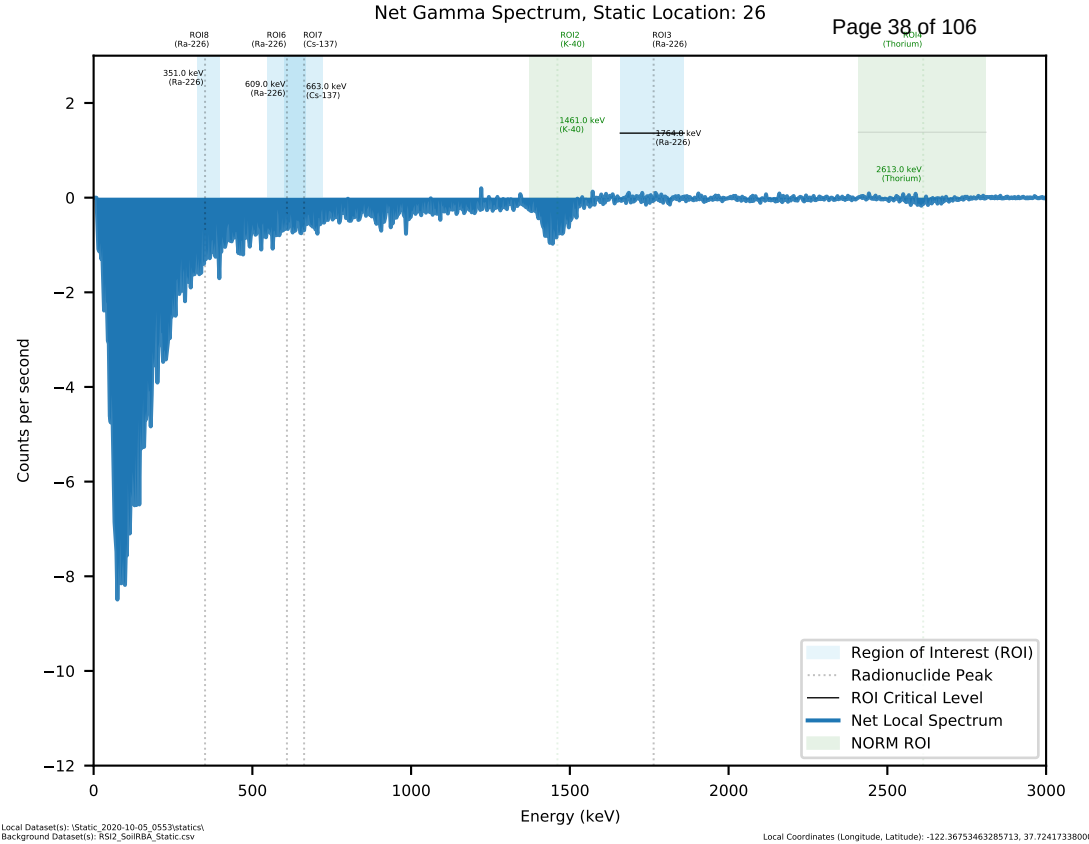

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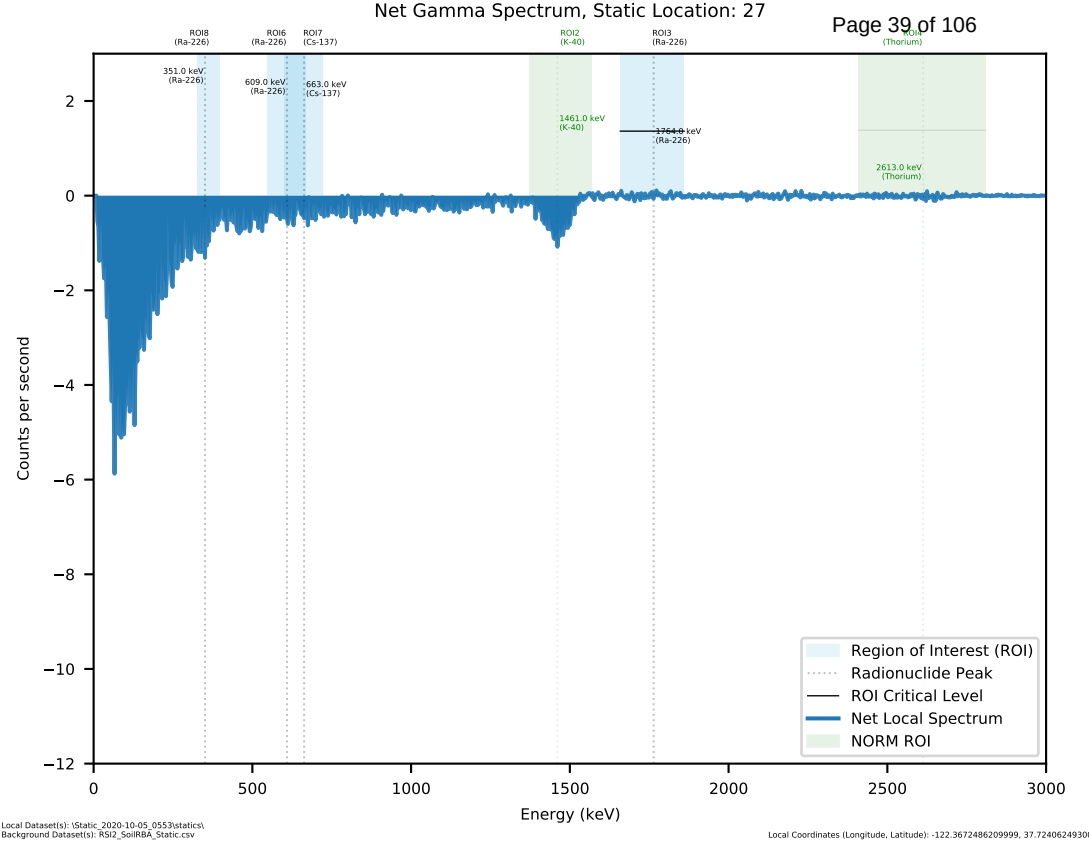

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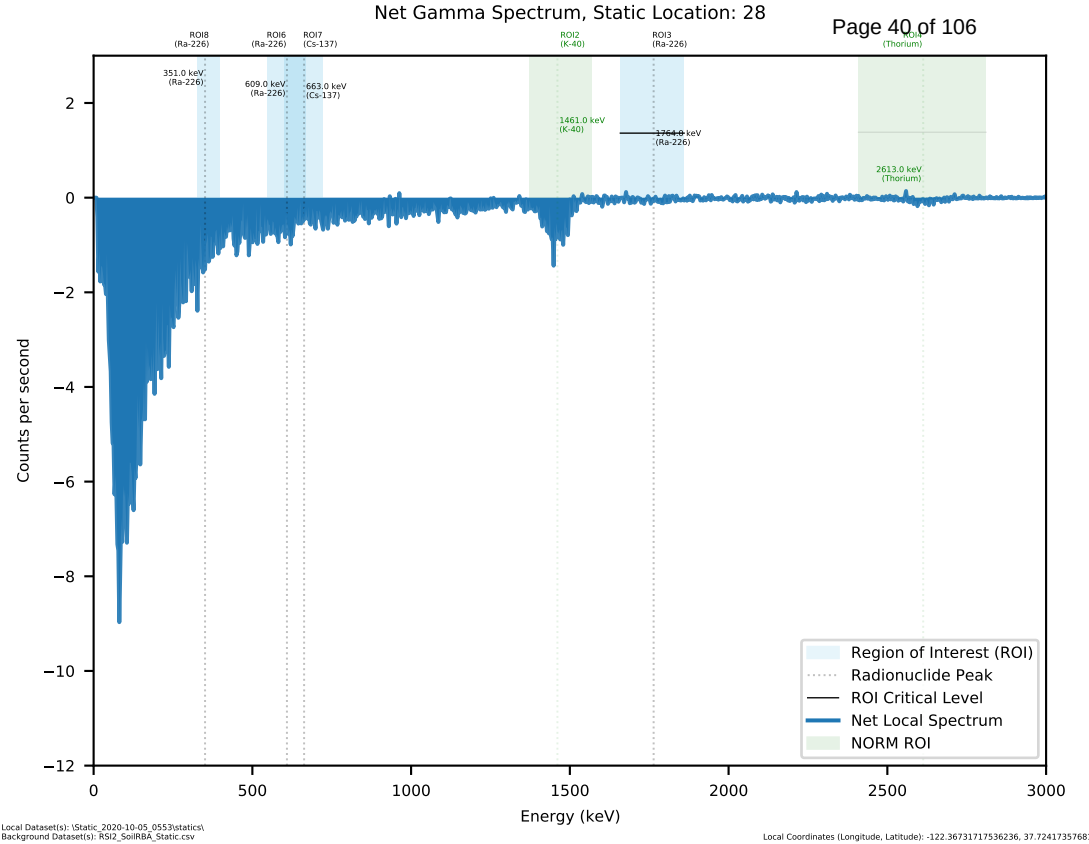

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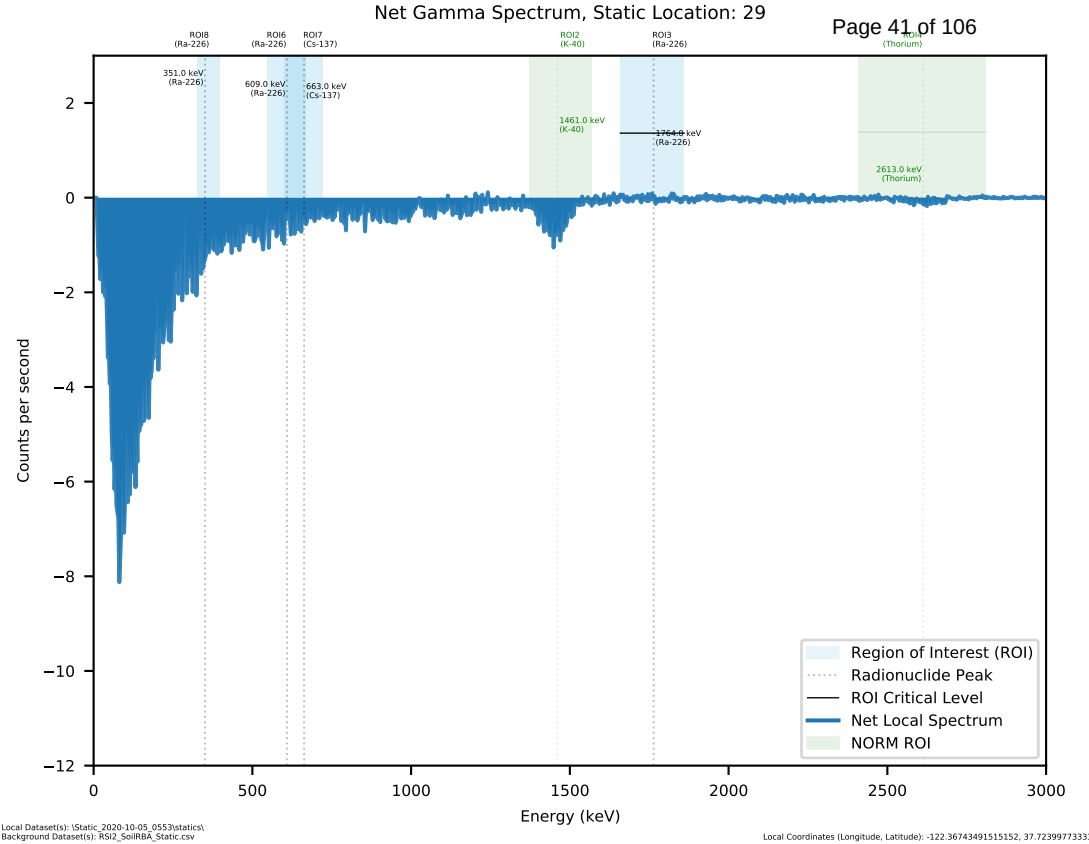

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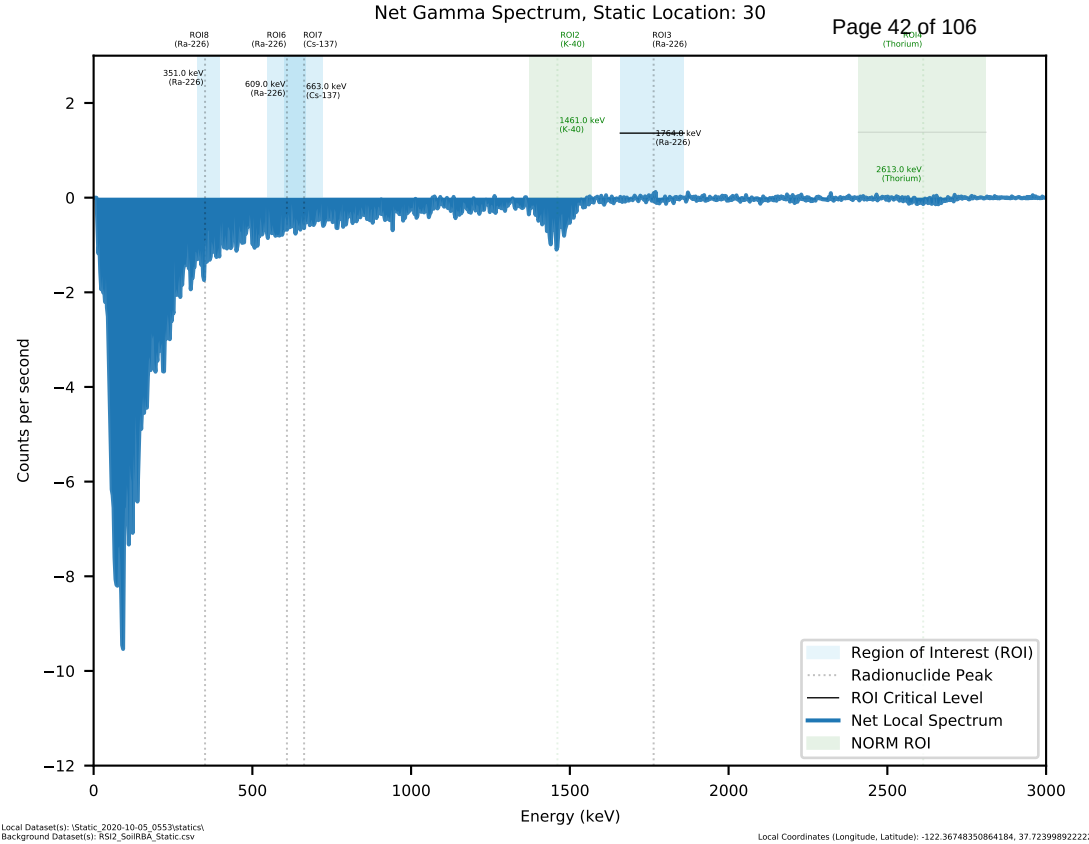

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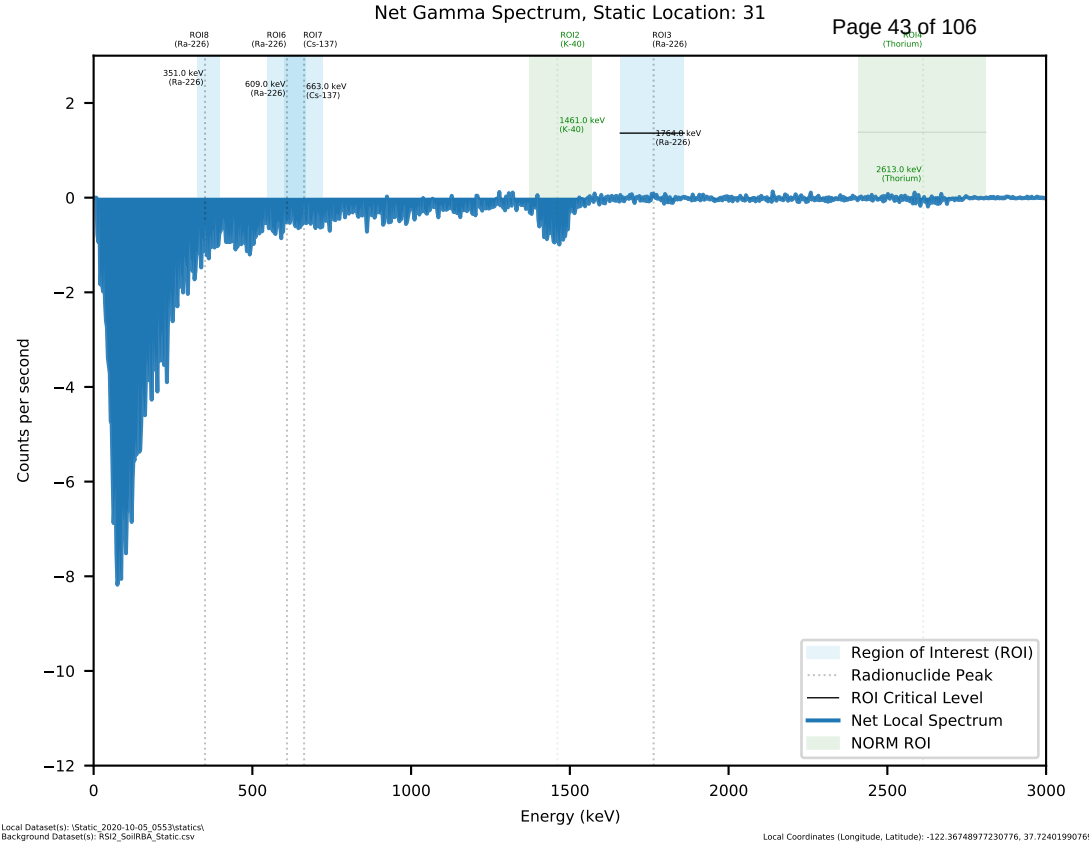

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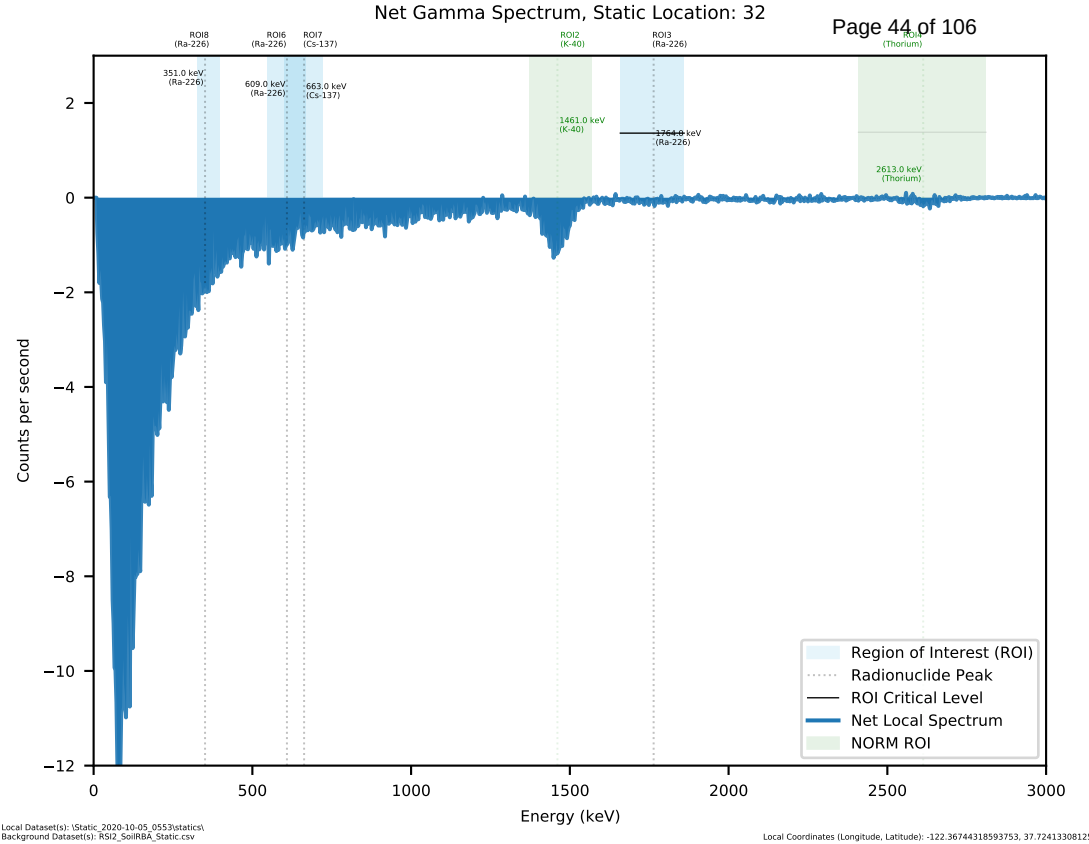

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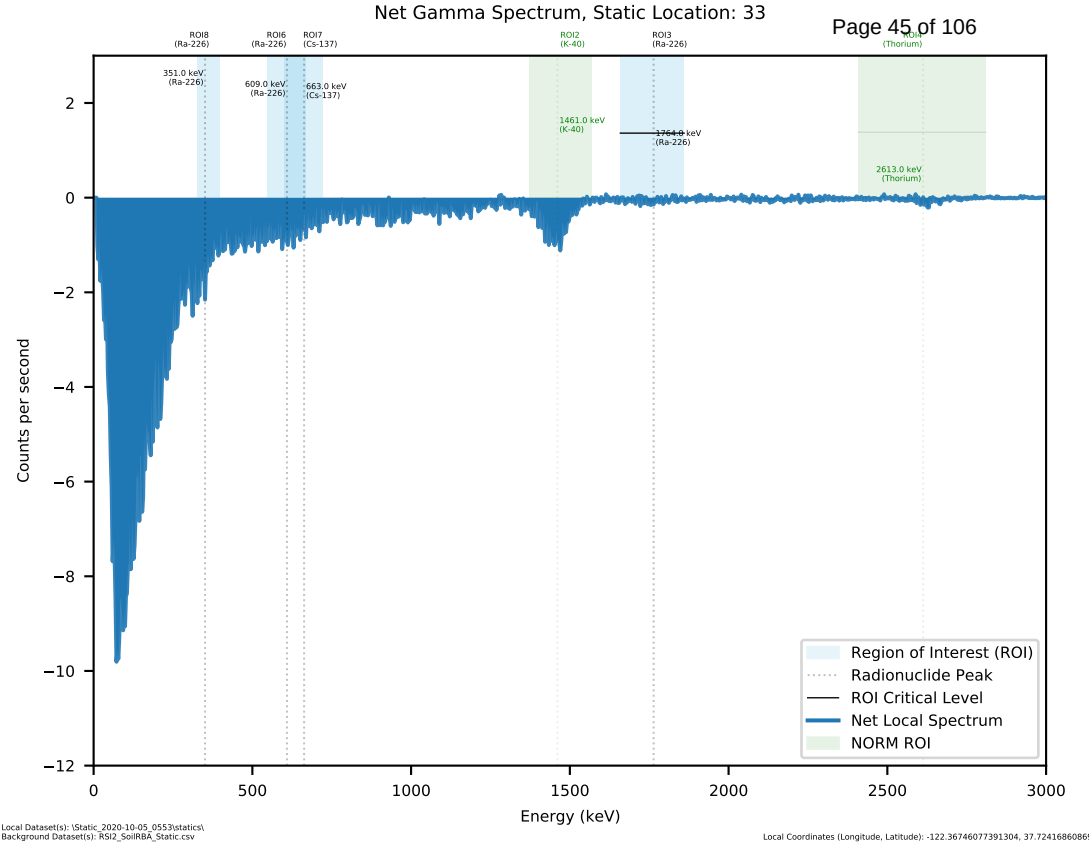

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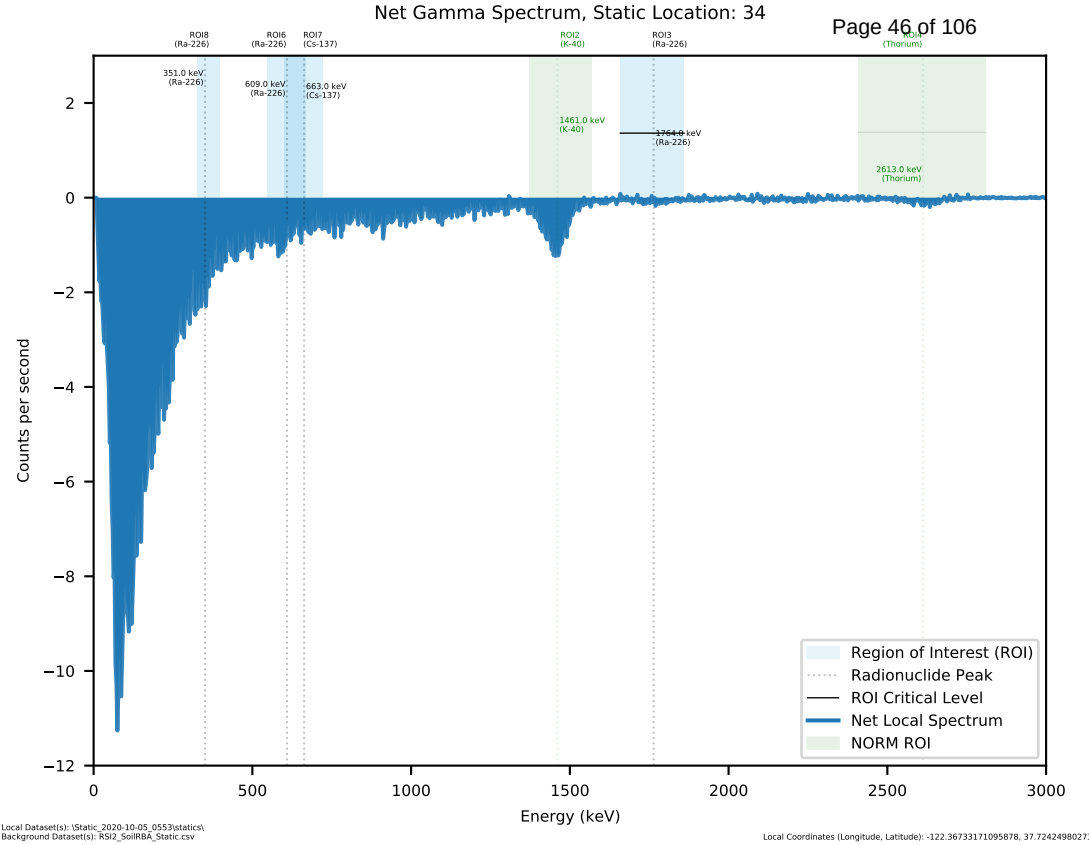

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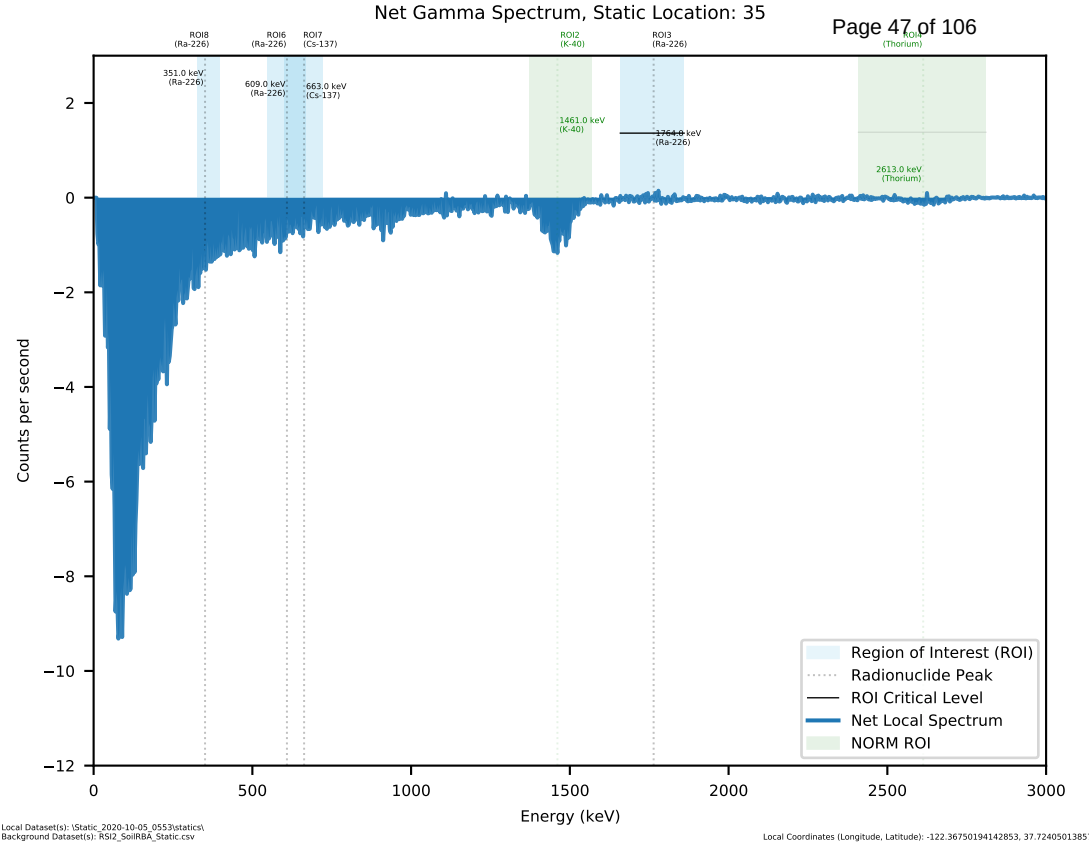

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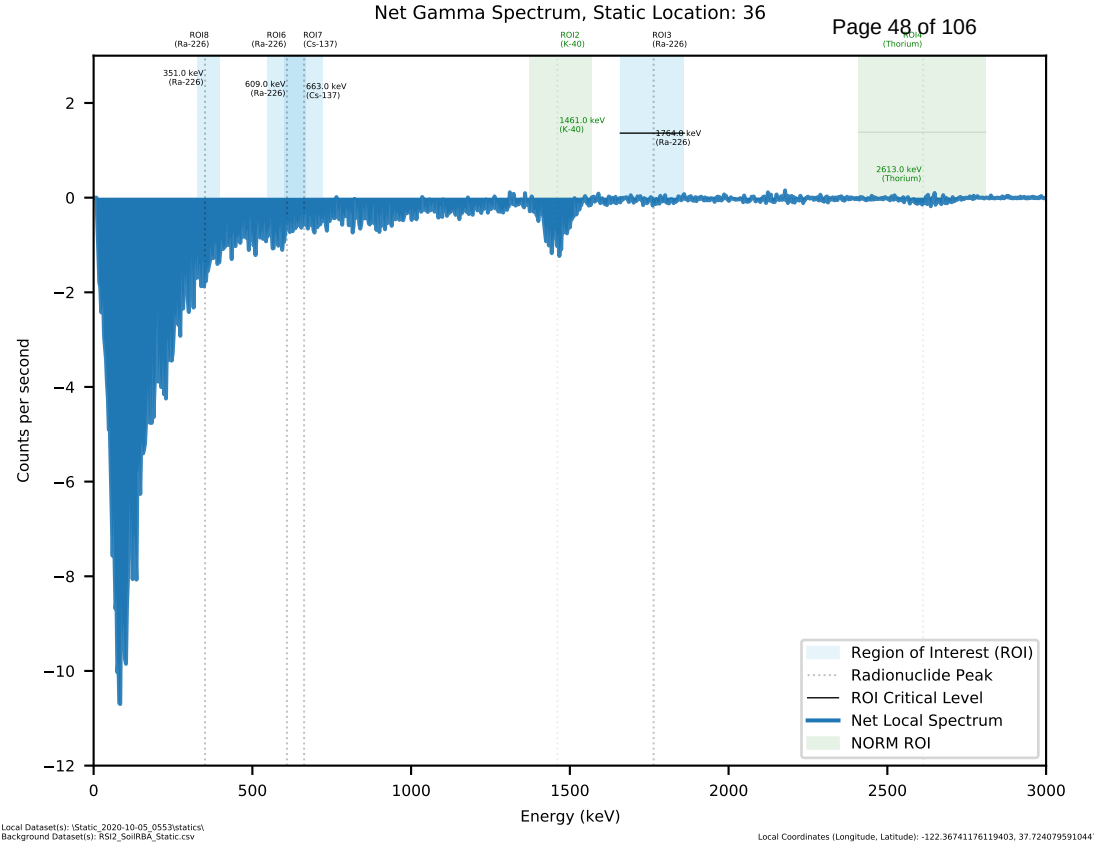

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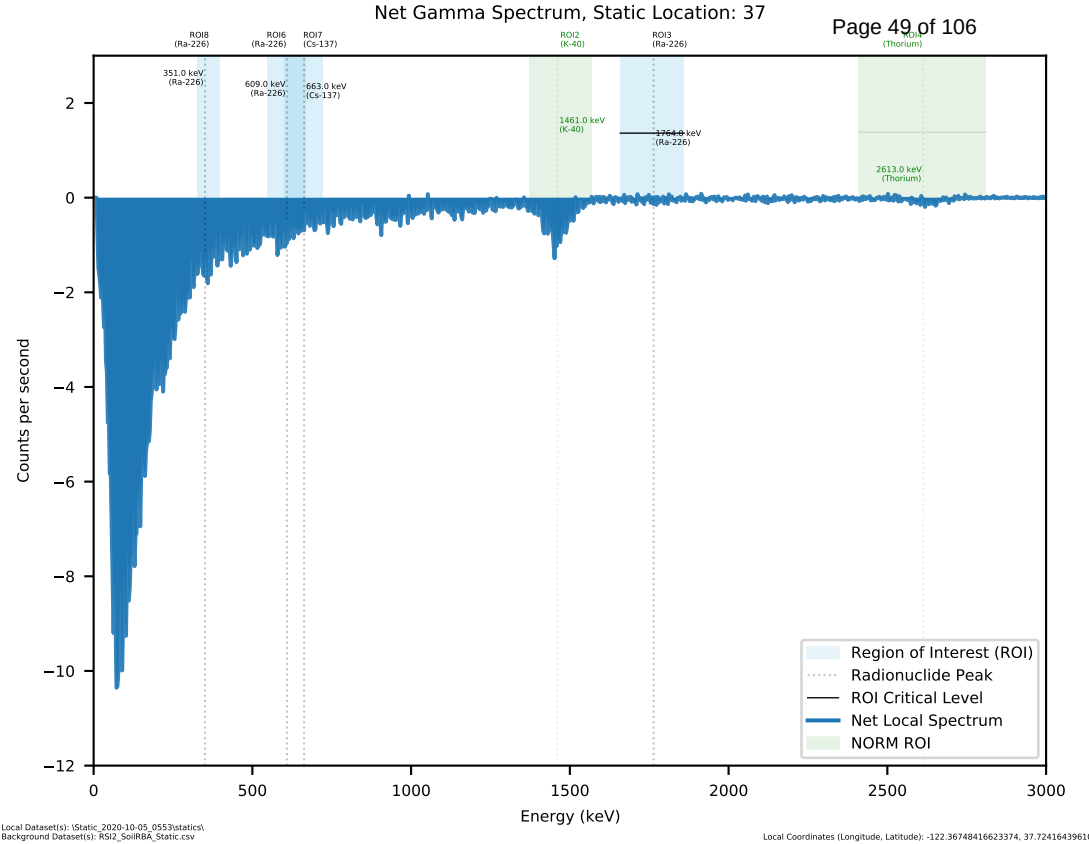

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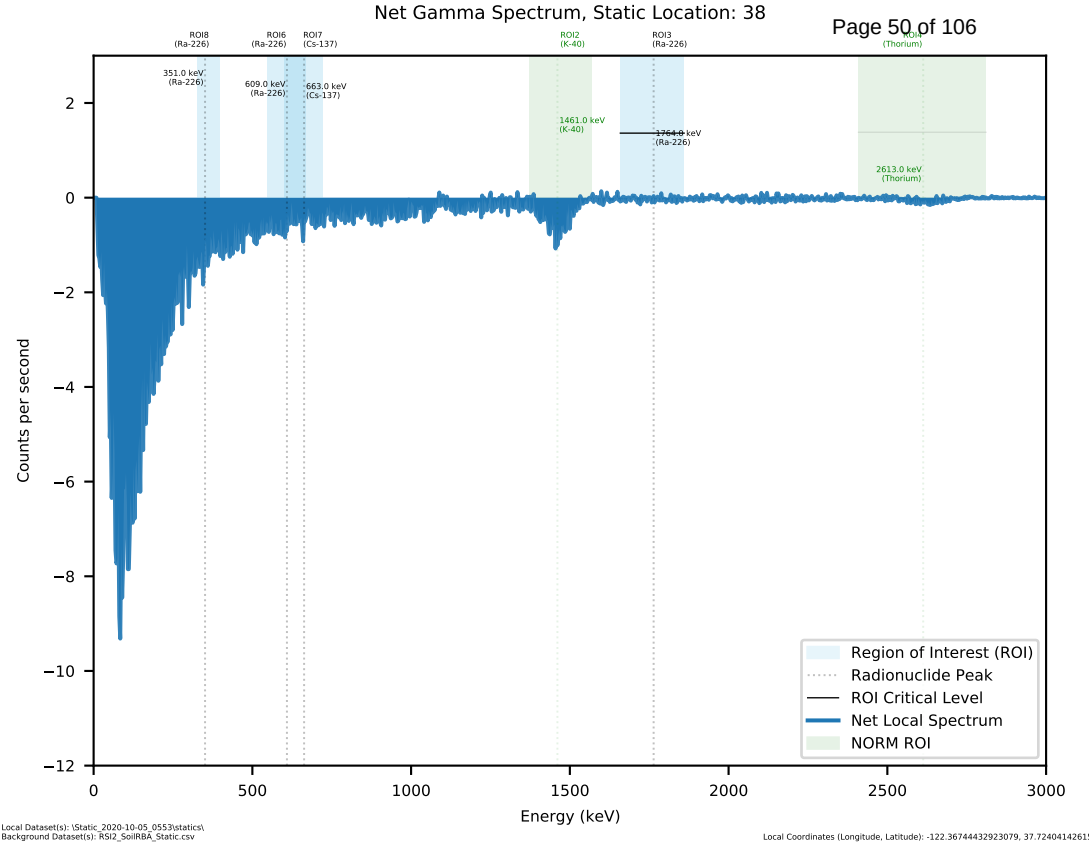

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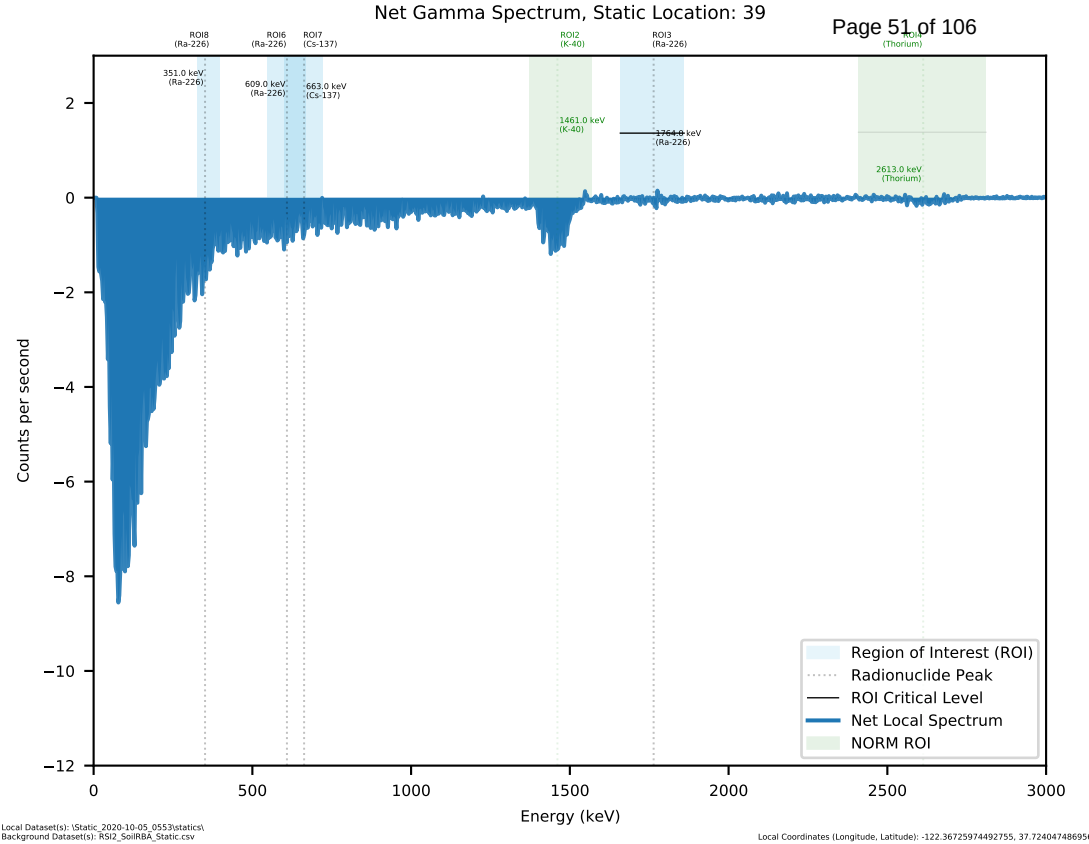

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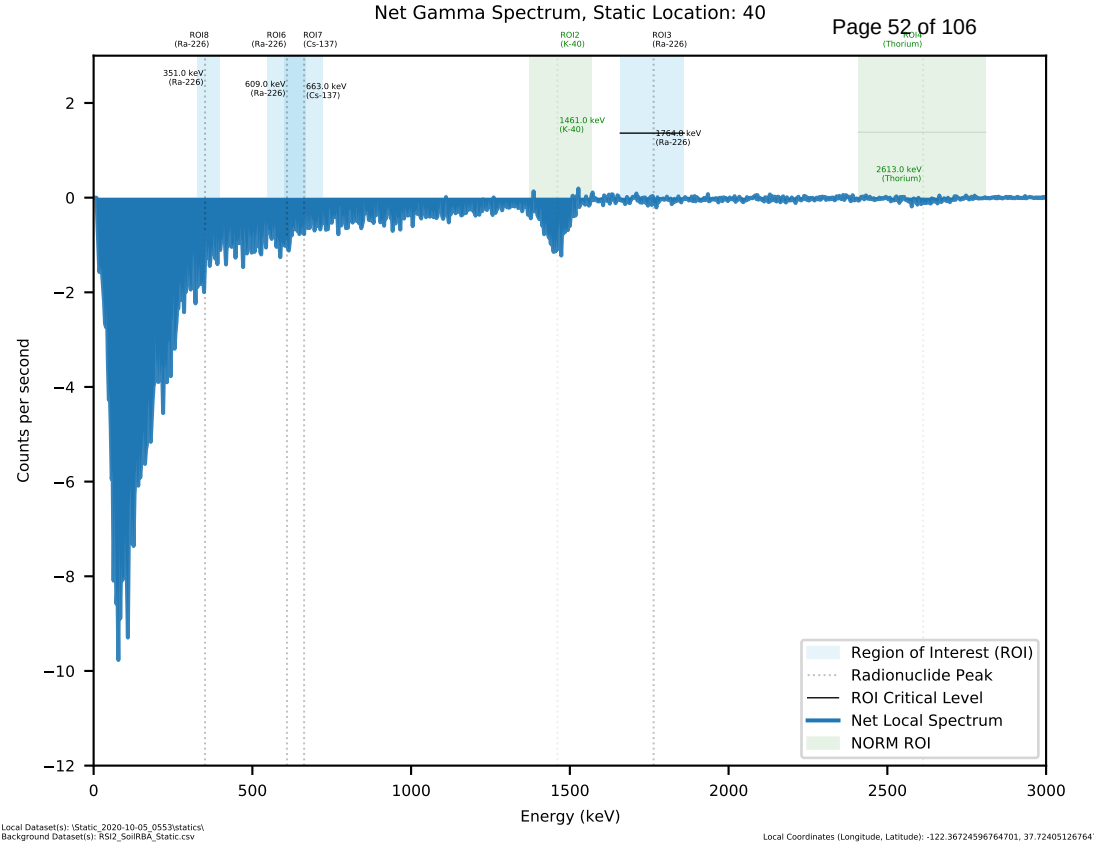

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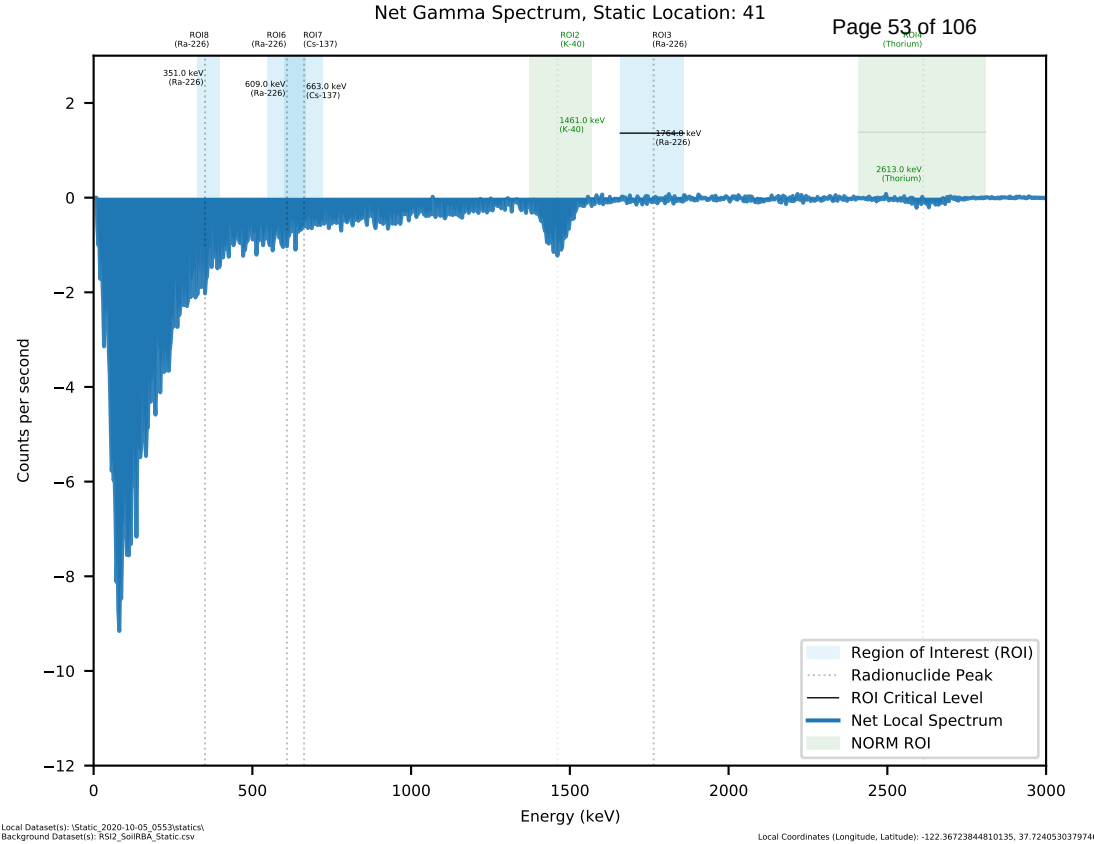

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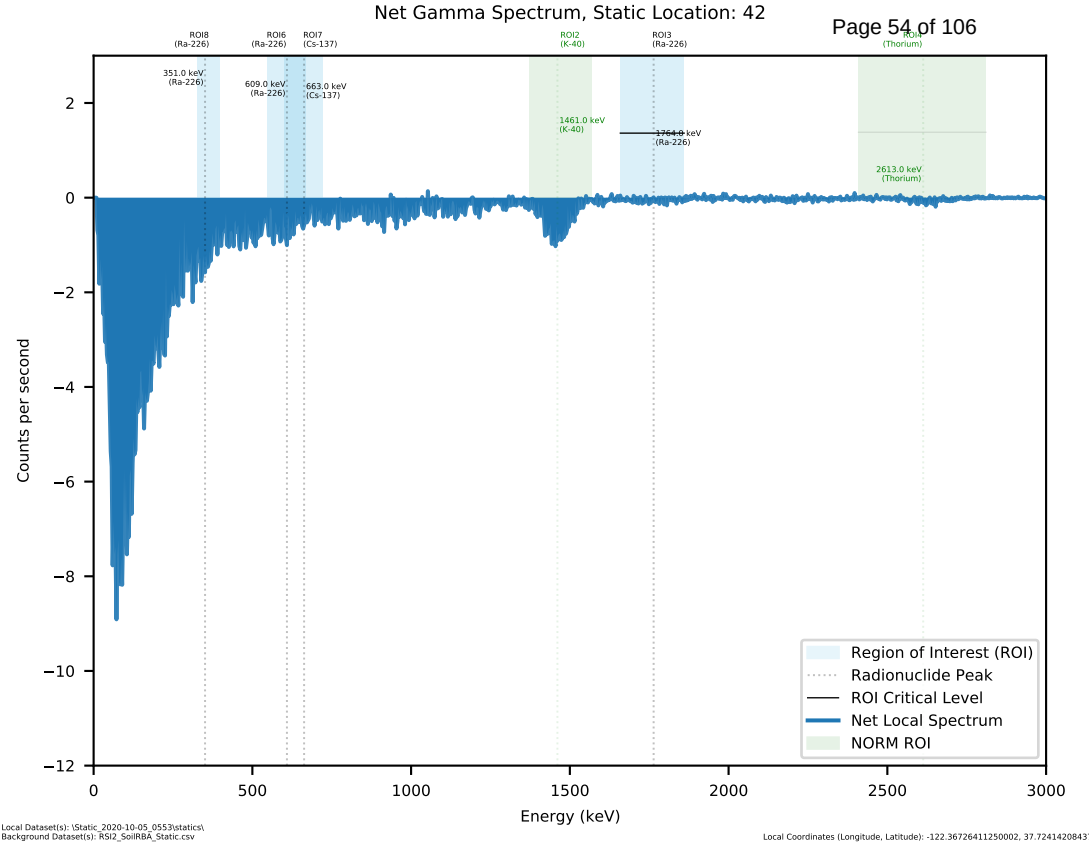

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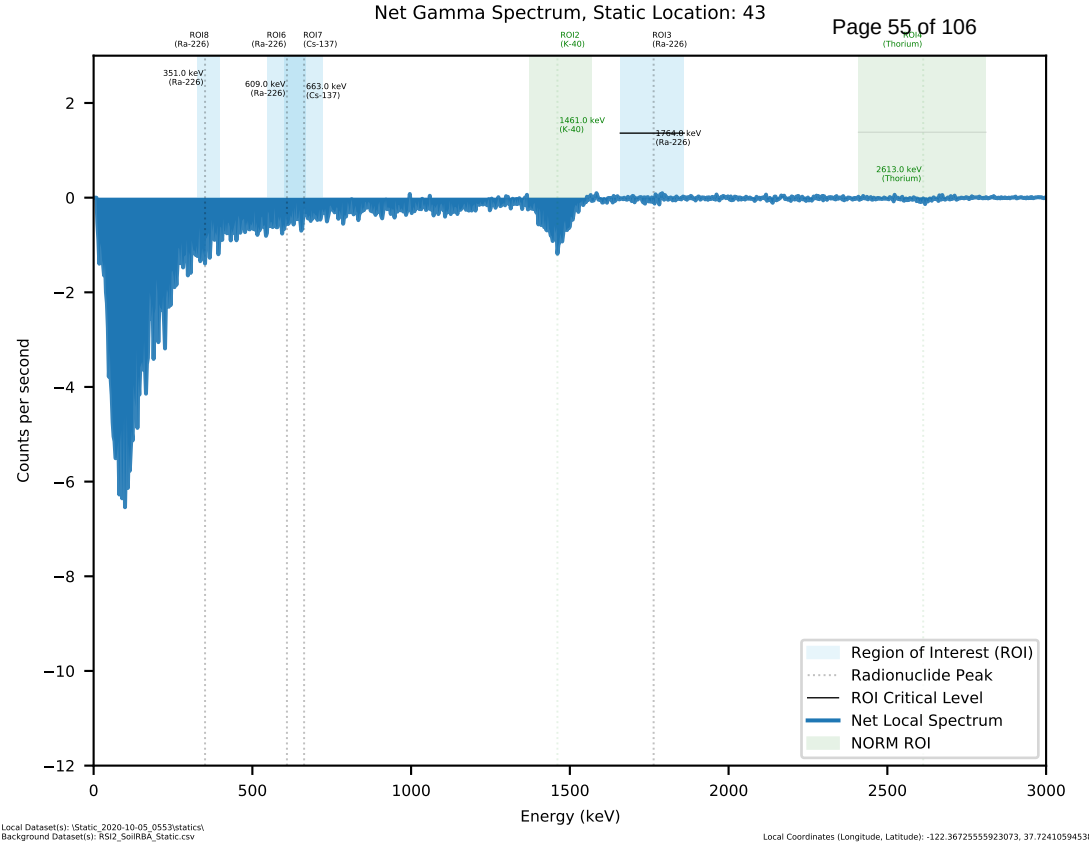

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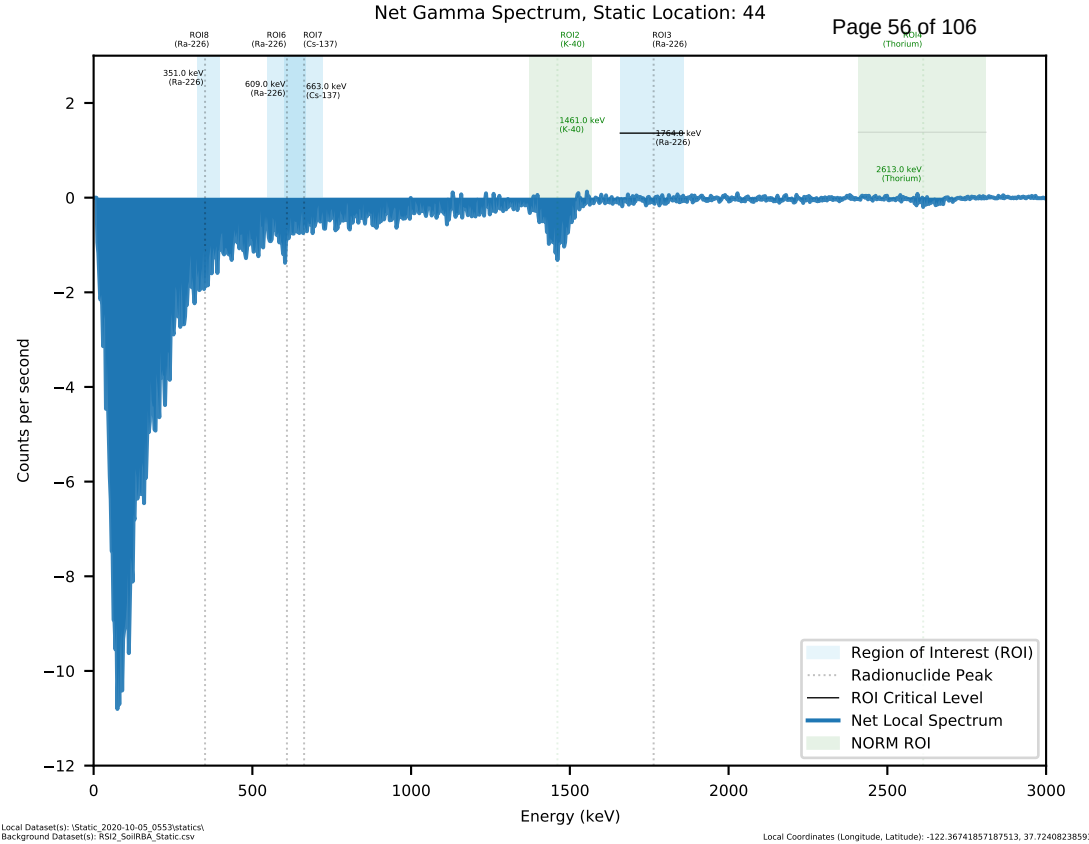

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Background Dataset(s): RSI2_SoilRBA_Static.csv

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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: 160-39797-1
Laboratory Sample Delivery Group: GJ46599786
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:
11/18/2020 3:27:06 PM

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

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.eurofinsus.com/Env

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.

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Receipt Checklists 10
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QC Association Summary 33
Tracer Carrier Summary 35

Job ID: 160-39797-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-39797-1

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- Added Pa234 to gamma analyte list.

RECEIPT

Job ID: 160-39797-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

The samples were received on 10/07/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.9 C.

TOTAL BETA STRONTIUM (GFPC)
Samples HPPG-ESU-TU098B-001 (160-39797-1), HPPG-ESU-TU098B-011 (160-39797-11), HPPG-ESU-TU098B-021 (160-39797-21) and HPPG-F-005 (160-39797-26) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/12/2020, prepared on 10/20/2020 and analyzed on 11/09/2020.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: HPPG-ESU-TU098B-001 (160-39797-1), HPPG-ESU-TU098B-011 (160-39797-11), HPPG-ESU-TU098B-021 (160-39797-21) and HPPG-F-005 (160-39797-26). The samples contained rocks of varying sizes.

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-TU098B-001 (160-39797-1), HPPG-ESU-TU098B-002 (160-39797-2), HPPG-ESU-TU098B-003 (160-39797-3), HPPG-ESU-TU098B-004 (160-39797-4), HPPG-ESU-TU098B-005 (160-39797-5), HPPG-ESU-TU098B-006 (160-39797-6), HPPG-ESU-TU098B-007 (160-39797-7), HPPG-ESU-TU098B-008 (160-39797-8), HPPG-ESU-TU098B-009 (160-39797-9), HPPG-ESU-TU098B-010 (160-39797-10), HPPG-ESU-TU098B-011 (160-39797-11), HPPG-ESU-TU098B-012 (160-39797-12), HPPG-ESU-TU098B-013 (160-39797-13), HPPG-ESU-TU098B-014 (160-39797-14), HPPG-ESU-TU098B-015 (160-39797-15), HPPG-ESU-TU098B-016 (160-39797-16), HPPG-ESU-TU098B-017 (160-39797-17), HPPG-ESU-TU098B-018 (160-39797-18), HPPG-ESU-TU098B-019 (160-39797-19), HPPG-ESU-TU098B-020 (160-39797-20), HPPG-ESU-TU098B-021 (160-39797-21), HPPG-ESU-TU098B-022 (160-39797-22), HPPG-ESU-TU098B-023 (160-39797-23), HPPG-ESU-TU098B-024 (160-39797-24), HPPG-ESU-TU098B-025 (160-39797-25), HPPG-F-005 (160-39797-26) and HPPG-F-006 (160-39797-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/12/2020, prepared on 10/16/2020 and 10/18/2020 and analyzed on 11/10/2020 and 11/11/2020.

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
Bi-214	Ra-226

Gamma prep batch 485978
The radium-226 detection goal of 0.2 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low

Job ID: 160-39797-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. The radium-226 activity in the sample is below to the DLC and RL. HPPG-ESU-TU098B-024 (160-39797-24) and HPPG-F-005 (160-39797-26)

The method blank (MB) z-score associated with Prep Batch 160-485978 is within limits and is stored in the level IV raw data. (MB 160-485978/1-A)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Th-234/U-238: HPPG-ESU-TU098B-021 (160-39797-21). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

Gamma prep batch 485999
The method blank (MB) z-score associated with Prep Batch 160-485999 is within limits and is stored in the level IV raw data. (MB 160-485999/1-A)

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. HPPG-ESU-TU098B-002 (160-39797-2), HPPG-ESU-TU098B-004 (160-39797-4) and HPPG-ESU-TU098B-007 (160-39797-7)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Pb-210: HPPG-ESU-TU098B-006 (160-39797-6). 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-005

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): Joaquin Ramirez

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/6/2020
Waybill Number: 4957 0225 2164
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

160-39797 Chain of Custody

Sample ID	Collection Information: Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Analysis Requested: 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-TU098B-001	10/5/2020	12:36	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599786	
HPPG-ESU-TU098B-002	10/5/2020	12:40	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-003	10/5/2020	12:45	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-004	10/5/2020	12:50	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-005	10/5/2020	12:54	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-006	10/5/2020	12:55	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-007	10/5/2020	12:58	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-008	10/5/2020	13:00	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	

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:
Locked Storage (RKillpack)		10/06/2020 12:23	Devin Lewis		10/06/2020 12:23
Devin Lewis		10/06/2020 12:53	Trevor Rizzo		10/06/2020 12:53
Trevor Rizzo		10/06/2020 12:53	SHIPPEDTOLAB		10/7/2020 0919

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

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-005

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): Joaquin Ramirez
Andrew Mum

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/6/2020
Waybill Number: 4957 0325 2164
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-TU098B-009	10/5/2020	13:03	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-010	10/5/2020	13:10	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-011	10/5/2020	13:22	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599786	
HPPG-ESU-TU098B-012	10/5/2020	13:19	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-013	10/5/2020	13:05	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-014	10/5/2020	13:14	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-015	10/5/2020	13:27	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-016	10/5/2020	13:25	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-017	10/5/2020	13:15	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-018	10/5/2020	13:33	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-019	10/5/2020	14:03	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-020	10/5/2020	14:23	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-021	10/5/2020	14:09	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599786	
HPPG-ESU-TU098B-022	10/5/2020	14:30	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	
HPPG-ESU-TU098B-023	10/5/2020	13:36	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-024	10/5/2020	13:52	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	
HPPG-ESU-TU098B-025	10/5/2020	13:39	G	SO	1	16 oz. plastic jar	X						4	GJ46599786	

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Sample Tech(s): Joaquin Ramirez

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/6/2020
Waybill Number: 4967 0225 2164
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-F-005	10/5/2020	12:36	G	SO	1	16 oz. plastic jar	X		X				5	GJ46599786	
HPPG-F-006	10/5/2020	14:30	G	SO	1	16 oz. plastic jar	X						5	GJ46599786	

All Transfers for COC 501197RSY-005

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/05/2020 17:06	Locked Storage (RKillpack)		10/05/2020 17:06
Locked Storage (RKillpack)		10/06/2020 12:23	Devin Lewis		10/06/2020 12:23
Devin Lewis		10/06/2020 12:53	Trevor Rizzo		10/06/2020 12:53
Trevor Rizzo		10/06/2020 12:53	SHIPPEDTOLAB		10/7/2020 0919

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-39797-1
SDG Number: GJ46599786

Login Number: 39797
List Number: 1
Creator: Mazariegos, Leonel A

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: 160-39797-1
SDG: GJ46599786

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: 160-39797-1
SDG: GJ46599786

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: 160-39797-1
SDG: GJ46599786

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-39797-1	HPPG-ESU-TU098B-001	Solid	10/05/20 12:36	10/07/20 09:19	
160-39797-2	HPPG-ESU-TU098B-002	Solid	10/05/20 12:40	10/07/20 09:19	
160-39797-3	HPPG-ESU-TU098B-003	Solid	10/05/20 12:45	10/07/20 09:19	
160-39797-4	HPPG-ESU-TU098B-004	Solid	10/05/20 12:50	10/07/20 09:19	
160-39797-5	HPPG-ESU-TU098B-005	Solid	10/05/20 12:54	10/07/20 09:19	
160-39797-6	HPPG-ESU-TU098B-006	Solid	10/05/20 12:55	10/07/20 09:19	
160-39797-7	HPPG-ESU-TU098B-007	Solid	10/05/20 12:58	10/07/20 09:19	
160-39797-8	HPPG-ESU-TU098B-008	Solid	10/05/20 13:00	10/07/20 09:19	
160-39797-9	HPPG-ESU-TU098B-009	Solid	10/05/20 13:03	10/07/20 09:19	
160-39797-10	HPPG-ESU-TU098B-010	Solid	10/05/20 13:10	10/07/20 09:19	
160-39797-11	HPPG-ESU-TU098B-011	Solid	10/05/20 13:22	10/07/20 09:19	
160-39797-12	HPPG-ESU-TU098B-012	Solid	10/05/20 13:19	10/07/20 09:19	
160-39797-13	HPPG-ESU-TU098B-013	Solid	10/05/20 13:05	10/07/20 09:19	
160-39797-14	HPPG-ESU-TU098B-014	Solid	10/05/20 13:14	10/07/20 09:19	
160-39797-15	HPPG-ESU-TU098B-015	Solid	10/05/20 13:27	10/07/20 09:19	
160-39797-16	HPPG-ESU-TU098B-016	Solid	10/05/20 13:25	10/07/20 09:19	
160-39797-17	HPPG-ESU-TU098B-017	Solid	10/05/20 13:15	10/07/20 09:19	
160-39797-18	HPPG-ESU-TU098B-018	Solid	10/05/20 13:33	10/07/20 09:19	
160-39797-19	HPPG-ESU-TU098B-019	Solid	10/05/20 14:03	10/07/20 09:19	
160-39797-20	HPPG-ESU-TU098B-020	Solid	10/05/20 14:23	10/07/20 09:19	
160-39797-21	HPPG-ESU-TU098B-021	Solid	10/05/20 14:09	10/07/20 09:19	
160-39797-22	HPPG-ESU-TU098B-022	Solid	10/05/20 14:30	10/07/20 09:19	
160-39797-23	HPPG-ESU-TU098B-023	Solid	10/05/20 13:36	10/07/20 09:19	
160-39797-24	HPPG-ESU-TU098B-024	Solid	10/05/20 13:52	10/07/20 09:19	
160-39797-25	HPPG-ESU-TU098B-025	Solid	10/05/20 13:39	10/07/20 09:19	
160-39797-26	HPPG-F-005	Solid	10/05/20 12:36	10/07/20 09:19	
160-39797-27	HPPG-F-006	Solid	10/05/20 14:30	10/07/20 09:19	

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-001

Lab Sample ID: 160-39797-1
Matrix: Solid

Date Collected: 10/05/20 12:36
Date Received: 10/07/20 09:19

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	-0.0124	U	0.0553	0.0553	0.160	0.0465	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*96.9*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*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	-0.217	U	0.522	0.523		0.349	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Actinium 228	**0.289**		0.109	0.113		0.137	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Bismuth-212	-0.0478	U	0.825	0.825		0.676	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Bismuth-214	**0.281**		0.105	0.109		0.0445	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Cesium-137	-0.00123	U	0.0628	0.0628	0.0700	0.0516	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Lead-210	0.649	U	1.13	1.13		0.776	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Lead-212	**0.342**		0.0799	0.0913		0.0410	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Lead-214	**0.312**		0.0877	0.0935		0.0528	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Potassium-40	**7.99**		1.22	1.47		0.261	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Protactinium-231	0.666	U	1.64	1.64		1.32	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Protactinium-234	0.0568	U	0.0944	0.0946		0.241	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Radium-226	**0.281**		0.105	0.109	0.200	0.0445	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Radium-228	**0.289**		0.109	0.113		0.137	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Thallium-208	**0.175**		0.0546	0.0576		0.0189	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Thorium-232	**0.289**		0.109	0.113		0.137	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Thorium-234	**0.836**		0.432	0.442		0.301	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Thorium 228	**0.342**		0.0799	0.0913		0.0410	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Uranium-235	-0.146	U	0.569	0.569		0.465	pCi/g	10/18/20 14:28	11/11/20 13:12	1
Uranium-238	**0.836**		0.432	0.442		0.301	pCi/g	10/18/20 14:28	11/11/20 13:12	1

Client Sample ID: HPPG-ESU-TU098B-002

Lab Sample ID: 160-39797-2
Matrix: Solid

Date Collected: 10/05/20 12:40
Date Received: 10/07/20 09:19

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	0.158	U	0.349	0.350		0.335	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Actinium 228	**0.328**		0.214	0.216		0.0871	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Bismuth-212	-0.449	U	0.958	0.959		0.748	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Bismuth-214	**0.356**		0.127	0.133		0.0548	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Cesium-137	-0.0492	U	0.0613	0.0615	0.0700	0.0721	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Lead-210	-0.399	U	1.28	1.28		0.928	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Lead-212	0.0242	U	0.111	0.111		0.0900	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Lead-214	**0.299**		0.107	0.111		0.0578	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Potassium-40	**6.82**		1.39	1.55		0.260	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Protactinium-231	0.000	U	0.187	0.187		1.93	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Protactinium-234	0.129	U	0.207	0.208		0.154	pCi/g	10/18/20 14:28	11/11/20 13:14	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-002

Lab Sample ID: 160-39797-2
Matrix: Solid
Date Collected: 10/05/20 12:40
Date Received: 10/07/20 09:19

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	**0.356**		0.127	0.133	0.200	0.0548	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Radium-228	**0.328**		0.214	0.216		0.0871	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Thallium-208	**0.145**		0.0486	0.0509		0.00909	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Thorium-232	**0.328**		0.214	0.216		0.0871	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Thorium-234	-0.675	U	0.848	0.851		0.814	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Thorium 228	0.0242	U	0.111	0.111		0.0900	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Uranium-235	-0.0107	U	0.341	0.341		0.259	pCi/g	10/18/20 14:28	11/11/20 13:14	1
Uranium-238	-0.675	U	0.848	0.851		0.814	pCi/g	10/18/20 14:28	11/11/20 13:14	1

Client Sample ID: HPPG-ESU-TU098B-003

Lab Sample ID: 160-39797-3
Matrix: Solid
Date Collected: 10/05/20 12:45
Date Received: 10/07/20 09:19

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	0.0876	U	0.306	0.306		0.262	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Actinium 228	**0.431**		0.170	0.175		0.0795	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Bismuth-212	0.294	U	0.520	0.521		0.399	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Bismuth-214	**0.370**		0.108	0.115		0.0439	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Cesium-137	0.0210	U	0.0477	0.0478	0.0700	0.0374	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Lead-210	0.0118	U	0.988	0.988		0.813	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Lead-212	**0.391**		0.0771	0.0922		0.0382	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Lead-214	**0.426**		0.0812	0.0925		0.0381	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Potassium-40	**8.71**		1.18	1.48		0.244	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Protactinium-231	-0.817	U	2.66	2.66		2.17	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Protactinium-234	0.0745	U	0.226	0.226		0.184	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Radium-226	**0.370**		0.108	0.115	0.200	0.0439	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Radium-228	**0.431**		0.170	0.175		0.0795	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Thallium-208	**0.114**		0.0336	0.0357		0.00687	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Thorium-232	**0.431**		0.170	0.175		0.0795	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Thorium-234	-0.328	U	0.431	0.432		0.790	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Thorium 228	**0.391**		0.0771	0.0922		0.0382	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Uranium-235	-0.0641	U	0.143	0.143		0.394	pCi/g	10/18/20 14:28	11/11/20 14:10	1
Uranium-238	-0.328	U	0.431	0.432		0.790	pCi/g	10/18/20 14:28	11/11/20 14:10	1

Client Sample ID: HPPG-ESU-TU098B-004

Lab Sample ID: 160-39797-4
Matrix: Solid
Date Collected: 10/05/20 12:50
Date Received: 10/07/20 09:19

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	0.154	U	0.500	0.500		0.309	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Actinium 228	**0.596**		0.282	0.288		0.117	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Bismuth-212	-0.479	U	0.979	0.980		0.771	pCi/g	10/18/20 14:28	11/11/20 14:08	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-004

Lab Sample ID: 160-39797-4
Date Collected: 10/05/20 12:50
Matrix: Solid
Date Received: 10/07/20 09:19

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	**0.414**		0.115	0.122		0.0448	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Cesium-137	-0.0573	U	0.0974	0.0976	0.0700	0.0768	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Lead-210	-0.929	U	1.69	1.70		1.43	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Lead-212	**0.534**		0.0931	0.108		0.0351	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Lead-214	**0.478**		0.123	0.132		0.0519	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Potassium-40	**9.74**		1.40	1.71		0.117	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Protactinium-231	0.000	U	0.325	0.325		2.27	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Protactinium-234	0.110	U	0.261	0.261		0.227	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Radium-226	**0.414**		0.115	0.122	0.200	0.0448	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Radium-228	**0.596**		0.282	0.288		0.117	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Thallium-208	**0.231**		0.0621	0.0664		0.0153	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Thorium-232	**0.596**		0.282	0.288		0.117	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Thorium-234	**0.510**		0.540	0.543		0.426	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Thorium 228	**0.534**		0.0931	0.108		0.0351	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Uranium-235	0.000368	U	0.000812	0.000813		0.476	pCi/g	10/18/20 14:28	11/11/20 14:08	1
Uranium-238	**0.510**		0.540	0.543		0.426	pCi/g	10/18/20 14:28	11/11/20 14:08	1

Client Sample ID: HPPG-ESU-TU098B-005

Lab Sample ID: 160-39797-5
Date Collected: 10/05/20 12:54
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.0270	U	0.398	0.398		0.235	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Actinium 228	**0.171**		0.146	0.147		0.0858	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Bismuth-212	0.301	U	0.555	0.556		0.433	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Bismuth-214	**0.288**		0.0767	0.0824		0.0301	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Cesium-137	0.0170	U	0.0460	0.0461	0.0700	0.0366	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Lead-210	0.450	U	0.824	0.826		0.651	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Lead-212	**0.274**		0.0576	0.0676		0.0265	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Lead-214	**0.311**		0.0714	0.0784		0.0387	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Potassium-40	**6.24**		0.901	1.10		0.0758	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Protactinium-231	0.243	U	0.907	0.907		1.44	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Protactinium-234	0.0131	U	0.0227	0.0227		0.176	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Radium-226	**0.288**		0.0767	0.0824	0.200	0.0301	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Radium-228	**0.171**		0.146	0.147		0.0858	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Thallium-208	**0.127**		0.0320	0.0346		0.00469	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Thorium-232	**0.171**		0.146	0.147		0.0858	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Thorium-234	0.269	U	0.602	0.603		0.610	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Thorium 228	**0.274**		0.0576	0.0676		0.0265	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Uranium-235	0.118	U	0.345	0.345		0.281	pCi/g	10/18/20 14:28	11/11/20 14:14	1
Uranium-238	0.269	U	0.602	0.603		0.610	pCi/g	10/18/20 14:28	11/11/20 14:14	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-006

Lab Sample ID: 160-39797-6
Date Collected: 10/05/20 12:55
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.257	U	0.429	0.430		0.280	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Actinium 228	**0.233**		0.183	0.185		0.120	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Bismuth-212	0.337	U	0.662	0.663		0.512	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Bismuth-214	0.149	U	0.0859	0.0873		0.166	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Cesium-137	-0.0164	U	0.0491	0.0491	0.0700	0.0386	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Lead-210	-2.08	U	1.23	1.25		1.60	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Lead-212	**0.357**		0.0827	0.0947		0.0409	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Lead-214	**0.432**		0.104	0.113		0.0520	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Potassium-40	**6.24**		1.13	1.30		0.279	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Protactinium-231	0.000	U	0.643	0.643		2.03	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Protactinium-234	0.0868	U	0.194	0.194		0.171	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Radium-226	0.149	U	0.0859	0.0873	0.200	0.166	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Radium-228	**0.233**		0.183	0.185		0.120	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Thallium-208	**0.148**		0.0543	0.0564		0.0221	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Thorium-232	**0.233**		0.183	0.185		0.120	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Thorium-234	**0.505**		0.575	0.578		0.446	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Thorium 228	**0.357**		0.0827	0.0947		0.0409	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Uranium-235	0.145	U	0.317	0.317		0.235	pCi/g	10/18/20 14:28	11/11/20 14:13	1
Uranium-238	**0.505**		0.575	0.578		0.446	pCi/g	10/18/20 14:28	11/11/20 14:13	1

Client Sample ID: HPPG-ESU-TU098B-007

Lab Sample ID: 160-39797-7
Date Collected: 10/05/20 12:58
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.589	0.589		0.357	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Actinium 228	0.103	U	0.239	0.239		0.171	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Bismuth-212	0.000	U	0.400	0.400		0.670	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Bismuth-214	**0.373**		0.134	0.139		0.0571	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Cesium-137	-0.0274	U	0.0561	0.0562	0.0700	0.0708	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Lead-210	**0.729**		0.993	0.996		0.631	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Lead-212	**0.304**		0.0813	0.0903		0.0379	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Lead-214	**0.313**		0.122	0.127		0.0588	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Potassium-40	**5.72**		1.29	1.42		0.264	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Protactinium-231	0.000	U	0.381	0.381		2.01	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Protactinium-234	-0.0142	U	0.221	0.221		0.148	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Radium-226	**0.373**		0.134	0.139	0.200	0.0571	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Radium-228	0.103	U	0.239	0.239		0.171	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Thallium-208	**0.139**		0.0560	0.0578		0.0182	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Thorium-232	0.103	U	0.239	0.239		0.171	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Thorium-234	-0.0818	U	0.707	0.707		0.479	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Thorium 228	**0.304**		0.0813	0.0903		0.0379	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Uranium-235	0.136	U	0.265	0.266		0.221	pCi/g	10/18/20 14:28	11/11/20 14:31	1
Uranium-238	-0.0818	U	0.707	0.707		0.479	pCi/g	10/18/20 14:28	11/11/20 14:31	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-008

Lab Sample ID: 160-39797-8
Date Collected: 10/05/20 13:00
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.223	U	0.441	0.442		0.318	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Actinium 228	**0.618**		0.249	0.257		0.0846	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Bismuth-212	0.274	U	0.614	0.615		0.469	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Bismuth-214	**0.411**		0.143	0.149		0.0601	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Cesium-137	0.0285	U	0.0520	0.0521	0.0700	0.0391	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Lead-210	-0.115	U	1.65	1.65		1.36	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Lead-212	**0.394**		0.107	0.118		0.0629	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Lead-214	**0.544**		0.121	0.134		0.0267	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Potassium-40	**7.48**		1.37	1.57		0.147	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Protactinium-231	-0.780	U	3.11	3.11		2.53	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Protactinium-234	-0.123	U	0.325	0.325		0.264	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Radium-226	**0.411**		0.143	0.149	0.200	0.0601	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Radium-228	**0.618**		0.249	0.257		0.0846	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Thallium-208	**0.140**		0.0516	0.0536		0.0172	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Thorium-232	**0.618**		0.249	0.257		0.0846	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Thorium-234	-0.741	U	0.746	0.751		1.07	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Thorium 228	**0.394**		0.107	0.118		0.0629	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Uranium-235	-0.243	U	0.398	0.399		0.501	pCi/g	10/18/20 14:28	11/11/20 14:33	1
Uranium-238	-0.741	U	0.746	0.751		1.07	pCi/g	10/18/20 14:28	11/11/20 14:33	1

Client Sample ID: HPPG-ESU-TU098B-009

Lab Sample ID: 160-39797-9
Date Collected: 10/05/20 13:03
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.454	U	0.863	0.865		0.522	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Actinium 228	**0.738**		0.207	0.224		0.0989	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Bismuth-212	0.365	U	0.937	0.938		0.740	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Bismuth-214	**0.711**		0.160	0.180		0.0497	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Cesium-137	-0.00518	U	0.0496	0.0496	0.0700	0.0507	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Lead-210	-1.67	U	1.87	1.88		1.75	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Lead-212	**0.740**		0.128	0.155		0.0622	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Lead-214	**0.542**		0.152	0.164		0.0735	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Potassium-40	**6.82**		1.46	1.66		0.418	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Protactinium-231	-0.974	U	3.57	3.57		2.91	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Protactinium-234	-0.132	U	0.400	0.400		0.326	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Radium-226	**0.711**		0.160	0.180	0.200	0.0497	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Radium-228	**0.738**		0.207	0.224		0.0989	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Thallium-208	**0.283**		0.0677	0.0751		0.0157	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Thorium-232	**0.738**		0.207	0.224		0.0989	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Thorium-234	0.0969	U	0.672	0.672		0.545	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Thorium 228	**0.740**		0.128	0.155		0.0622	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Uranium-235	0.215	U	0.462	0.463		0.524	pCi/g	10/18/20 14:28	11/11/20 15:41	1
Uranium-238	0.0969	U	0.672	0.672		0.545	pCi/g	10/18/20 14:28	11/11/20 15:41	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-010

Lab Sample ID: 160-39797-10
Date Collected: 10/05/20 13:10
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.146	U	0.320	0.320		0.235	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Actinium 228	**0.321**		0.114	0.119		0.0373	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Bismuth-212	0.327	U	0.521	0.523		0.398	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Bismuth-214	**0.311**		0.0956	0.101		0.0385	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Cesium-137	-0.0163	U	0.0480	0.0481	0.0700	0.0382	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Lead-210	0.448	U	0.998	1.00		0.796	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Lead-212	**0.305**		0.0683	0.0789		0.0347	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Lead-214	**0.313**		0.0857	0.0917		0.0337	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Potassium-40	**7.06**		1.06	1.28		0.238	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Protactinium-231	0.316	U	1.07	1.07		1.66	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Protactinium-234	0.0708	U	0.203	0.203		0.165	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Radium-226	**0.311**		0.0956	0.101	0.200	0.0385	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Radium-228	**0.321**		0.114	0.119		0.0373	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Thallium-208	**0.162**		0.0438	0.0469		0.0124	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Thorium-232	**0.321**		0.114	0.119		0.0373	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Thorium-234	-0.304	U	0.340	0.341		0.782	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Thorium 228	**0.305**		0.0683	0.0789		0.0347	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Uranium-235	0.135	U	0.115	0.116		0.324	pCi/g	10/18/20 14:28	11/11/20 14:43	1
Uranium-238	-0.304	U	0.340	0.341		0.782	pCi/g	10/18/20 14:28	11/11/20 14:43	1

Client Sample ID: HPPG-ESU-TU098B-011

Lab Sample ID: 160-39797-11
Date Collected: 10/05/20 13:22
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.0347	U	0.0525	0.0526	0.160	0.0462	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*94.2*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*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	0.0868	U	0.524	0.524		0.322	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Actinium 228	**0.308**		0.156	0.160		0.112	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Bismuth-212	0.488	U	0.882	0.883		0.688	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Bismuth-214	**0.355**		0.128	0.133		0.0520	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Cesium-137	0.00783	U	0.0635	0.0635	0.0700	0.0517	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Lead-210	0.352	U	1.17	1.17		0.857	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Lead-212	**0.338**		0.0831	0.0903		0.0431	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Lead-214	**0.249**		0.108	0.111		0.0566	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Potassium-40	**6.99**		1.29	1.47		0.275	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Protactinium-231	-0.492	U	2.67	2.67		2.18	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Protactinium-234	-0.0291	U	0.0882	0.0882		0.226	pCi/g	10/18/20 14:28	11/11/20 14:44	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-011

Lab Sample ID: 160-39797-11
Matrix: Solid

Date Collected: 10/05/20 13:22
Date Received: 10/07/20 09:19

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	**0.355**		0.128	0.133	0.200	0.0520	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Radium-228	**0.308**		0.156	0.160		0.112	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Thallium-208	**0.201**		0.0503	0.0543		0.00718	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Thorium-232	**0.308**		0.156	0.160		0.112	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Thorium-234	0.0926	U	0.471	0.471		0.379	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Thorium 228	**0.338**		0.0831	0.0903		0.0431	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Uranium-235	0.00927	U	0.465	0.465		0.383	pCi/g	10/18/20 14:28	11/11/20 14:44	1
Uranium-238	0.0926	U	0.471	0.471		0.379	pCi/g	10/18/20 14:28	11/11/20 14:44	1

Client Sample ID: HPPG-ESU-TU098B-012

Lab Sample ID: 160-39797-12
Matrix: Solid

Date Collected: 10/05/20 13:19
Date Received: 10/07/20 09:19

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	-0.307	U	0.587	0.588		0.340	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Actinium 228	**0.482**		0.135	0.144		0.0457	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Bismuth-212	0.0147	U	0.517	0.517		0.424	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Bismuth-214	**0.402**		0.116	0.123		0.0485	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Cesium-137	0.00485	U	0.0567	0.0567	0.0700	0.0464	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Lead-210	-0.690	U	1.49	1.49		1.20	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Lead-212	**0.493**		0.0741	0.0977		0.0256	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Lead-214	**0.533**		0.0907	0.106		0.0406	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Potassium-40	**8.53**		1.11	1.41		0.0835	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Protactinium-231	-0.639	U	2.25	2.25		1.83	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Protactinium-234	0.0321	U	0.0656	0.0657		0.204	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Radium-226	**0.402**		0.116	0.123	0.200	0.0485	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Radium-228	**0.482**		0.135	0.144		0.0457	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Thallium-208	**0.114**		0.0705	0.0715		0.0316	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Thorium-232	**0.482**		0.135	0.144		0.0457	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Thorium-234	0.214	U	0.439	0.439		0.820	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Thorium 228	**0.493**		0.0741	0.0977		0.0256	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Uranium-235	0.142	U	0.396	0.396		0.322	pCi/g	10/18/20 14:28	11/11/20 14:49	1
Uranium-238	0.214	U	0.439	0.439		0.820	pCi/g	10/18/20 14:28	11/11/20 14:49	1

Client Sample ID: HPPG-ESU-TU098B-013

Lab Sample ID: 160-39797-13
Matrix: Solid

Date Collected: 10/05/20 13:05
Date Received: 10/07/20 09:19

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	U	0.668	0.669		0.407	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Actinium 228	**0.626**		0.216	0.225		0.0427	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Bismuth-212	0.000	U	0.494	0.494		0.678	pCi/g	10/18/20 14:28	11/11/20 15:35	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-013

Lab Sample ID: 160-39797-13
Matrix: Solid
Date Collected: 10/05/20 13:05
Date Received: 10/07/20 09:19

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	**0.298**		0.120	0.124		0.0521	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Cesium-137	0.000646	U	0.0604	0.0604	0.0700	0.0492	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Lead-210	-0.134	U	1.23	1.23		0.885	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Lead-212	**0.433**		0.100	0.115		0.0460	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Lead-214	**0.394**		0.130	0.137		0.0795	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Potassium-40	**6.36**		1.62	1.74		0.492	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Protactinium-231	0.651	U	1.83	1.83		1.46	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Protactinium-234	0.0598	U	0.224	0.224		0.171	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Radium-226	**0.298**		0.120	0.124	0.200	0.0521	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Radium-228	**0.626**		0.216	0.225		0.0427	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Thallium-208	**0.160**		0.0602	0.0624		0.0171	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Thorium-232	**0.626**		0.216	0.225		0.0427	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Thorium-234	0.242	U	0.499	0.500		0.392	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Thorium 228	**0.433**		0.100	0.115		0.0460	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Uranium-235	0.121	U	0.329	0.330		0.279	pCi/g	10/18/20 14:28	11/11/20 15:35	1
Uranium-238	0.242	U	0.499	0.500		0.392	pCi/g	10/18/20 14:28	11/11/20 15:35	1

Client Sample ID: HPPG-ESU-TU098B-014

Lab Sample ID: 160-39797-14
Matrix: Solid
Date Collected: 10/05/20 13:14
Date Received: 10/07/20 09:19

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	-0.333	U	0.630	0.632		0.394	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Actinium 228	**0.447**		0.201	0.206		0.0868	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Bismuth-212	-0.268	U	0.815	0.815		0.650	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Bismuth-214	**0.420**		0.155	0.161		0.0623	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Cesium-137	-0.00653	U	0.0633	0.0633	0.0700	0.0516	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Lead-210	0.668	U	1.25	1.26		0.864	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Lead-212	**0.467**		0.0966	0.114		0.0486	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Lead-214	**0.326**		0.112	0.117		0.0537	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Potassium-40	**7.78**		1.27	1.50		0.287	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Protactinium-231	0.680	U	1.82	1.82		1.99	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Protactinium-234	0.0158	U	0.0448	0.0448		0.256	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Radium-226	**0.420**		0.155	0.161	0.200	0.0623	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Radium-228	**0.447**		0.201	0.206		0.0868	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Thallium-208	**0.174**		0.0552	0.0581		0.0195	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Thorium-232	**0.447**		0.201	0.206		0.0868	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Thorium-234	**0.640**		0.634	0.638		0.446	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Thorium 228	**0.467**		0.0966	0.114		0.0486	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Uranium-235	0.197	U	0.406	0.407		0.373	pCi/g	10/18/20 14:28	11/11/20 14:46	1
Uranium-238	**0.640**		0.634	0.638		0.446	pCi/g	10/18/20 14:28	11/11/20 14:46	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-015

Lab Sample ID: 160-39797-15

Date Collected: 10/05/20 13:27
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.0830	U	0.298	0.298		0.357	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Actinium 228	0.163	U	0.233	0.234		0.183	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Bismuth-212	-0.0540	U	0.741	0.741		0.604	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Bismuth-214	**0.435**		0.145	0.153		0.0579	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Cesium-137	0.0322	U	0.0648	0.0649	0.0700	0.0499	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Lead-210	**1.09**		1.35	1.35		0.908	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Lead-212	**0.384**		0.0985	0.108		0.0531	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Lead-214	**0.360**		0.114	0.122		0.0853	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Potassium-40	**7.37**		1.35	1.59		0.282	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Protactinium-231	0.389	U	1.55	1.55		2.41	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Protactinium-234	0.140	U	0.117	0.118		0.304	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Radium-226	**0.435**		0.145	0.153	0.200	0.0579	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Radium-228	0.163	U	0.233	0.234		0.183	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Thallium-208	**0.178**		0.0690	0.0720		0.0245	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Thorium-232	0.163	U	0.233	0.234		0.183	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Thorium-234	0.209	U	0.517	0.518		0.409	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Thorium 228	**0.384**		0.0985	0.108		0.0531	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Uranium-235	0.243	U	0.482	0.483		0.514	pCi/g	10/18/20 14:28	11/11/20 14:47	1
Uranium-238	0.209	U	0.517	0.518		0.409	pCi/g	10/18/20 14:28	11/11/20 14:47	1

Client Sample ID: HPPG-ESU-TU098B-016

Lab Sample ID: 160-39797-16

Date Collected: 10/05/20 13:25
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.0907	U	0.508	0.508		0.299	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Actinium 228	**0.562**		0.131	0.143		0.0371	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Bismuth-212	-0.152	U	0.635	0.635		0.512	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Bismuth-214	0.0920	U	0.0824	0.0829		0.125	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Cesium-137	0.00734	U	0.0523	0.0523	0.0700	0.0425	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Lead-210	0.464	U	1.01	1.01		0.807	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Lead-212	**0.388**		0.0729	0.0885		0.0336	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Lead-214	**0.311**		0.0823	0.0884		0.0413	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Potassium-40	**7.31**		1.07	1.31		0.237	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Protactinium-231	-0.791	U	2.48	2.48		2.02	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Protactinium-234	0.0948	U	0.178	0.178		0.160	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Radium-226	0.0920	U	0.0824	0.0829	0.200	0.125	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Radium-228	**0.562**		0.131	0.143		0.0371	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Thallium-208	**0.142**		0.0470	0.0493		0.0178	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Thorium-232	**0.562**		0.131	0.143		0.0371	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Thorium-234	-0.286	U	0.401	0.402		0.642	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Thorium 228	**0.388**		0.0729	0.0885		0.0336	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Uranium-235	-0.144	U	0.409	0.409		0.333	pCi/g	10/18/20 14:28	11/11/20 15:37	1
Uranium-238	-0.286	U	0.401	0.402		0.642	pCi/g	10/18/20 14:28	11/11/20 15:37	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-017

Lab Sample ID: 160-39797-17
Matrix: Solid

Date Collected: 10/05/20 13:15
Date Received: 10/07/20 09:19

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	-0.193	U	0.506	0.506		0.294	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Actinium 228	**0.291**		0.182	0.185		0.0819	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Bismuth-212	-0.298	U	0.620	0.621		0.487	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Bismuth-214	**0.290**		0.0856	0.0907		0.0381	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Cesium-137	-0.00160	U	0.0520	0.0520	0.0700	0.0427	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Lead-210	0.356	U	1.01	1.01		0.809	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Lead-212	**0.305**		0.0626	0.0740		0.0277	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Lead-214	**0.319**		0.0880	0.0941		0.0365	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Potassium-40	**6.77**		0.985	1.20		0.0835	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Protactinium-231	0.000	U	0.639	0.639		1.60	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Protactinium-234	0.0545	U	0.213	0.213		0.174	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Radium-226	**0.290**		0.0856	0.0907	0.200	0.0381	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Radium-228	**0.291**		0.182	0.185		0.0819	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Thallium-208	**0.111**		0.0355	0.0374		0.00870	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Thorium-232	**0.291**		0.182	0.185		0.0819	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Thorium-234	0.176	U	0.370	0.371		0.731	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Thorium 228	**0.305**		0.0626	0.0740		0.0277	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Uranium-235	0.0967	U	0.163	0.163		0.109	pCi/g	10/18/20 14:28	11/11/20 15:39	1
Uranium-238	0.176	U	0.370	0.371		0.731	pCi/g	10/18/20 14:28	11/11/20 15:39	1

Client Sample ID: HPPG-ESU-TU098B-018

Lab Sample ID: 160-39797-18
Matrix: Solid

Date Collected: 10/05/20 13:33
Date Received: 10/07/20 09:19

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	-0.346	U	0.610	0.611		0.407	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Actinium 228	**0.404**		0.170	0.175		0.167	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Bismuth-212	0.298	U	0.805	0.805		0.630	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Bismuth-214	**0.507**		0.135	0.145		0.0423	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Cesium-137	-0.0387	U	0.0445	0.0446	0.0700	0.0549	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Lead-210	**1.52**		1.71	1.72		1.06	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Lead-212	**0.412**		0.0925	0.102		0.0448	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Lead-214	**0.507**		0.116	0.127		0.0485	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Potassium-40	**8.54**		1.56	1.78		0.240	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Protactinium-231	0.000	U	0.354	0.354		2.35	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Protactinium-234	-0.0937	U	0.290	0.291		0.236	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Radium-226	**0.507**		0.135	0.145	0.200	0.0423	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Radium-228	**0.404**		0.170	0.175		0.167	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Thallium-208	**0.169**		0.0845	0.0862		0.0389	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Thorium-232	**0.404**		0.170	0.175		0.167	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Thorium-234	-0.314	U	0.686	0.687		0.576	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Thorium 228	**0.412**		0.0925	0.102		0.0448	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Uranium-235	0.0748	U	0.163	0.163		0.422	pCi/g	10/16/20 16:12	11/10/20 12:32	1
Uranium-238	-0.314	U	0.686	0.687		0.576	pCi/g	10/16/20 16:12	11/10/20 12:32	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-019

Lab Sample ID: 160-39797-19

Date Collected: 10/05/20 14:03
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.00651	U	0.0121	0.0122		0.423	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Actinium 228	**0.307**		0.179	0.182		0.128	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Bismuth-212	0.000	U	0.158	0.158		0.521	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Bismuth-214	**0.406**		0.163	0.168		0.0682	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Cesium-137	-0.0276	U	0.0924	0.0924	0.0700	0.0512	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Lead-210	**0.925**		0.977	0.983		0.638	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Lead-212	**0.372**		0.0932	0.105		0.0445	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Lead-214	**0.370**		0.126	0.132		0.0558	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Potassium-40	**7.48**		1.50	1.68		0.277	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Protactinium-231	0.398	U	1.58	1.58		2.13	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Protactinium-234	0.0614	U	0.0752	0.0755		0.182	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Radium-226	**0.406**		0.163	0.168	0.200	0.0682	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Radium-228	**0.307**		0.179	0.182		0.128	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Thallium-208	**0.119**		0.0458	0.0474		0.00968	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Thorium-232	**0.307**		0.179	0.182		0.128	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Thorium-234	-0.107	U	0.573	0.573		0.476	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Thorium 228	**0.372**		0.0932	0.105		0.0445	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Uranium-235	0.115	U	0.286	0.286		0.266	pCi/g	10/16/20 16:12	11/10/20 12:31	1
Uranium-238	-0.107	U	0.573	0.573		0.476	pCi/g	10/16/20 16:12	11/10/20 12:31	1

Client Sample ID: HPPG-ESU-TU098B-020

Lab Sample ID: 160-39797-20

Date Collected: 10/05/20 14:23
Matrix: Solid
Date Received: 10/07/20 09:19

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	**0.335**		0.345	0.347		0.240	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Actinium 228	**0.359**		0.125	0.131		0.0977	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Bismuth-212	0.000	U	0.239	0.239		0.464	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Bismuth-214	**0.390**		0.107	0.115		0.0438	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Cesium-137	-0.0175	U	0.0482	0.0483	0.0700	0.0381	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Lead-210	-0.693	U	1.28	1.29		1.02	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Lead-212	**0.451**		0.0782	0.0976		0.0325	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Lead-214	**0.486**		0.104	0.115		0.0378	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Potassium-40	**7.58**		1.13	1.37		0.255	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Protactinium-231	0.000	U	0.470	0.470		1.82	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Protactinium-234	0.0959	U	0.190	0.190		0.177	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Radium-226	**0.390**		0.107	0.115	0.200	0.0438	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Radium-228	**0.359**		0.125	0.131		0.0977	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Thallium-208	**0.170**		0.0415	0.0451		0.00718	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Thorium-232	**0.359**		0.125	0.131		0.0977	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Thorium-234	0.448	U	0.413	0.416		0.726	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Thorium 228	**0.451**		0.0782	0.0976		0.0325	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Uranium-235	0.0692	U	0.158	0.159		0.323	pCi/g	10/16/20 16:12	11/10/20 12:16	1
Uranium-238	0.448	U	0.413	0.416		0.726	pCi/g	10/16/20 16:12	11/10/20 12:16	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-021

Lab Sample ID: 160-39797-21
Matrix: Solid

Date Collected: 10/05/20 14:09
Date Received: 10/07/20 09:19

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	-0.0168	U	0.0621	0.0621	0.160	0.0523	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*93.4*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*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	0.262	U	0.504	0.505		0.300	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Actinium 228	**0.485**		0.157	0.165		0.0307	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Bismuth-212	0.0287	U	0.727	0.727		0.596	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Bismuth-214	**0.418**		0.149	0.155		0.0669	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Cesium-137	-0.0237	U	0.0690	0.0690	0.0700	0.0548	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Lead-210	**1.22**		1.88	1.89		1.12	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Lead-212	**0.410**		0.0882	0.0980		0.0406	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Lead-214	**0.385**		0.112	0.118		0.0510	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Potassium-40	**7.67**		1.25	1.47		0.119	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Protactinium-231	0.000	U	0.640	0.640		2.27	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Protactinium-234	0.117	U	0.117	0.117		0.230	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Radium-226	**0.418**		0.149	0.155	0.200	0.0669	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Radium-228	**0.485**		0.157	0.165		0.0307	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Thallium-208	**0.102**		0.0658	0.0666		0.0275	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Thorium-232	**0.485**		0.157	0.165		0.0307	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Thorium-234	-0.948	U	0.597	0.606		0.635	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Thorium 228	**0.410**		0.0882	0.0980		0.0406	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Uranium-235	-0.183	U	0.523	0.523		0.425	pCi/g	10/16/20 16:12	11/10/20 13:46	1
Uranium-238	-0.948	U	0.597	0.606		0.635	pCi/g	10/16/20 16:12	11/10/20 13:46	1

Client Sample ID: HPPG-ESU-TU098B-022

Lab Sample ID: 160-39797-22
Matrix: Solid

Date Collected: 10/05/20 14:30
Date Received: 10/07/20 09:19

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	0.107	U	0.239	0.239		0.287	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Actinium 228	**0.500**		0.131	0.140		0.0554	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Bismuth-212	-0.214	U	0.700	0.701		0.561	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Bismuth-214	**0.127**		0.163	0.164		0.126	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Cesium-137	0.0316	U	0.0561	0.0562	0.0700	0.0438	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Lead-210	0.514	U	1.12	1.12		0.896	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Lead-212	**0.423**		0.0793	0.0964		0.0381	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Lead-214	**0.342**		0.0856	0.0927		0.0440	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Potassium-40	**8.24**		1.12	1.41		0.0893	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Protactinium-231	0.000	U	0.460	0.460		1.73	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Protactinium-234	-0.0213	U	0.238	0.238		0.196	pCi/g	10/16/20 16:12	11/10/20 12:30	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-022 — Lab Sample ID: 160-39797-22

Date Collected: 10/05/20 14:30 — **Matrix: Solid**
Date Received: 10/07/20 09:19

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	**0.127**		0.163	0.164	0.200	0.126	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Radium-228	**0.500**		0.131	0.140		0.0554	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Thallium-208	**0.208**		0.0527	0.0570		0.0130	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Thorium-232	**0.500**		0.131	0.140		0.0554	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Thorium-234	0.000	U	0.402	0.402		0.832	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Thorium 228	**0.423**		0.0793	0.0964		0.0381	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Uranium-235	-0.152	U	0.403	0.403		0.328	pCi/g	10/16/20 16:12	11/10/20 12:30	1
Uranium-238	0.000	U	0.402	0.402		0.832	pCi/g	10/16/20 16:12	11/10/20 12:30	1

Client Sample ID: HPPG-ESU-TU098B-023 — Lab Sample ID: 160-39797-23

Date Collected: 10/05/20 13:36 — **Matrix: Solid**
Date Received: 10/07/20 09:19

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	0.194	U	0.425	0.426		0.250	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Actinium 228	**0.438**		0.218	0.222		0.154	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Bismuth-212	-0.397	U	0.950	0.951		0.743	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Bismuth-214	-0.0409	U	0.225	0.225		0.187	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Cesium-137	0.000615	U	0.0553	0.0553	0.0700	0.0450	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Lead-210	0.487	U	1.33	1.33		0.914	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Lead-212	**0.365**		0.0993	0.110		0.0536	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Lead-214	**0.380**		0.108	0.115		0.0573	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Potassium-40	**6.47**		1.58	1.71		0.468	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Protactinium-231	0.000000267	U	2.53	2.53		2.08	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Protactinium-234	0.0994	U	0.197	0.197		0.163	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Radium-226	-0.0409	U	0.225	0.225	0.200	0.187	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Radium-228	**0.438**		0.218	0.222		0.154	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Thallium-208	**0.152**		0.0560	0.0582		0.0167	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Thorium-232	**0.438**		0.218	0.222		0.154	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Thorium-234	0.345	U	0.462	0.463		0.364	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Thorium 228	**0.365**		0.0993	0.110		0.0536	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Uranium-235	-0.0112	U	0.340	0.340		0.302	pCi/g	10/16/20 16:12	11/10/20 13:10	1
Uranium-238	0.345	U	0.462	0.463		0.364	pCi/g	10/16/20 16:12	11/10/20 13:10	1

Client Sample ID: HPPG-ESU-TU098B-024 — Lab Sample ID: 160-39797-24

Date Collected: 10/05/20 13:52 — **Matrix: Solid**
Date Received: 10/07/20 09:19

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	0.211	U	0.330	0.331		0.250	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Actinium 228	**0.353**		0.277	0.280		0.127	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Bismuth-212	-0.548	U	1.04	1.05		0.811	pCi/g	10/16/20 16:12	11/10/20 14:35	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-ESU-TU098B-024

Lab Sample ID: 160-39797-24

Date Collected: 10/05/20 13:52
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.0536	U	0.110	0.110		0.209	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Cesium-137	-0.00127	U	0.0734	0.0734	0.0700	0.0448	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Lead-210	**0.859**		0.935	0.940		0.612	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Lead-212	**0.309**		0.0780	0.0877		0.0301	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Lead-214	**0.309**		0.0941	0.0994		0.0522	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Potassium-40	**6.79**		1.43	1.59		0.275	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Protactinium-231	0.439	U	2.07	2.07		1.68	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Protactinium-234	0.0762	U	0.0981	0.0984		0.196	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Radium-226	0.0536	U	0.110	0.110	0.200	0.209	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Radium-228	**0.353**		0.277	0.280		0.127	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Thallium-208	0.0463	U	0.0903	0.0905		0.0515	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Thorium-232	**0.353**		0.277	0.280		0.127	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Thorium-234	-0.118	U	0.555	0.555		0.462	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Thorium 228	**0.309**		0.0780	0.0877		0.0301	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Uranium-235	-0.161	U	0.301	0.301		0.279	pCi/g	10/16/20 16:12	11/10/20 14:35	1
Uranium-238	-0.118	U	0.555	0.555		0.462	pCi/g	10/16/20 16:12	11/10/20 14:35	1

Client Sample ID: HPPG-ESU-TU098B-025

Lab Sample ID: 160-39797-25

Date Collected: 10/05/20 13:39
Matrix: Solid
Date Received: 10/07/20 09:19

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	0.101	U	0.364	0.364		0.282	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Actinium 228	**0.453**		0.170	0.176		0.0624	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Bismuth-212	-0.204	U	0.647	0.647		0.517	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Bismuth-214	**0.277**		0.0912	0.0956		0.0406	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Cesium-137	-0.0450	U	0.0733	0.0735	0.0700	0.0578	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Lead-210	-0.686	U	1.51	1.51		1.22	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Lead-212	**0.383**		0.0695	0.0854		0.0275	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Lead-214	**0.302**		0.0780	0.0840		0.0362	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Potassium-40	**6.55**		1.04	1.23		0.245	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Protactinium-231	-0.684	U	2.16	2.16		1.75	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Protactinium-234	-0.0249	U	0.0738	0.0738		0.218	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Radium-226	**0.277**		0.0912	0.0956	0.200	0.0406	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Radium-228	**0.453**		0.170	0.176		0.0624	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Thallium-208	**0.137**		0.0542	0.0560		0.0218	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Thorium-232	**0.453**		0.170	0.176		0.0624	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Thorium-234	-0.283	U	0.379	0.380		0.786	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Thorium 228	**0.383**		0.0695	0.0854		0.0275	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Uranium-235	-0.0478	U	0.107	0.107		0.369	pCi/g	10/16/20 16:12	11/10/20 14:31	1
Uranium-238	-0.283	U	0.379	0.380		0.786	pCi/g	10/16/20 16:12	11/10/20 14:31	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-F-005

Lab Sample ID: 160-39797-26
Date Collected: 10/05/20 12:36
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.0311	U	0.0539	0.0540	0.160	0.0471	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*90.3*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*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	0.149	U	0.316	0.316		0.318	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Actinium 228	**0.474**		0.178	0.184		0.0982	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Bismuth-212	-0.333	U	1.01	1.01		0.809	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Bismuth-214	0.163	U	0.216	0.217		0.219	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Cesium-137	0.0264	U	0.0512	0.0513	0.0700	0.0390	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Lead-210	**0.931**		1.28	1.29		0.905	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Lead-212	**0.496**		0.0952	0.108		0.0412	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Lead-214	**0.457**		0.134	0.142		0.0590	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Potassium-40	**8.47**		1.32	1.58		0.120	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Protactinium-231	0.456	U	2.01	2.01		2.27	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Protactinium-234	0.0766	U	0.233	0.233		0.221	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Radium-226	0.163	U	0.216	0.217	0.200	0.219	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Radium-228	**0.474**		0.178	0.184		0.0982	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Thallium-208	**0.185**		0.0704	0.0729		0.0278	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Thorium-232	**0.474**		0.178	0.184		0.0982	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Thorium-234	0.388	U	0.537	0.539		0.479	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Thorium 228	**0.496**		0.0952	0.108		0.0412	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Uranium-235	0.000	U	0.247	0.247		0.414	pCi/g	10/16/20 16:12	11/10/20 14:32	1
Uranium-238	0.388	U	0.537	0.539		0.479	pCi/g	10/16/20 16:12	11/10/20 14:32	1

Client Sample ID: HPPG-F-006

Lab Sample ID: 160-39797-27
Date Collected: 10/05/20 14:30
Matrix: Solid
Date Received: 10/07/20 09:19

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	-0.0796	U	0.548	0.548		0.323	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Actinium 228	**0.583**		0.150	0.162		0.0226	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Bismuth-212	-0.209	U	0.716	0.716		0.574	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Bismuth-214	**0.502**		0.126	0.137		0.0486	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Cesium-137	-0.0316	U	0.0520	0.0521	0.0700	0.0402	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Lead-210	-0.692	U	1.28	1.28		1.02	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Lead-212	**0.435**		0.0725	0.0918		0.0259	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Lead-214	**0.425**		0.104	0.113		0.0405	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Potassium-40	**8.32**		1.13	1.41		0.0893	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Protactinium-231	0.611	U	1.47	1.48		1.62	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Protactinium-234	0.131	U	0.211	0.211		0.153	pCi/g	10/16/20 16:12	11/10/20 14:33	1

Client Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Client Sample ID: HPPG-F-006

Date Collected: 10/05/20 14:30
Date Received: 10/07/20 09:19

Lab Sample ID: 160-39797-27

Matrix: Solid

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	**0.502**		0.126	0.137	0.200	0.0486	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Radium-228	**0.583**		0.150	0.162		0.0226	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Thallium-208	**0.184**		0.0538	0.0571		0.0163	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Thorium-232	**0.583**		0.150	0.162		0.0226	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Thorium-234	0.0230	U	0.0451	0.0452		0.886	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Thorium 228	**0.435**		0.0725	0.0918		0.0259	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Uranium-235	-0.167	U	0.459	0.459		0.374	pCi/g	10/16/20 16:12	11/10/20 14:33	1
Uranium-238	0.0230	U	0.0451	0.0452		0.886	pCi/g	10/16/20 16:12	11/10/20 14:33	1

QC Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-486247/24-A
Matrix: Solid
Analysis Batch: 488625

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 486247

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.06412		0.0644	0.0645	0.160	0.0481	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*94.2*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*1*

Lab Sample ID: LCS 160-486247/1-A
Matrix: Solid
Analysis Batch: 488624

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 486247

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Total Beta Strontium			7.78	6.438		0.528	0.160	0.0457	pCi/g	83	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*96.5*		*40 - 110*

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

Lab Sample ID: MB 160-485978/1-A
Matrix: Solid
Analysis Batch: 488682

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 485978

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.02071	U	0.488	0.488		0.289	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Actinium 228	0.1501		0.108	0.109		0.0508	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Bismuth-212	-0.2904	U	0.509	0.510		0.380	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Bismuth-214	-0.02286	U	0.136	0.136		0.113	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Cesium-137	-0.006810	U	0.0434	0.0434	0.0700	0.0349	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Lead-210	-0.5657	U	1.07	1.07		0.836	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Lead-212	-0.01907	U	0.0738	0.0738		0.0769	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Lead-214	-0.05244	U	0.110	0.110		0.0765	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Potassium-40	-0.04400	U	0.706	0.706		0.430	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Protactinium-231	0.0000	U	0.676	0.677		1.53	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Protactinium-234	-0.07134	U	0.205	0.205		0.166	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Radium-226	-0.02286	U	0.136	0.136	0.200	0.113	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Radium-228	0.1501		0.108	0.109		0.0508	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thallium-208	-0.04372	U	0.0397	0.0400		0.0389	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thorium-232	0.1501		0.108	0.109		0.0508	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thorium-234	0.05462	U	0.280	0.280		0.487	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thorium 228	-0.01907	U	0.0738	0.0738		0.0769	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Uranium-235	0.09220	U	0.275	0.275		0.241	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Uranium-238	0.05462	U	0.280	0.280		0.487	pCi/g	10/16/20 16:12	11/10/20 12:57	1

QC Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

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

Lab Sample ID: LCS 160-485978/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 488678 — **Prep Batch: 485978**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	100.5		10.5		0.508	pCi/g	104	87 - 116
Cesium-137	26.8	27.07		2.89	0.0700	0.0690	pCi/g	101	87 - 120
Cobalt-60	9.58	9.434		0.998		0.0299	pCi/g	98	87 - 115

Lab Sample ID: MB 160-485999/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 488865 — **Prep Batch: 485999**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.07533	U	0.647	0.647		0.399	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Actinium 228	0.08202	U	0.161	0.161		0.0913	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Bismuth-212	0.0000	U	0.114	0.114		0.288	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Bismuth-214	0.08271		0.0915	0.0919		0.0606	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Cesium-137	0.001577	U	0.0596	0.0596	0.0700	0.0489	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Lead-210	0.1826	U	1.66	1.66		1.19	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Lead-212	0.0000	U	0.0576	0.0576		0.0986	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Lead-214	-0.01167	U	0.0949	0.0949		0.0786	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Potassium-40	0.4077		0.333	0.335		0.158	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Protactinium-231	0.0000	U	0.439	0.439		2.29	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Protactinium-234	0.07148	U	0.219	0.219		0.176	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Radium-226	0.08271		0.0915	0.0919	0.200	0.0606	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Radium-228	0.08202	U	0.161	0.161		0.0913	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Thallium-208	0.05032		0.0470	0.0473		0.0211	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Thorium-232	0.08202	U	0.161	0.161		0.0913	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Thorium-234	0.05364	U	0.0586	0.0589		0.688	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Thorium 228	0.0000	U	0.0576	0.0576		0.0986	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Uranium-235	0.04430	U	0.136	0.136		0.349	pCi/g	10/18/20 14:28	11/11/20 13:08	1
Uranium-238	0.05364	U	0.0586	0.0589		0.688	pCi/g	10/18/20 14:28	11/11/20 13:08	1

Lab Sample ID: LCS 160-485999/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 488869 — **Prep Batch: 485999**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	96.63		12.5		0.635	pCi/g	100	87 - 116
Cesium-137	26.8	29.34		3.49	0.0700	0.148	pCi/g	110	87 - 120
Cobalt-60	9.58	10.35		1.25		0.111	pCi/g	108	87 - 115

Lab Sample ID: 160-39797-17 DU — **Client Sample ID: HPPG-ESU-TU098B-017**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 488867 — **Prep Batch: 485999**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium-227	-0.193	U	0.02550	U	0.551		0.341	pCi/g	0.21	1
Actinium 228	0.291		0.2189		0.212		0.129	pCi/g	0.18	1

QC Sample Results

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

Job ID: 160-39797-1
SDG: GJ46599786

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

Lab Sample ID: 160-39797-17 DU
Matrix: Solid
Analysis Batch: 488867

Client Sample ID: HPPG-ESU-TU098B-017
Prep Type: Total/NA
Prep Batch: 485999

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit			RER	RER Limit
Bismuth-212	-0.298	U		0.0000	U	0.597		0.670	pCi/g			0.24	1
Bismuth-214	0.290			0.3646		0.141		0.0593	pCi/g			0.32	1
Cesium-137	-0.00160	U		0.0006256	U	0.0526	0.0700	0.0427	pCi/g			0.02	1
Lead-210	0.356	U		-0.4800	U	1.59		1.14	pCi/g			0.32	1
Lead-212	0.305			0.2724		0.0890		0.0404	pCi/g			0.20	1
Lead-214	0.319			0.4408		0.130		0.0497	pCi/g			0.54	1
Potassium-40	6.77			6.179		1.51		0.279	pCi/g			0.22	1
Protactinium-231	0.000	U		0.5528	U	1.77		1.95	pCi/g			0.23	1
Protactinium-234	0.0545	U		-0.0005949	U	0.203		0.165	pCi/g			0.13	1
Radium-226	0.290			0.3646		0.141	0.200	0.0593	pCi/g			0.32	1
Radium-228	0.291			0.2189		0.212		0.129	pCi/g			0.18	1
Thallium-208	0.111			0.1484		0.0548		0.00976	pCi/g			0.40	1
Thorium-232	0.291			0.2189		0.212		0.129	pCi/g			0.18	1
Thorium-234	0.176	U		-0.7191	U	0.825		0.810	pCi/g			0.75	1
Thorium 228	0.305			0.2724		0.0890		0.0404	pCi/g			0.20	1
Uranium-235	0.0967	U		0.07098	U	0.151		0.302	pCi/g			0.08	1
Uranium-238	0.176	U		-0.7191	U	0.825		0.810	pCi/g			0.75	1

QC Association Summary

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

Job ID: 160-39797-1
SDG: GJ46599786

Rad

Leach Batch: 485293

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39797-25	HPPG-ESU-TU098B-025	Total/NA	Solid	Dry and Grind	
160-39797-26	HPPG-F-005	Total/NA	Solid	Dry and Grind	
160-39797-27	HPPG-F-006	Total/NA	Solid	Dry and Grind	

Leach Batch: 485308

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39797-1	HPPG-ESU-TU098B-001	Total/NA	Solid	Dry and Grind	
160-39797-2	HPPG-ESU-TU098B-002	Total/NA	Solid	Dry and Grind	
160-39797-3	HPPG-ESU-TU098B-003	Total/NA	Solid	Dry and Grind	
160-39797-4	HPPG-ESU-TU098B-004	Total/NA	Solid	Dry and Grind	
160-39797-5	HPPG-ESU-TU098B-005	Total/NA	Solid	Dry and Grind	
160-39797-6	HPPG-ESU-TU098B-006	Total/NA	Solid	Dry and Grind	
160-39797-7	HPPG-ESU-TU098B-007	Total/NA	Solid	Dry and Grind	
160-39797-8	HPPG-ESU-TU098B-008	Total/NA	Solid	Dry and Grind	
160-39797-9	HPPG-ESU-TU098B-009	Total/NA	Solid	Dry and Grind	
160-39797-10	HPPG-ESU-TU098B-010	Total/NA	Solid	Dry and Grind	
160-39797-11	HPPG-ESU-TU098B-011	Total/NA	Solid	Dry and Grind	
160-39797-12	HPPG-ESU-TU098B-012	Total/NA	Solid	Dry and Grind	
160-39797-13	HPPG-ESU-TU098B-013	Total/NA	Solid	Dry and Grind	
160-39797-14	HPPG-ESU-TU098B-014	Total/NA	Solid	Dry and Grind	
160-39797-15	HPPG-ESU-TU098B-015	Total/NA	Solid	Dry and Grind	
160-39797-16	HPPG-ESU-TU098B-016	Total/NA	Solid	Dry and Grind	
160-39797-17	HPPG-ESU-TU098B-017	Total/NA	Solid	Dry and Grind	
160-39797-18	HPPG-ESU-TU098B-018	Total/NA	Solid	Dry and Grind	
160-39797-19	HPPG-ESU-TU098B-019	Total/NA	Solid	Dry and Grind	
160-39797-20	HPPG-ESU-TU098B-020	Total/NA	Solid	Dry and Grind	
160-39797-21	HPPG-ESU-TU098B-021	Total/NA	Solid	Dry and Grind	
160-39797-22	HPPG-ESU-TU098B-022	Total/NA	Solid	Dry and Grind	
160-39797-23	HPPG-ESU-TU098B-023	Total/NA	Solid	Dry and Grind	
160-39797-24	HPPG-ESU-TU098B-024	Total/NA	Solid	Dry and Grind	
160-39797-17 DU	HPPG-ESU-TU098B-017	Total/NA	Solid	Dry and Grind	

Prep Batch: 485978

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39797-18	HPPG-ESU-TU098B-018	Total/NA	Solid	Fill_Geo-21	485308
160-39797-19	HPPG-ESU-TU098B-019	Total/NA	Solid	Fill_Geo-21	485308
160-39797-20	HPPG-ESU-TU098B-020	Total/NA	Solid	Fill_Geo-21	485308
160-39797-21	HPPG-ESU-TU098B-021	Total/NA	Solid	Fill_Geo-21	485308
160-39797-22	HPPG-ESU-TU098B-022	Total/NA	Solid	Fill_Geo-21	485308
160-39797-23	HPPG-ESU-TU098B-023	Total/NA	Solid	Fill_Geo-21	485308
160-39797-24	HPPG-ESU-TU098B-024	Total/NA	Solid	Fill_Geo-21	485308
160-39797-25	HPPG-ESU-TU098B-025	Total/NA	Solid	Fill_Geo-21	485293
160-39797-26	HPPG-F-005	Total/NA	Solid	Fill_Geo-21	485293
160-39797-27	HPPG-F-006	Total/NA	Solid	Fill_Geo-21	485293
MB 160-485978/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-485978/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 485999

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39797-1	HPPG-ESU-TU098B-001	Total/NA	Solid	Fill_Geo-21	485308
160-39797-2	HPPG-ESU-TU098B-002	Total/NA	Solid	Fill_Geo-21	485308

QC Association Summary

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

Job ID: 160-39797-1
SDG: GJ46599786

Rad (Continued)

Prep Batch: 485999 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39797-3	HPPG-ESU-TU098B-003	Total/NA	Solid	Fill_Geo-21	485308
160-39797-4	HPPG-ESU-TU098B-004	Total/NA	Solid	Fill_Geo-21	485308
160-39797-5	HPPG-ESU-TU098B-005	Total/NA	Solid	Fill_Geo-21	485308
160-39797-6	HPPG-ESU-TU098B-006	Total/NA	Solid	Fill_Geo-21	485308
160-39797-7	HPPG-ESU-TU098B-007	Total/NA	Solid	Fill_Geo-21	485308
160-39797-8	HPPG-ESU-TU098B-008	Total/NA	Solid	Fill_Geo-21	485308
160-39797-9	HPPG-ESU-TU098B-009	Total/NA	Solid	Fill_Geo-21	485308
160-39797-10	HPPG-ESU-TU098B-010	Total/NA	Solid	Fill_Geo-21	485308
160-39797-11	HPPG-ESU-TU098B-011	Total/NA	Solid	Fill_Geo-21	485308
160-39797-12	HPPG-ESU-TU098B-012	Total/NA	Solid	Fill_Geo-21	485308
160-39797-13	HPPG-ESU-TU098B-013	Total/NA	Solid	Fill_Geo-21	485308
160-39797-14	HPPG-ESU-TU098B-014	Total/NA	Solid	Fill_Geo-21	485308
160-39797-15	HPPG-ESU-TU098B-015	Total/NA	Solid	Fill_Geo-21	485308
160-39797-16	HPPG-ESU-TU098B-016	Total/NA	Solid	Fill_Geo-21	485308
160-39797-17	HPPG-ESU-TU098B-017	Total/NA	Solid	Fill_Geo-21	485308
MB 160-485999/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-485999/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-39797-17 DU	HPPG-ESU-TU098B-017	Total/NA	Solid	Fill_Geo-21	485308

Prep Batch: 486247

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39797-1	HPPG-ESU-TU098B-001	Total/NA	Solid	DPS-0	485308
160-39797-11	HPPG-ESU-TU098B-011	Total/NA	Solid	DPS-0	485308
160-39797-21	HPPG-ESU-TU098B-021	Total/NA	Solid	DPS-0	485308
160-39797-26	HPPG-F-005	Total/NA	Solid	DPS-0	485293
MB 160-486247/24-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-486247/1-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: 160-39797-1
SDG: GJ46599786

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)**							
160-39797-1	HPPG-ESU-TU098B-001	96.9							
160-39797-11	HPPG-ESU-TU098B-011	94.2							
160-39797-21	HPPG-ESU-TU098B-021	93.4							
160-39797-26	HPPG-F-005	90.3							
LCS 160-486247/1-A	Lab Control Sample	96.5							
MB 160-486247/24-A	Method Blank	94.2							

Tracer/Carrier Legend

Sr = Sr Carrier

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: 160-39798-1
Laboratory Sample Delivery Group: D1189469
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:
11/18/2020 3:59:20 PM

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

LINKS

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Visit us at: www.eurofinsus.com/Env

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.

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Job ID: 160-39798-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-39798-1

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- Added Pa234 to gamma analyte list

RECEIPT

Case Narrative

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

Job ID: 160-39798-1
SDG: D1189469

Job ID: 160-39798-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

The samples were received on 10/07/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.9 C.

TOTAL BETA STRONTIUM (GFPC)
Sample HPPG-ESU-TU098B-B-001 (160-39798-1) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/12/2020, prepared on 10/20/2020 and analyzed on 11/09/2020.

The following sample could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: HPPG-ESU-TU098B-B-001 (160-39798-1). The samples contained rocks of varying sizes.

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)
Sample HPPG-ESU-TU098B-B-001 (160-39798-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/12/2020, prepared on 10/16/2020 and analyzed on 11/10/2020.

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
Bi-214	Ra-226

The method blank (MB) z-score associated with Prep Batch 160-485978 is within limits and is stored in the level IV raw data. (MB 160-485978/1-A)

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-006

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): Andrew Murri

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/6/2020
Waybill Number: 4957 0225 2164
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

Sample ID	Collection Information: 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-TU098B-B-001	10/6/2020	08:32	G	SO	1	16 oz. plastic jar	X		X				4	D1189469	

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:
Lewis, Devin		10/06/2020 12:53	Trevor Rizzo		10/06/2020 12:53
Trevor Rizzo		10/06/2020 12:54	SHIPPEDTOLAB		10/7/2020 0919

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

160-39798 Chain of Custody

All Transfers for COC 501197RSY-006

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/06/2020 12:53	Trevor Rizzo		10/06/2020 12:53
Trevor Rizzo		10/06/2020 12:54	SHIPPEDTOLAB		10/7/2020 0919

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-39798-1
SDG Number: D1189469

Login Number: 39798
List Number: 1
Creator: Mazariegos, Leonel A

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: 160-39798-1
SDG: D1189469

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: 160-39798-1
SDG: D1189469

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: 160-39798-1
SDG: D1189469

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-39798-1	HPPG-ESU-TU098B-B-001	Solid	10/06/20 08:32	10/07/20 09:19	

Client Sample Results

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

Job ID: 160-39798-1
SDG: D1189469

Client Sample ID: HPPG-ESU-TU098B-B-001

Lab Sample ID: 160-39798-1
Matrix: Solid

Date Collected: 10/06/20 08:32
Date Received: 10/07/20 09:19

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	**0.0850**		0.0619	0.0621	0.160	0.0438	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*93.3*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*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	0.126	U	0.475	0.475		0.366	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Actinium 228	**0.646**		0.165	0.178		0.119	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Bismuth-212	0.437	U	0.759	0.760		0.587	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Bismuth-214	**0.548**		0.146	0.157		0.0529	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Cesium-137	0.0180	U	0.0497	0.0497	0.0700	0.0390	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Lead-210	**1.43**		1.58	1.59		0.982	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Lead-212	**0.646**		0.108	0.136		0.0498	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Lead-214	**0.531**		0.116	0.129		0.0578	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Potassium-40	**7.30**		1.22	1.43		0.281	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Protactinium-231	0.000	U	0.590	0.590		2.43	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Protactinium-234	0.0802	U	0.255	0.256		0.239	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Radium-226	**0.548**		0.146	0.157	0.200	0.0529	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Radium-228	**0.646**		0.165	0.178		0.119	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Thallium-208	**0.134**		0.0916	0.0926		0.0450	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Thorium-232	**0.646**		0.165	0.178		0.119	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Thorium-234	**0.939**		0.673	0.681		0.456	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Thorium 228	**0.646**		0.108	0.136		0.0498	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Uranium-235	-0.0852	U	0.266	0.266		0.467	pCi/g	10/16/20 16:12	11/10/20 14:34	1
Uranium-238	**0.939**		0.673	0.681		0.456	pCi/g	10/16/20 16:12	11/10/20 14:34	1

QC Sample Results

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

Job ID: 160-39798-1
SDG: D1189469

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-486247/24-A
Matrix: Solid
Analysis Batch: 488625

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 486247

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.06412		0.0644	0.0645	0.160	0.0481	pCi/g	10/20/20 07:09	11/09/20 16:51	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*94.2*		*40 - 110*	*10/20/20 07:09*	*11/09/20 16:51*	*1*

Lab Sample ID: LCS 160-486247/1-A
Matrix: Solid
Analysis Batch: 488624

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 486247

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Total Beta Strontium			7.78	6.438		0.528	0.160	0.0457	pCi/g	83	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*96.5*		*40 - 110*

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

Lab Sample ID: MB 160-485978/1-A
Matrix: Solid
Analysis Batch: 488682

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 485978

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.02071	U	0.488	0.488		0.289	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Actinium 228	0.1501		0.108	0.109		0.0508	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Bismuth-212	-0.2904	U	0.509	0.510		0.380	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Bismuth-214	-0.02286	U	0.136	0.136		0.113	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Cesium-137	-0.006810	U	0.0434	0.0434	0.0700	0.0349	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Lead-210	-0.5657	U	1.07	1.07		0.836	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Lead-212	-0.01907	U	0.0738	0.0738		0.0769	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Lead-214	-0.05244	U	0.110	0.110		0.0765	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Potassium-40	-0.04400	U	0.706	0.706		0.430	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Protactinium-231	0.0000	U	0.676	0.677		1.53	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Protactinium-234	-0.07134	U	0.205	0.205		0.166	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Radium-226	-0.02286	U	0.136	0.136	0.200	0.113	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Radium-228	0.1501		0.108	0.109		0.0508	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thallium-208	-0.04372	U	0.0397	0.0400		0.0389	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thorium-232	0.1501		0.108	0.109		0.0508	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thorium-234	0.05462	U	0.280	0.280		0.487	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Thorium 228	-0.01907	U	0.0738	0.0738		0.0769	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Uranium-235	0.09220	U	0.275	0.275		0.241	pCi/g	10/16/20 16:12	11/10/20 12:57	1
Uranium-238	0.05462	U	0.280	0.280		0.487	pCi/g	10/16/20 16:12	11/10/20 12:57	1

QC Sample Results

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

Job ID: 160-39798-1
SDG: D1189469

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

Lab Sample ID: LCS 160-485978/2-A
Matrix: Solid
Analysis Batch: 488678

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 485978

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	100.5		10.5		0.508	pCi/g	104	87 - 116
Cesium-137	26.8	27.07		2.89	0.0700	0.0690	pCi/g	101	87 - 120
Cobalt-60	9.58	9.434		0.998		0.0299	pCi/g	98	87 - 115

QC Association Summary

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

Job ID: 160-39798-1
SDG: D1189469

Rad

Leach Batch: 485293

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39798-1	HPPG-ESU-TU098B-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 485978

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39798-1	HPPG-ESU-TU098B-B-001	Total/NA	Solid	Fill_Geo-21	485293
MB 160-485978/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-485978/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 486247

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-39798-1	HPPG-ESU-TU098B-B-001	Total/NA	Solid	DPS-0	485293
MB 160-486247/24-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-486247/1-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: 160-39798-1
SDG: D1189469

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)**							
160-39798-1	HPPG-ESU-TU098B-B-001	93.3							
LCS 160-486247/1-A	Lab Control Sample	96.5							
MB 160-486247/24-A	Method Blank	94.2							

Tracer/Carrier Legend

Sr = Sr Carrier