From: Whittaker, Laura [laura.whittaker@aptim.com]
Sent: Thursday, November 1, 2018 6:20 AM
To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]
CC: Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Fowler, Janet CIV NAVSEA, SEA 04N [janet.fowler1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Amy Mangel [amy.mangel@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]
Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY B4 (DC)
Attachments: HPNS APTIM RSY B4 (DC) Soil Non-LLRW Concurrence Request 11012018 (reduc....pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

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

Thank you.

LAURA WHITTAKER
Radiological Technician 4 (RCT IV)

APTIM | Radiation Safety

M 423 544 9145
E laura.whittaker@aptim.com

APTIM

2410 Cherahala Blvd
Knoxville, TN 37932

APTIM.com

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Hunters Point Naval Shipyard, Parcel E-2
RSY Data Report

Contract No. EMAC III CTO-0013		
RSY Pad: B4	RSY Pad Use Number: Deconstruction (DC)	First Submittal ☑ Second Submittal ☐
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 11/01/2018

Soil Sample Data					
Sample Identification	Survey Location	Type of Sample	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.331
PE2-RSYB4-DC-S001	1	Systematic	0.619	0.0183	0.0149
PE2-RSYB4-DC-S002	2	Systematic	0.864	0.027	N/A
PE2-RSYB4-DC-S003	3	Systematic	0.823	-0.0764	N/A
PE2-RSYB4-DC-S004	4	Systematic	0.623	-0.0484	N/A
PE2-RSYB4-DC-S005	5	Systematic	0.702	0.0123	N/A
PE2-RSYB4-DC-S006	6	Systematic	0.709	0.0109	N/A
PE2-RSYB4-DC-S007	7	Systematic	0.642	-0.0415	N/A
PE2-RSYB4-DC-S008	8	Systematic	0.617	0.00919	N/A
PE2-RSYB4-DC-S009	9	Systematic	0.774	-0.00322	N/A
PE2-RSYB4-DC-S010	10	Systematic	0.682	-0.0358	N/A
PE2-RSYB4-DC-S011	11	Systematic	0.249	-0.0721	0.00197
PE2-RSYB4-DC-S012	12	Systematic	0.649	-0.0219	N/A
PE2-RSYB4-DC-S013	13	Systematic	0.711	0.0155	N/A
PE2-RSYB4-DC-S014	14	Systematic	0.568	-0.0363	N/A
PE2-RSYB4-DC-S015	15	Systematic	0.737	-0.0182	N/A
PE2-RSYB4-DC-S016	16	Systematic	0.747	-0.0725	N/A
PE2-RSYB4-DC-S017	17	Systematic	0.646	-0.0510	N/A
PE2-RSYB4-DC-S018	18	Systematic	0.613	-0.0296	N/A
Biased Soil Sample Data					
PE2-RSYB4-DC-B-S001	1	Biased	0.535	0.0114	0.124
PE2-RSYB4-DC-B-S002	2	Biased	0.654	-0.0367	N/A
PE2-RSYB4-DC-B-S003	3	Biased	0.627	-0.0214	N/A
PE2-RSYB4-DC-B-S004	4	Biased	0.308	-0.0300	N/A
PE2-RSYB4-DC-B-S005	5	Biased	0.576	0.0119	N/A

^{226}Ra Radium-226
^{137}Cs Cesium-137
Sr Strontium
pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-09182018-PE2-ROV2-2977	09/18/2018	RS-701/ RSX-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,842 CPS	3,332-**4,880**$^{+}$ CPS
RSI Follow-up Static Survey	HPRS-09272018-PE2-JSS2-2990	09/27/2018	RS-701/ RSX-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	**4,270-4,957**$^{+}$ CPS
Systematic Sample Survey	HPRS-09142018-PE2-JSS-2971	09/14/2018	2221	06/29/2019	117634	15,069 CPM	17,241 CPM	N/A	N/A	15,491-**18,965**$^{+}$ CPM
Biased Sample Survey	HPRS-09282018-PE2-JSS-2992	09/28/2018	2221	02/09/2019	105934	15,147 CPM	17,406 CPM	N/A	N/A	**19,783-20,569**$^{+}$ CPM

\+ Gamma readings exceeding the Reference Area 3σ IL are attributable to the presence of naturally-occurring non-Navy program radionuclides in the excavated soil—see Note(s) in the Summary table (page 2) for more details.

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

Summary
1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).
2) RSI Follow-up static survey—26 locations identified during the data review process were investigated. 8 follow-up locations exceeded the Reference Area static IL for regions of interests (ROIs) 6, 7, and/or 8 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7). Note: Gamma readings reported in the Instrument and Survey Data table (page 1) for the gamma walkover and follow-up static surveys show the mean gamma gross count rate range(ROI 10, VD1) for all surveyed follow-up locations. Spectral analysis results show 8 follow-up locations exceeded the Reference Area Static IL for regions of interests (ROI) 6, 7, and/or 8. Biased samples were collected at five representative locations to support the evaluation of the elevated gamma readings. Biased soil samples PE2-RSYB4-DC-B-S001-PE2-RSYB4-DC-B-S005 were collected and submitted for gamma spectroscopy analysis to further characterize the elevated soil readings at follow-up locations 2, 5, 21, 25, and 26 (see Summary Note 4 below).
3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 38-61). Ten percent of the systematic and biased soil samples (three samples in total, PE2-RSYB4-DC-S001, PE2-RSYB4-DC-S011, & PE2-RSYB4-DC-B-S001) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 38-61 & 62-77).
4) Biased sample survey—samples PE2-RSYB4-DC-B-S001-PE2-RSYB4-DC-B-S005 were obtained and analyzed to support the evaluation of elevated gamma readings collected at follow-up locations 2, 5, 21, 25, and 26. Biased soil sample location are shown on the Biased Sample Survey map (page 9). TestAmerica sample results are attached (pages 62-77). Note: Static gamma measurements collected at systematic and biased sample locations were obtained with a handheld Ludlum 2221 Scaler/Ratemeter and 3"x3" NaI probe; the results show gamma readings exceeding the instrument-specific Reference Area Static IL at several sample locations. Sample results indicate that this activity is due to the presence of naturally-occurring non-Navy program radionuclides in the excavated soil.
Conclusions: **All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 26 locations were investigated during the follow-up static survey, with 8 readings greater than the Reference Area static IL. Biased soil samples were collected at five representative follow-up locations to support the evaluation of elevated gamma readings. Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 10-35).** **Final analytical results for systematic and biased samples from this RSY pad are concluded to be comparable to background. Histograms showing systematic soil sample activity concentrations are provided (pages 36-37). Ten percent of the systematic and biased soil samples (three samples in total, PE2-RSYB4-DC-S001, PE2-RSYB4-DC-S011 & PE2-RSYB4-DC-B-S001) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).** **This data package characterizes the construction base layer for RSY B4 pad. The soil was initially import clean material.** **APTIM request RASO concurrence to release this soil as Non-LLRW.** **Disposition: This soil shall be dispositioned as non-LLRW waste. The soil will be stockpiled onsite for reuse following appropriate chemical characterization.**

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAsssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review**: The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review**: The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs**:
    - **Z-Scores**: The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three (Z>3) is marked for follow-up.
    - **Local Z-Scores**: Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local Z>3 is marked for follow-up.
    - **Semi-local Z-Scores**: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local Z>3 is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
    - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a Z>3 is marked for follow-up.
    - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local Z>3 is marked for follow-up.
    - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local Z>3 is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
  - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a Z>3 is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local Z>3 is marked for follow-up.
  - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local Z>3 is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
  - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a Z>3 is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local Z>3 is marked for follow-up.
  - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local Z>3 is marked for follow-up.

- **Z-Score Time Series Review**: The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

$$L_C = 2.33\sqrt{B}$$

Where:

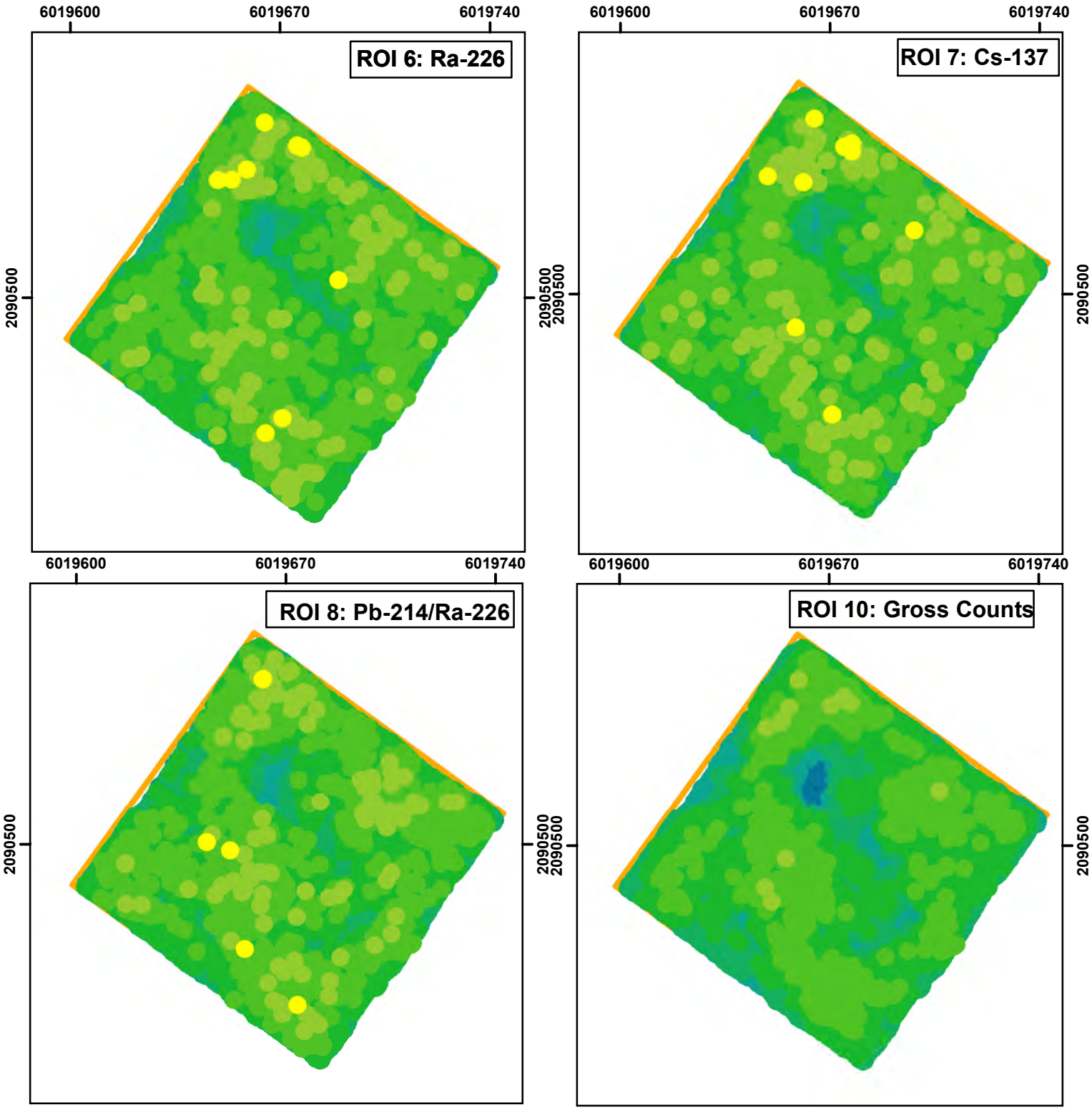
LC	=	critical level (counts)
B	=	average background in the ROI

When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

RSI Data Plots
HPNS Parcel E-2
RSY Pad B4 Deconstruction

Contour Map



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
- RSY Pad Boundaries

0 20 40 80 Feet

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

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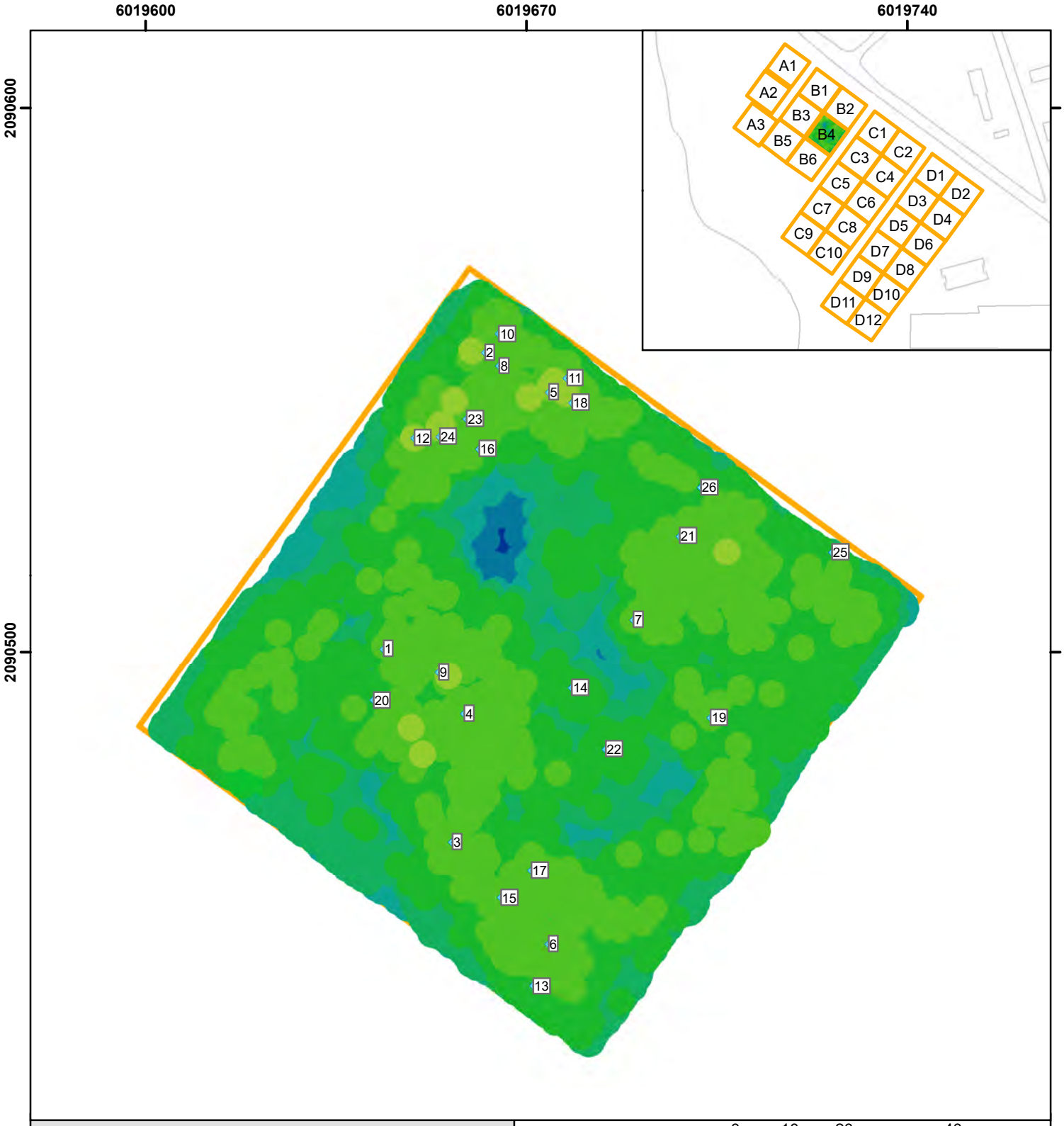
RSI Review Summary

Summary:

26 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on 8 gamma static data locations exceeded the Reference Area Static IL for region of interest (ROIs) 6, 7, and/or 8. All other gamma static readings at follow-up locations were less than the Reference Area static IL for ROIs 3, 6, 7, and 8; figures for all locations are provided on pages 10-35.

RSI Follow-up Static Survey
HPRS-09272018-PE2-JSS2-2990

HPNS Parcel E-2
RSY Pad B4 (DC)



RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

- Follow-up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev
- RSY Pad Boundaries

0 10 20 40 Feet

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

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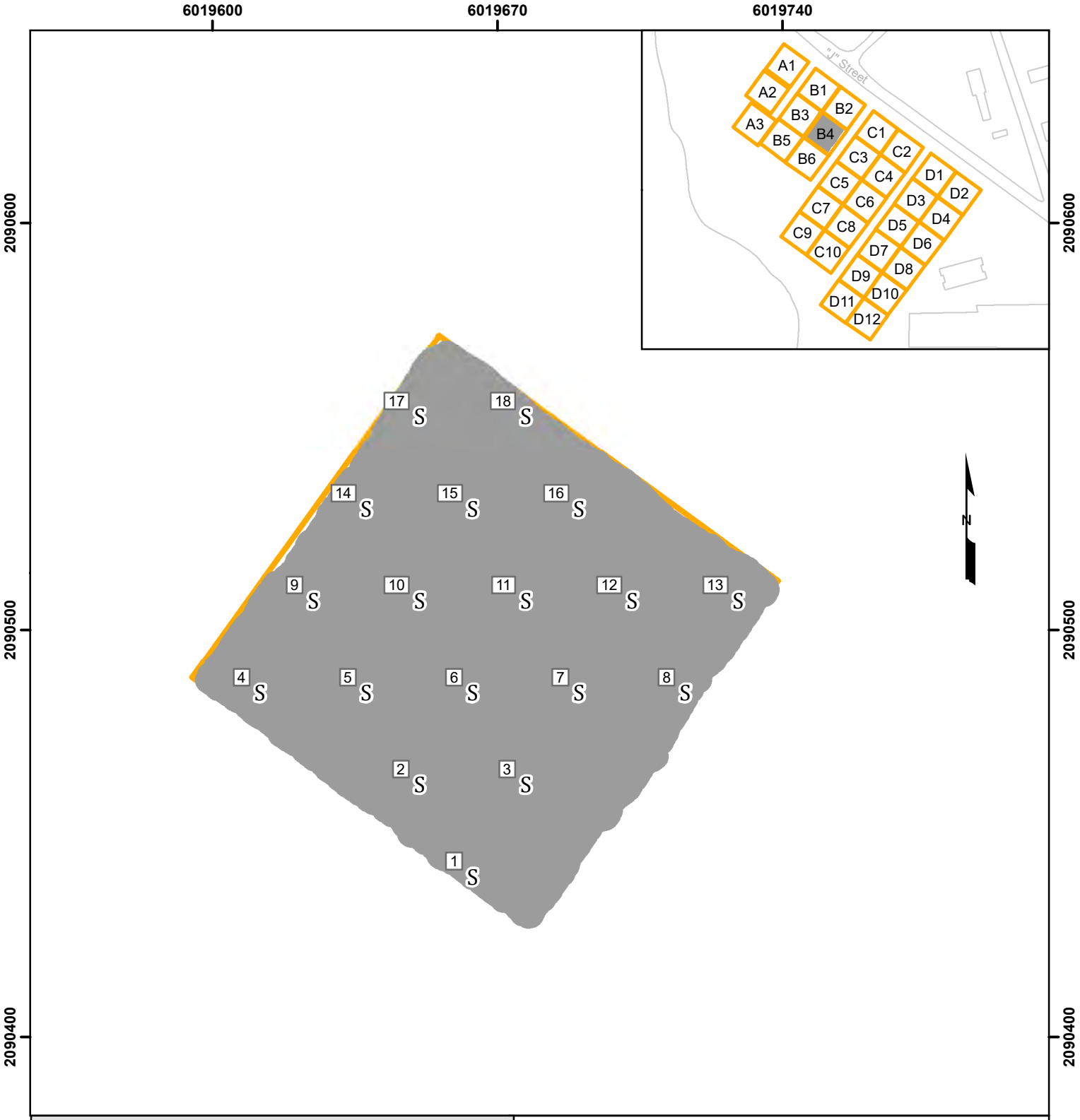
C:\Users\laura.whittaker\Desktop\GIS\RSY Pads\RSY-B\RSY-B4\1HPRS-09182018-PE2-ROV2-2977 RSY-B4-DC scan.mxd

Systematic Sample Survey
HPRS-09142018-PE2-JSS-2971

HPNS Parcel E-2
RSY Pad B4-DC



Survey Instrument: Model 2221/ 44-20
Serial Number: 117634

S Systematic Sample Locations

RS-700 GWS Scan Coverage

RSY Pad Boundaries

0 15 30 60 Feet

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

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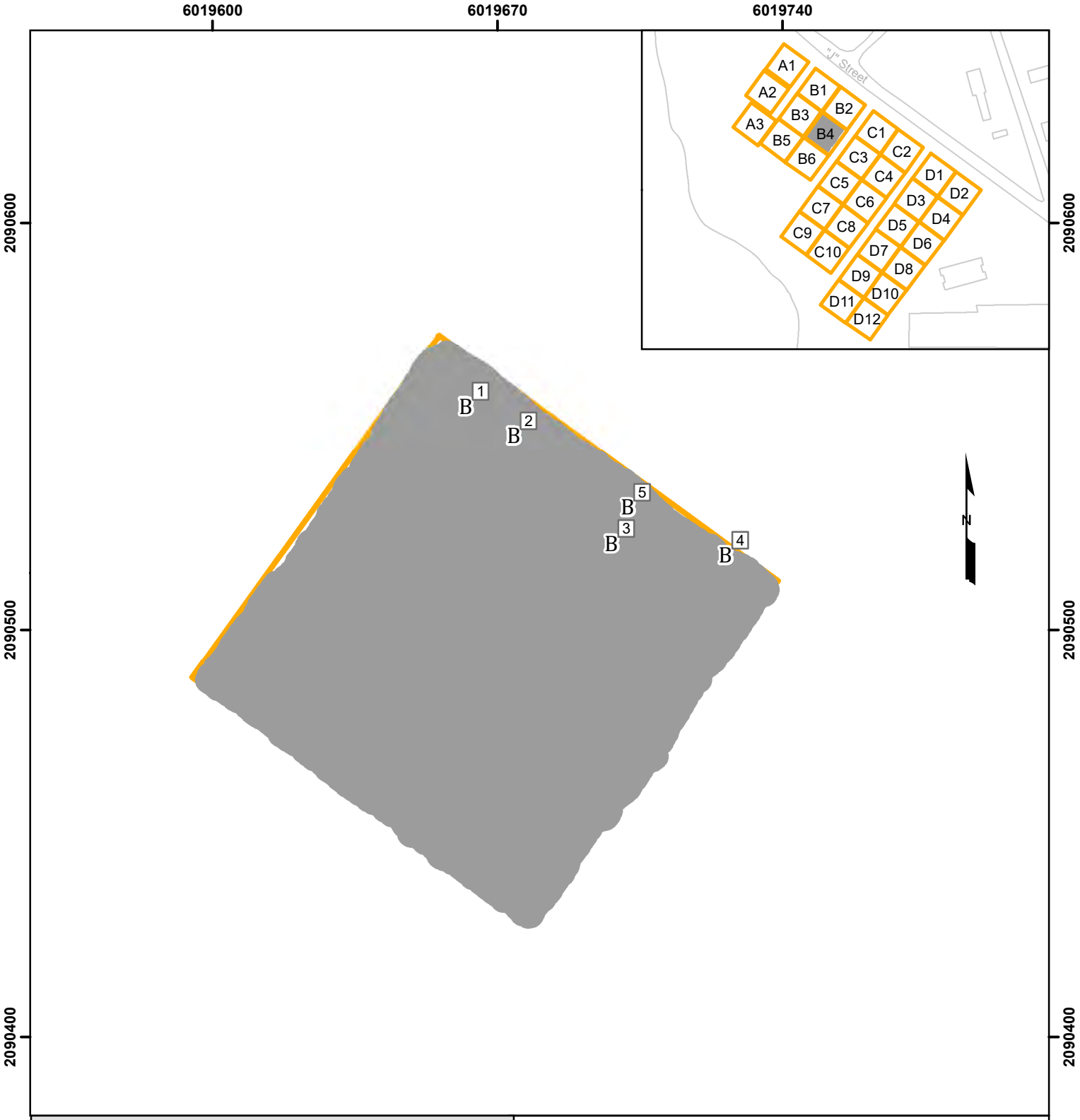
Biased Sample Survey
HPRS-09282018-PE2-JSS-2992

HPNS Parcel E-2
RSY Pad B4-DC



Survey Instrument: Model 2221/ 44-20
Serial Number: 105934

B Biased Sample Locations

RS-700 GWS Scan Coverage

RSY Pad Boundaries

0 15 30 60 Feet

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

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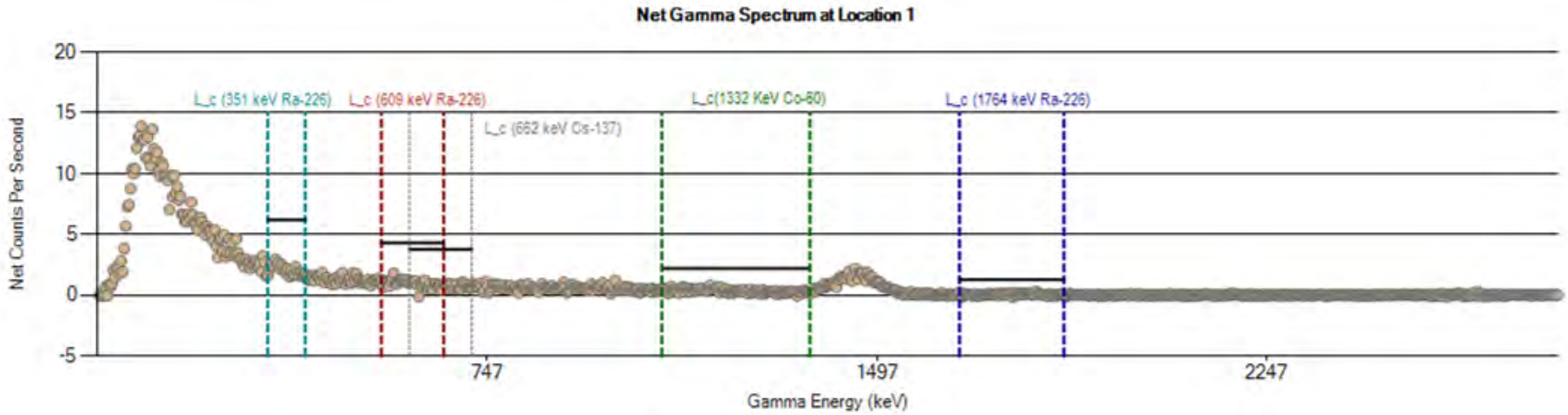
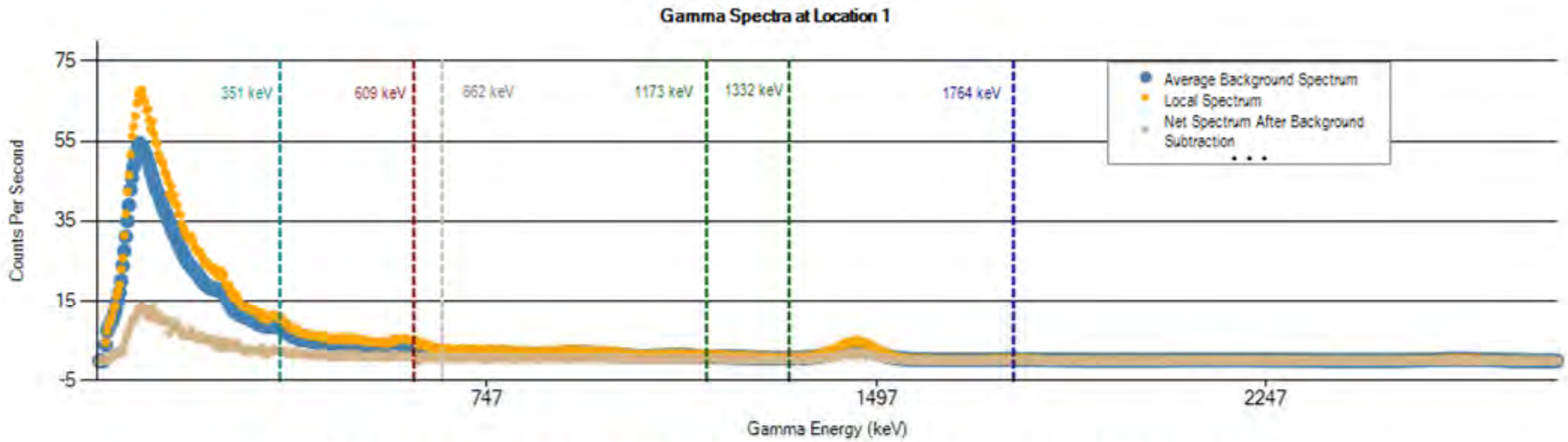
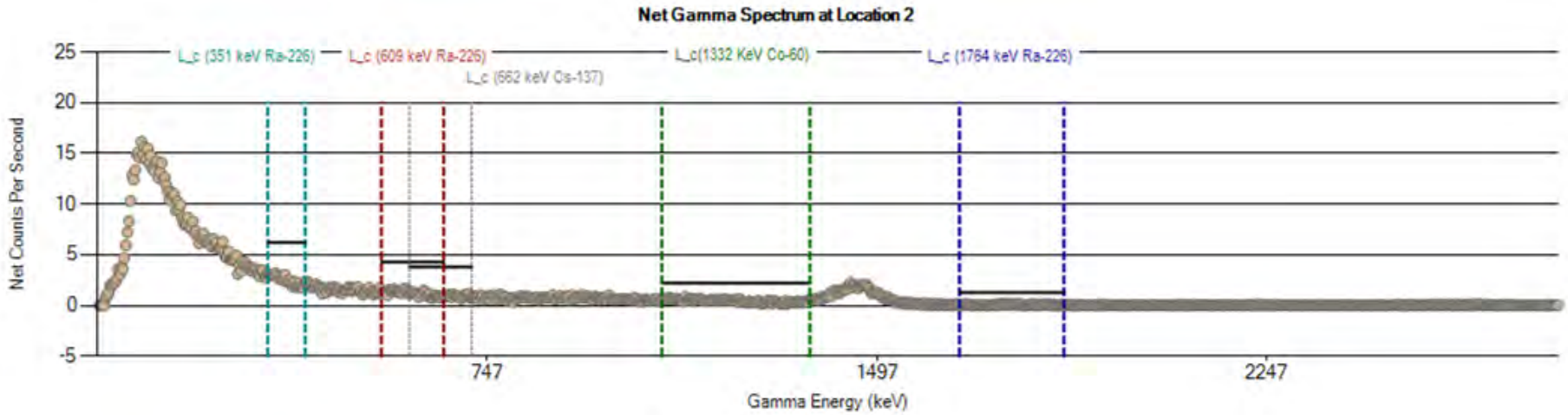
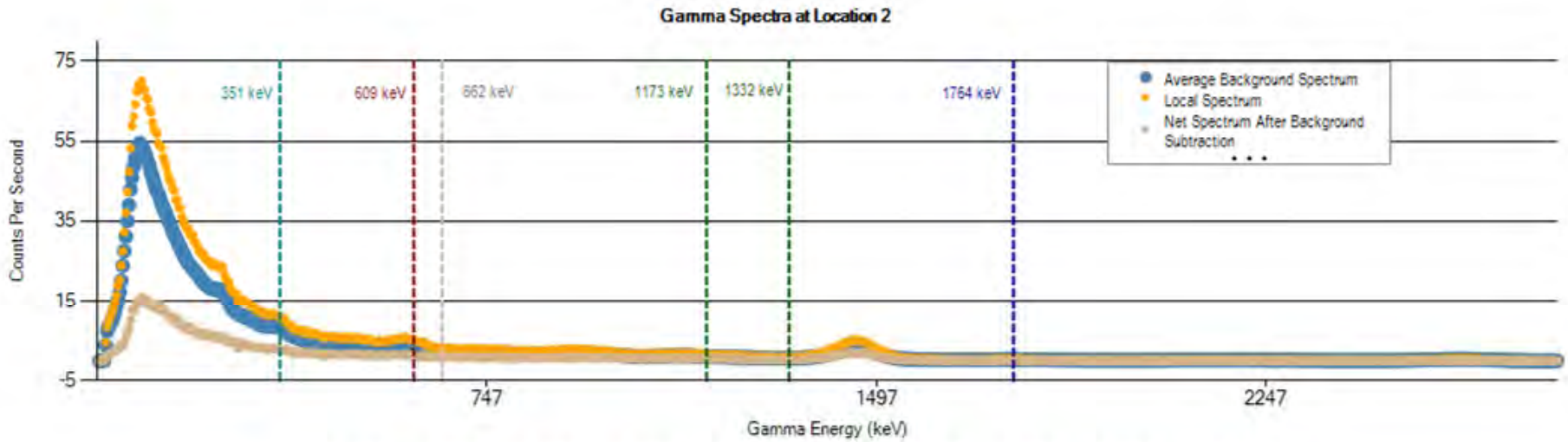


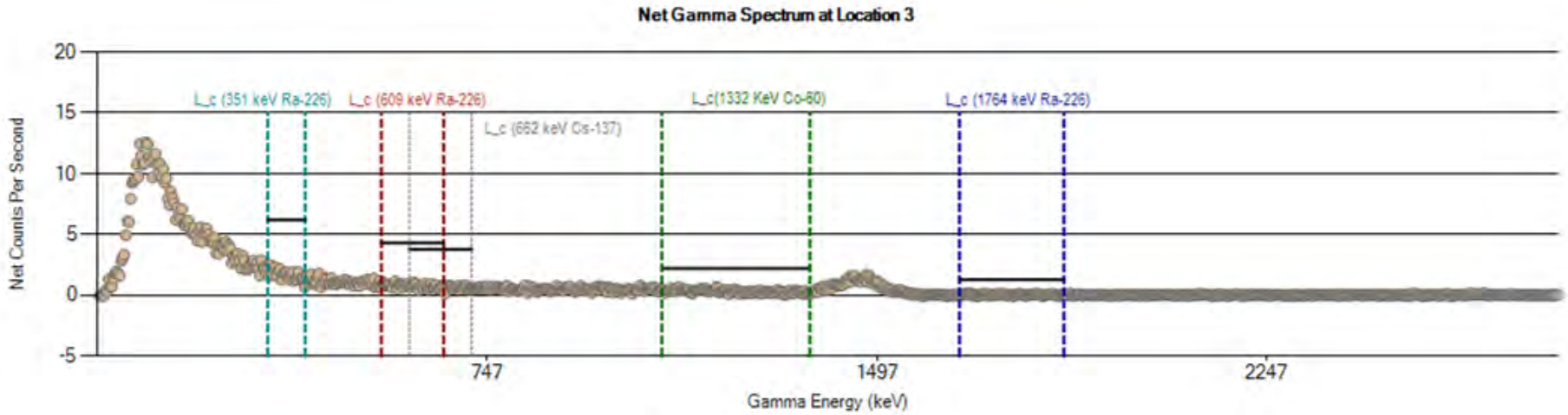


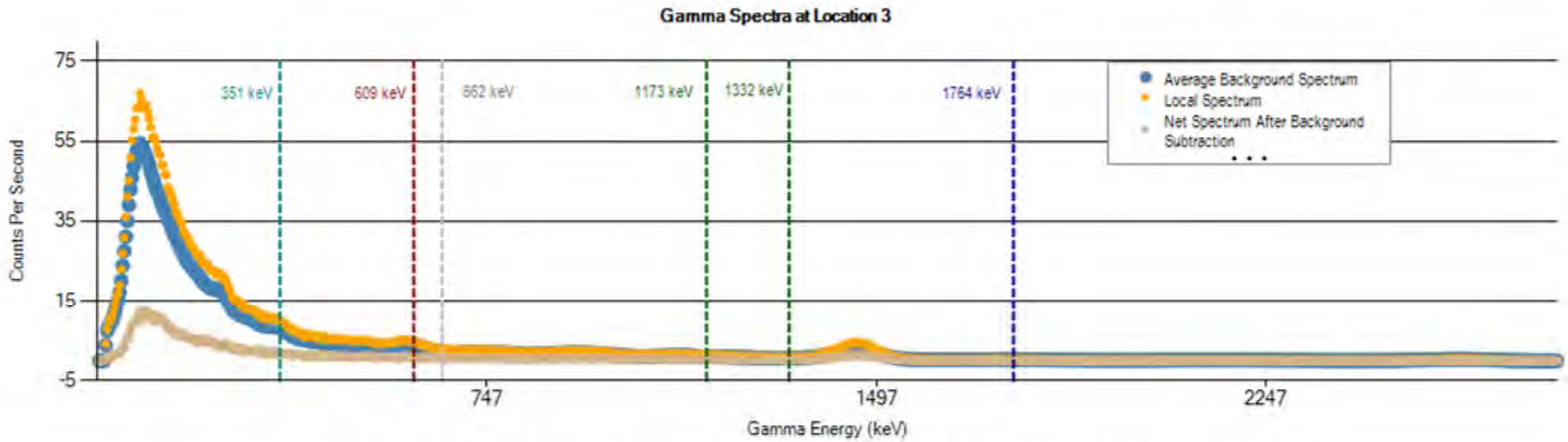
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	**1145**	**176**	25	28	199	180	140	227	**123**	**4588**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



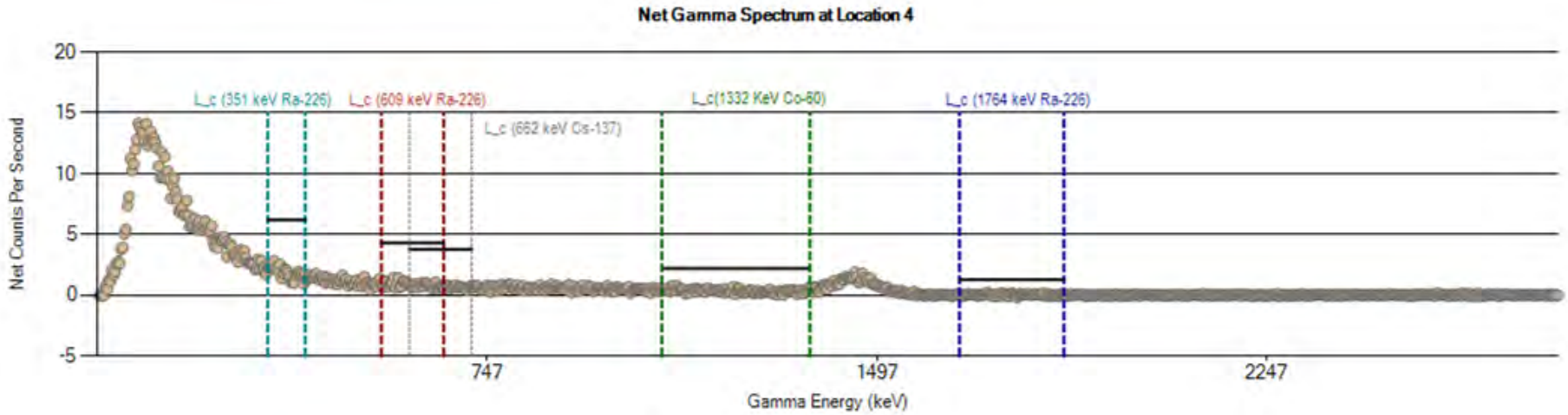


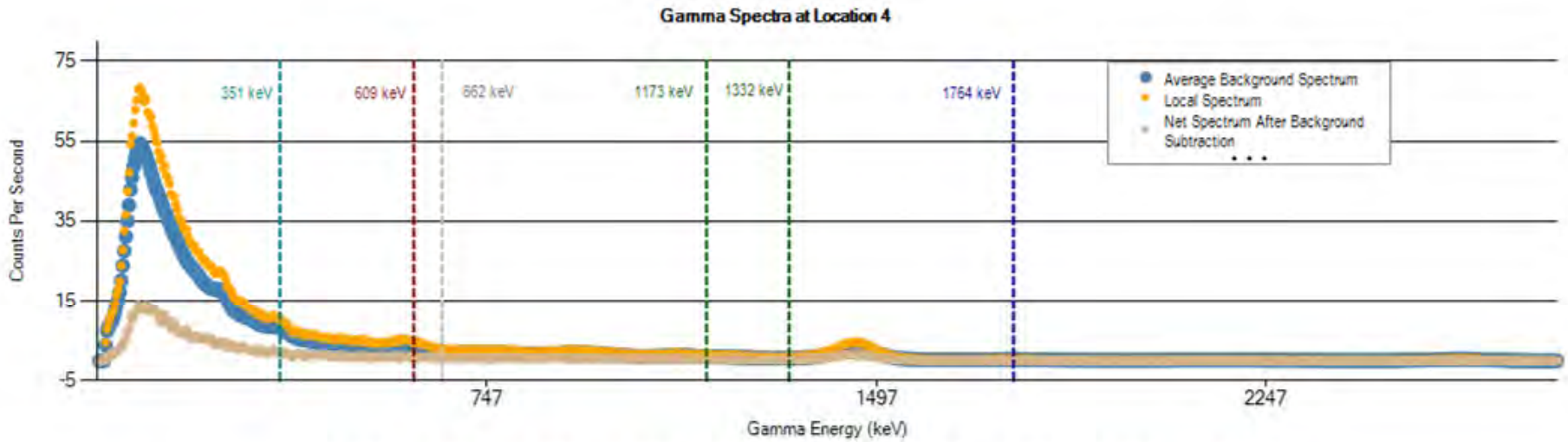
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	**1207**	**185**	25	29	**208**	**190**	**148**	**236**	**132**	**4805**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



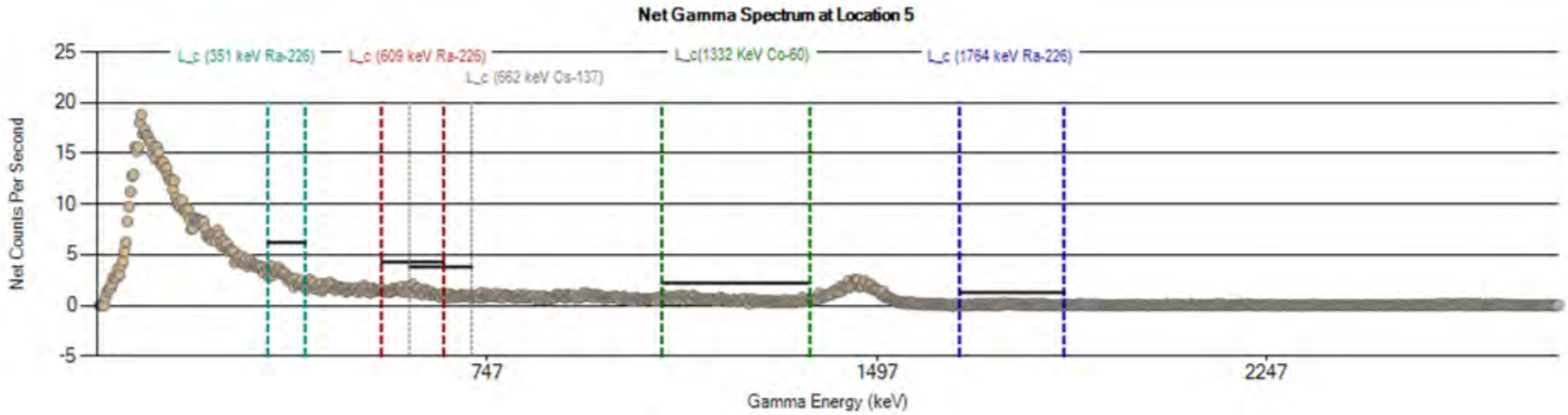


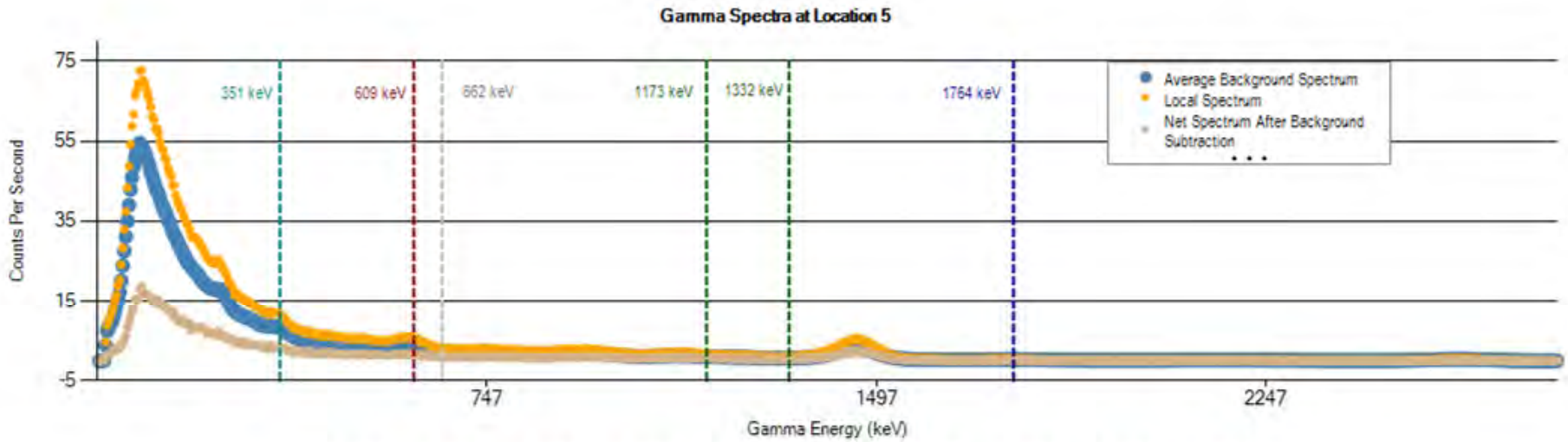
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	**1100**	**166**	24	27	190	172	135	216	120	**4474**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



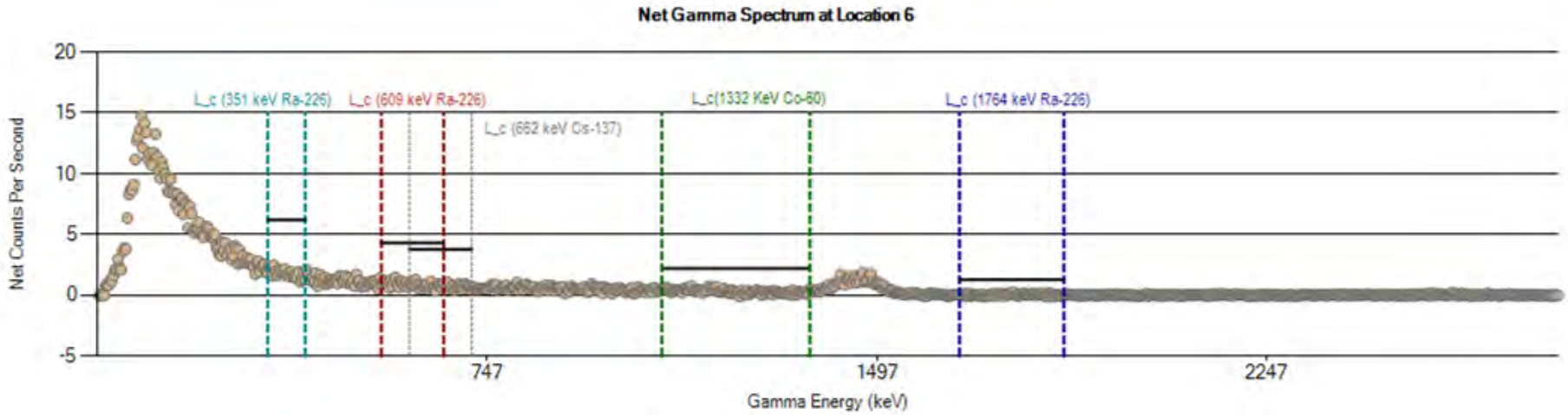


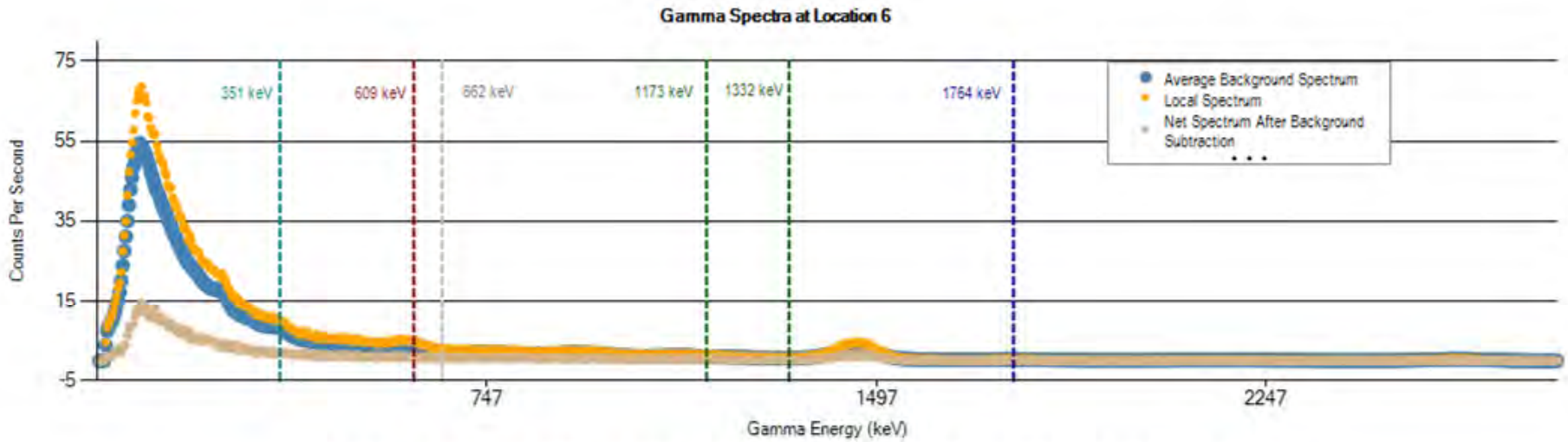
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	**1121**	**169**	23	28	192	175	137	220	**124**	**4583**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



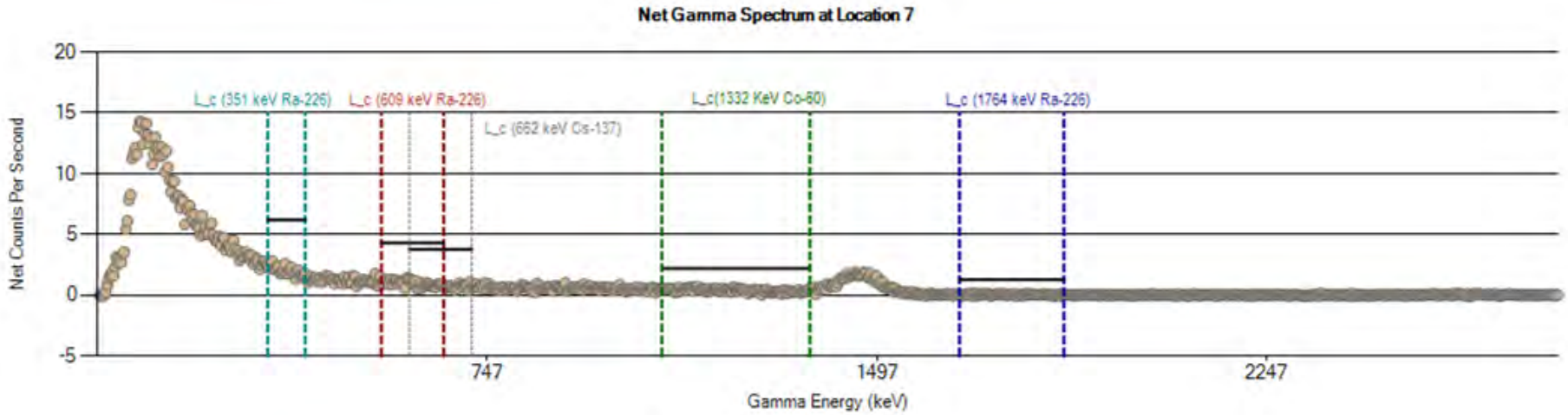


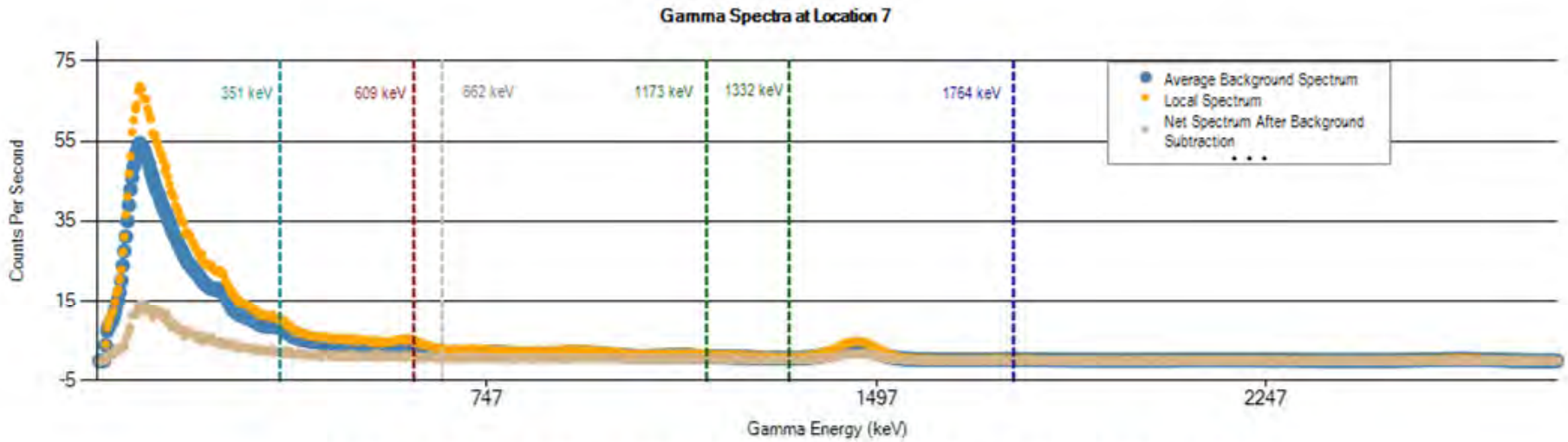
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	**1259**	**196**	26	30	**212**	**198**	**154**	**243**	**141**	**4957**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



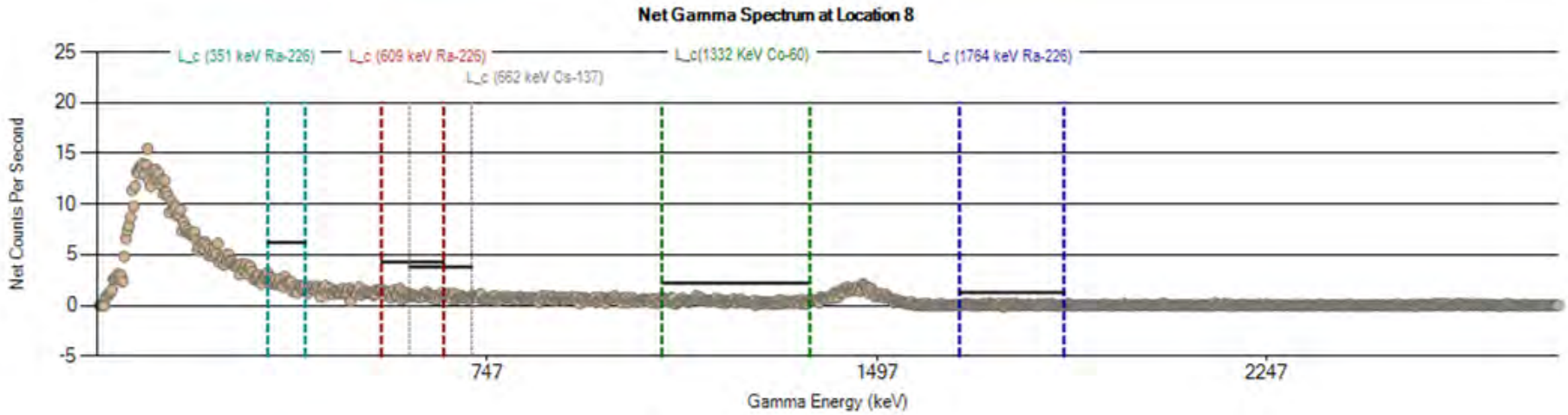


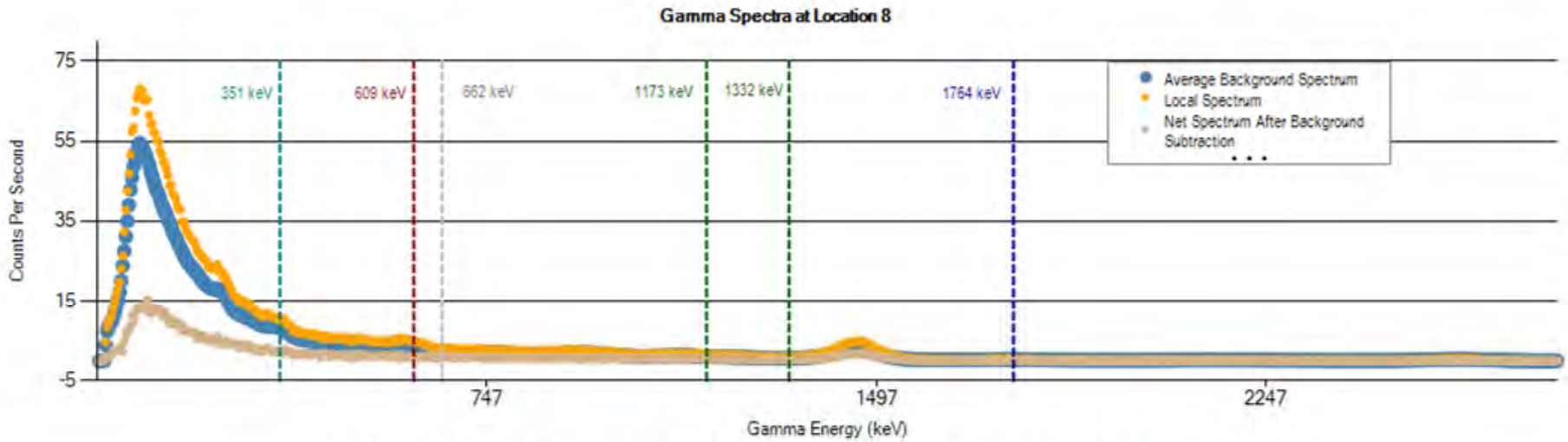
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	**1116**	**167**	23	28	195	177	139	219	120	**4542**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



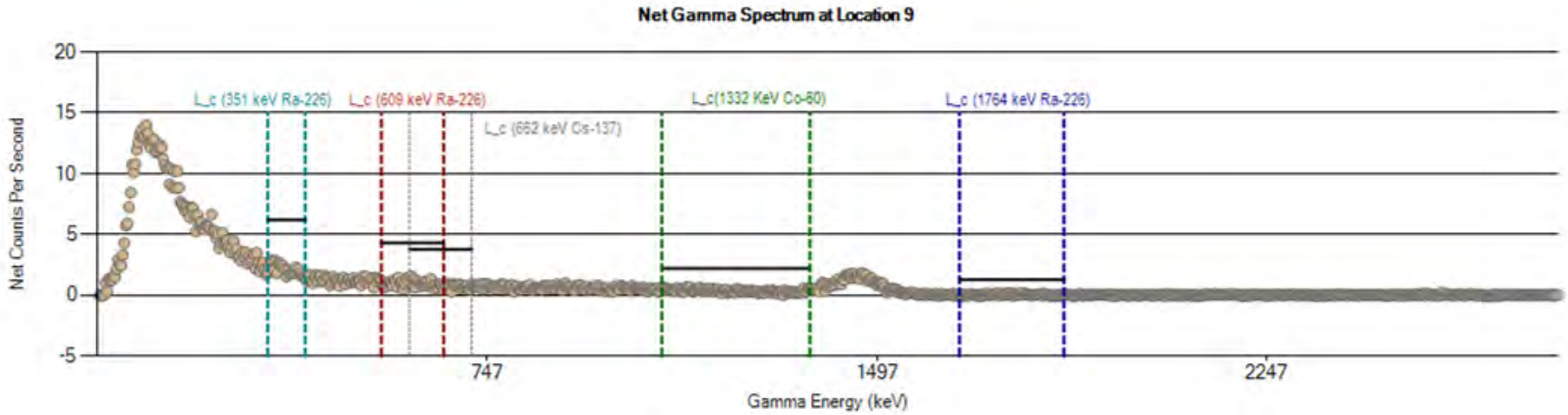


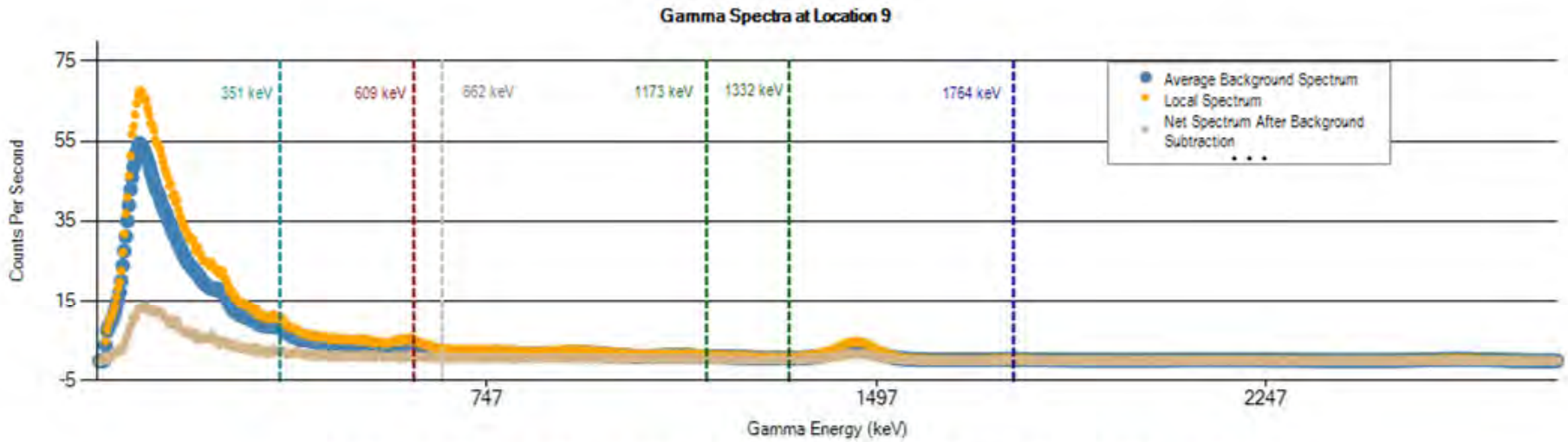
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	**1147**	**177**	24	28	197	180	140	224	**127**	**4625**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



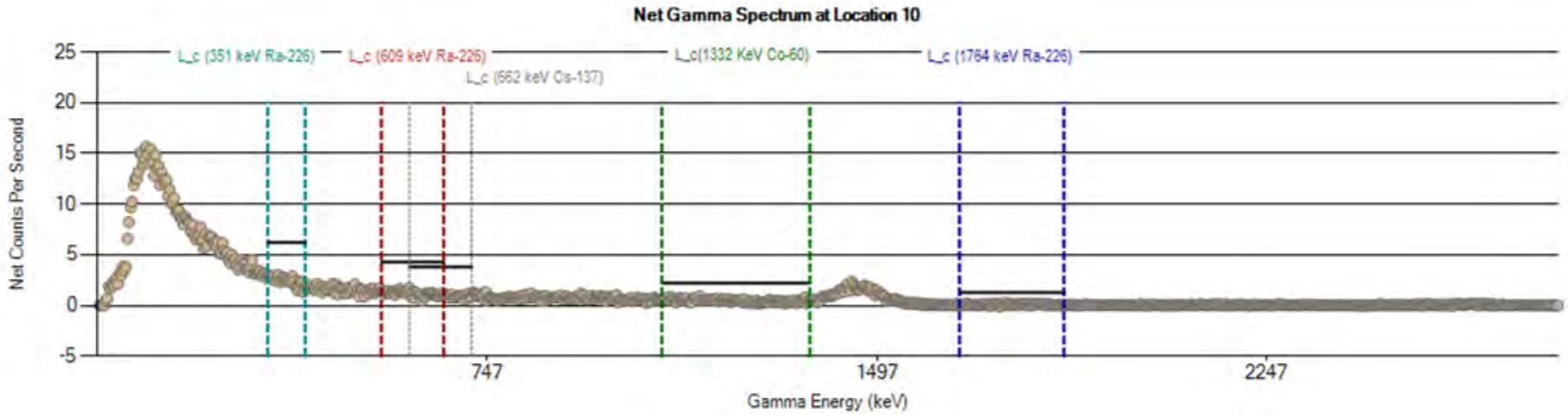


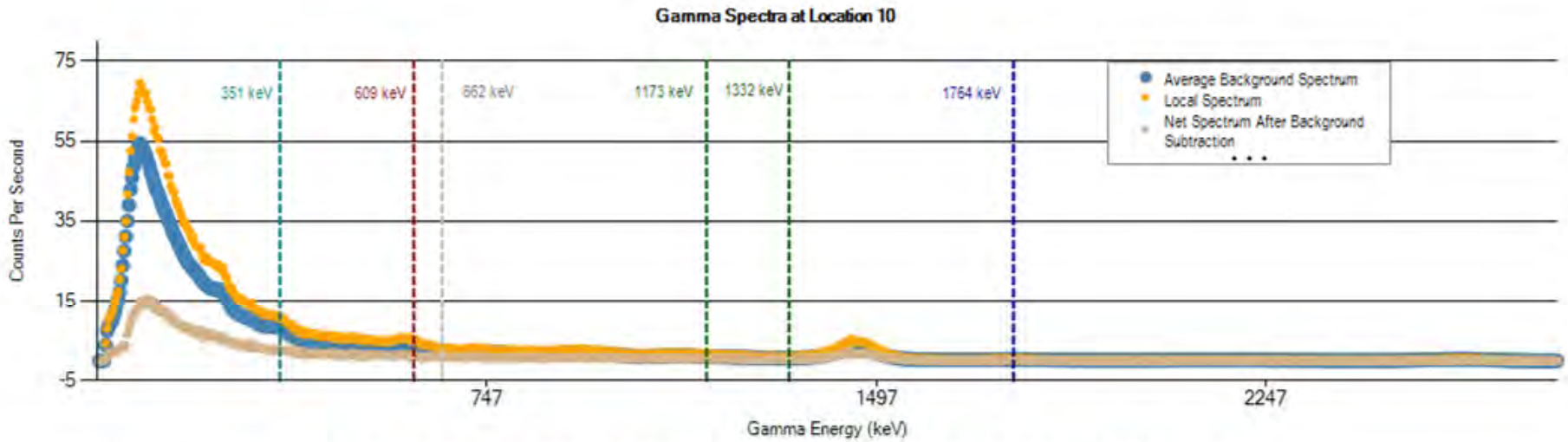
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	**1168**	**179**	24	28	**202**	183	145	226	**127**	**4684**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



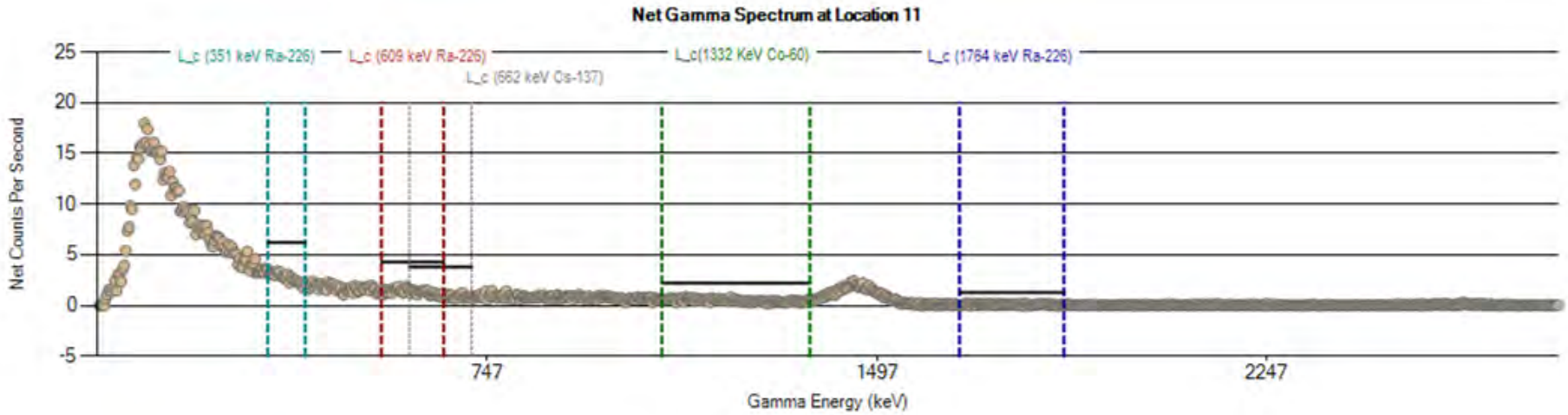


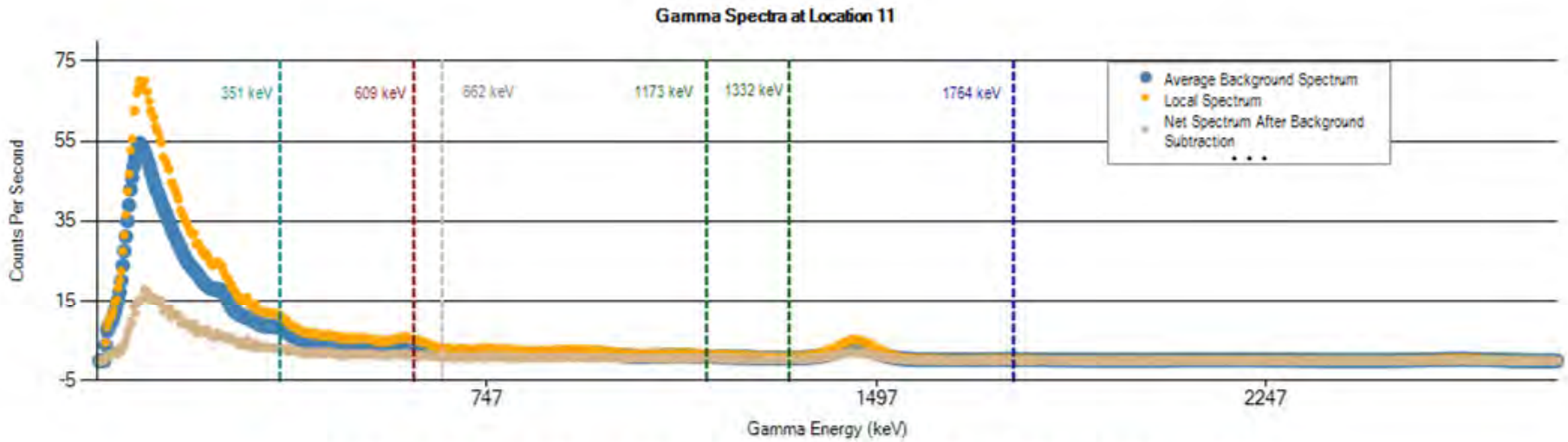
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	**1145**	**174**	24	27	196	179	141	226	**124**	**4626**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



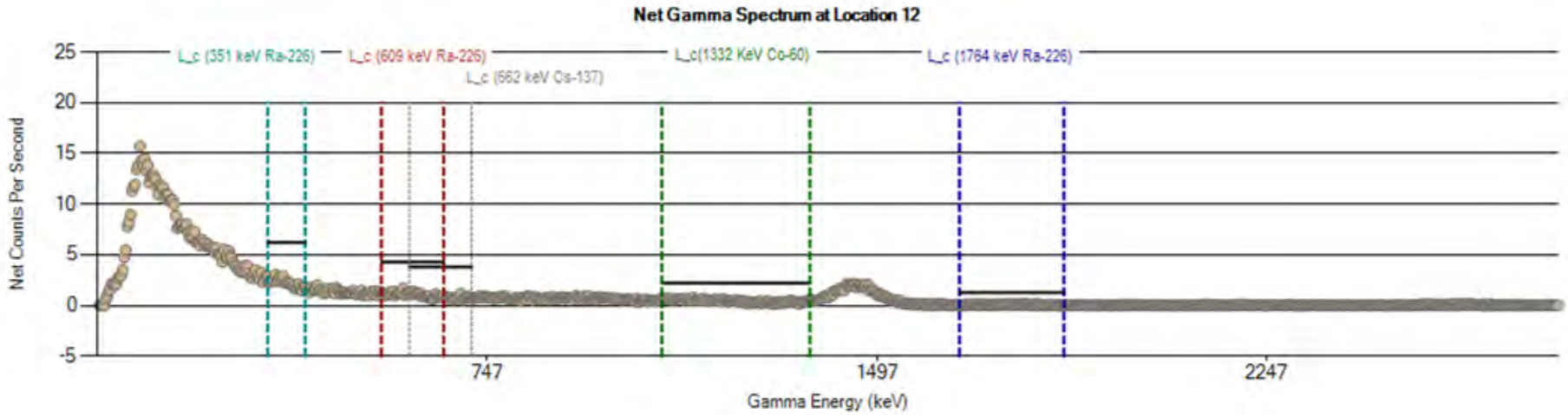


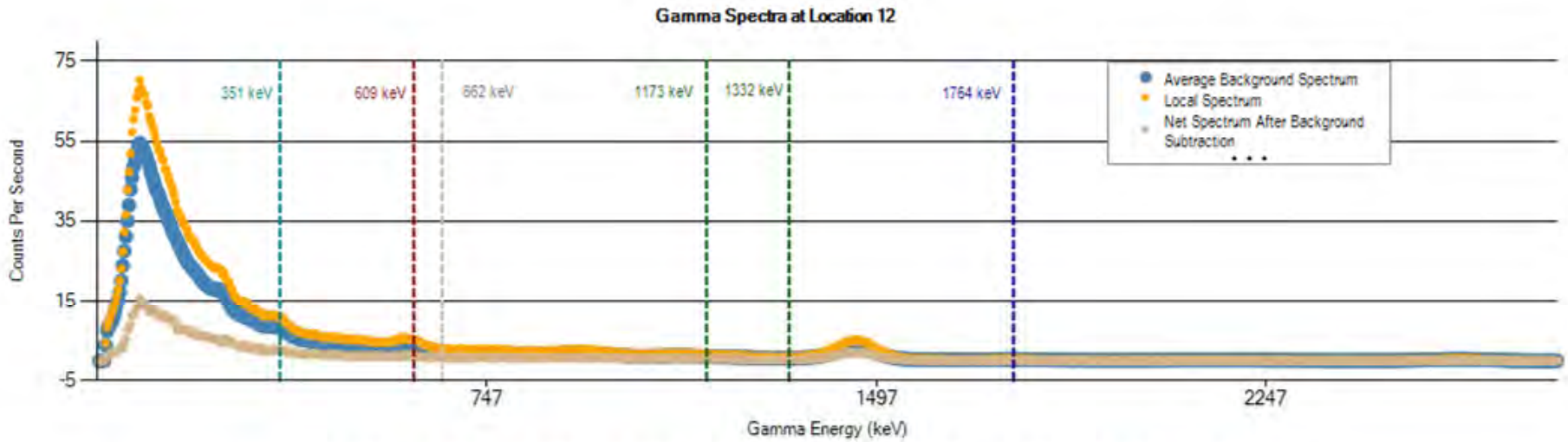
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	**1211**	**184**	26	30	**208**	189	**147**	**235**	**134**	**4787**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



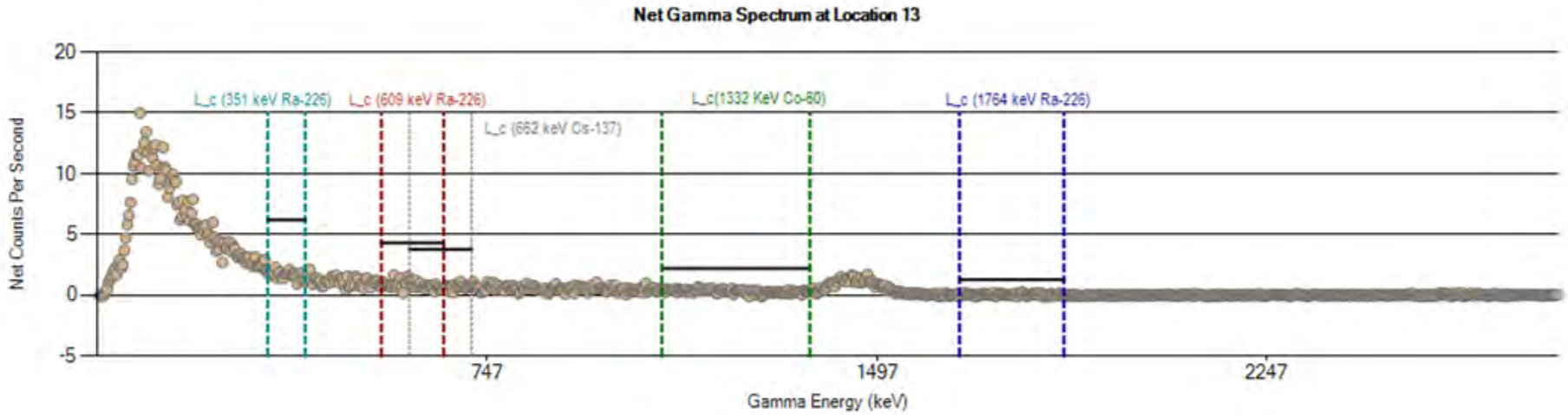


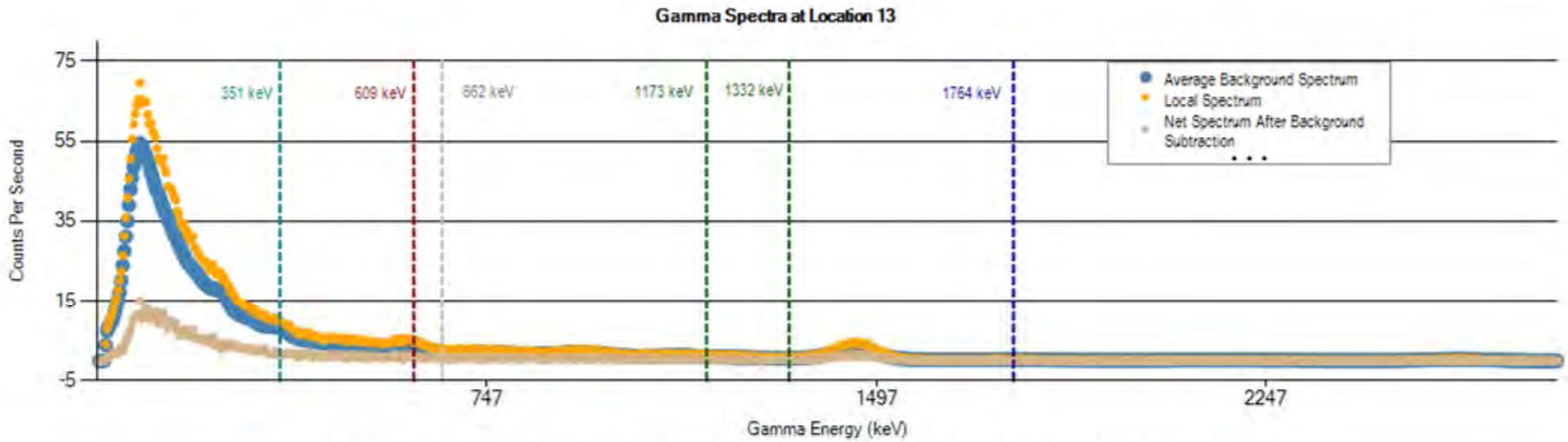
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	**1240**	**189**	26	31	**212**	**195**	**151**	**242**	**135**	**4900**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



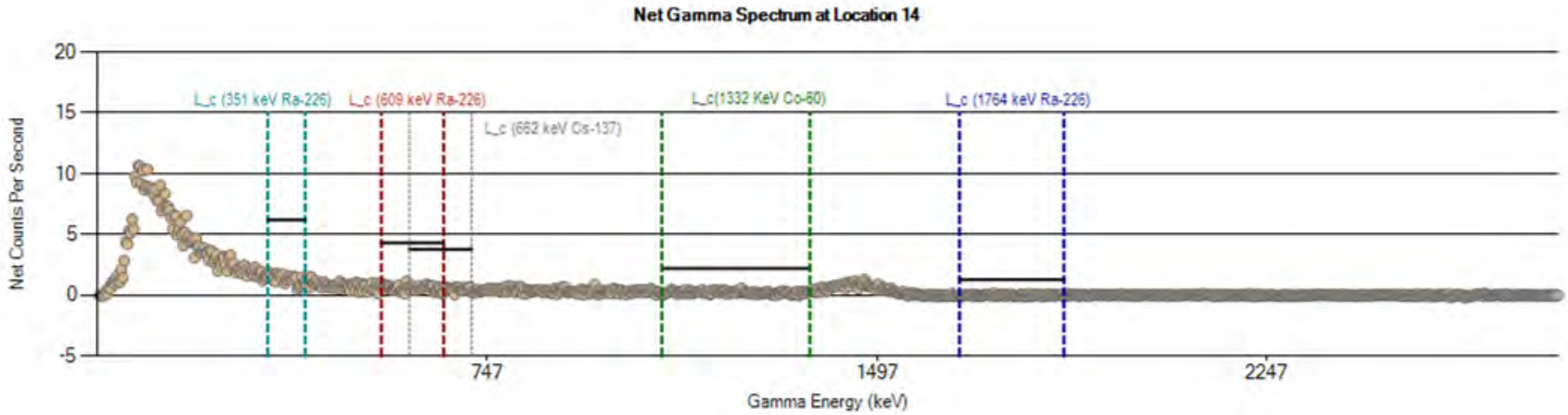


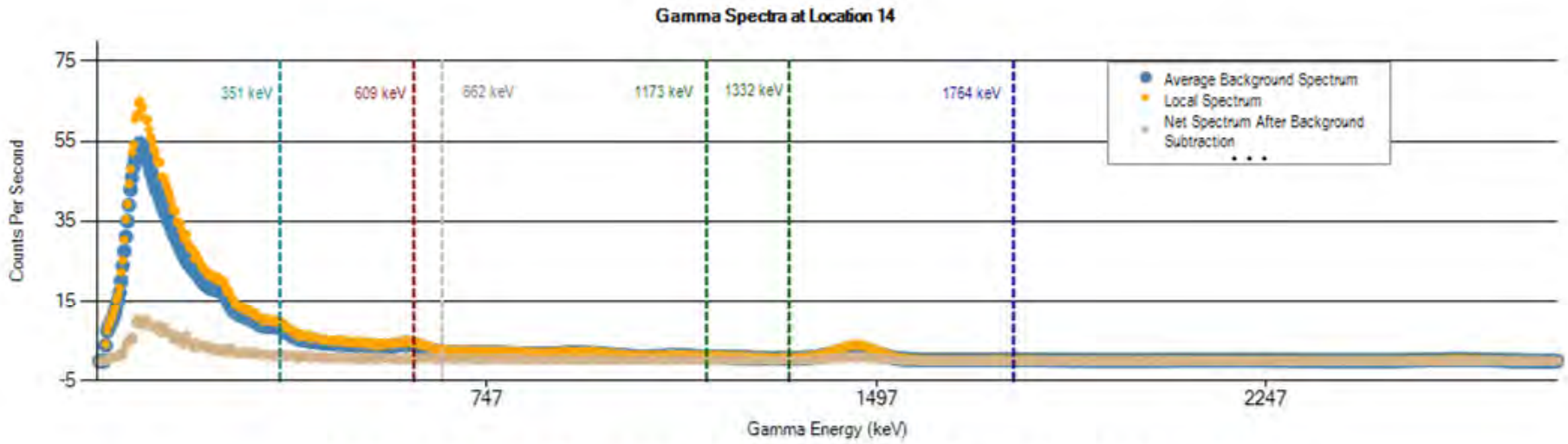
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	**1184**	**187**	25	29	199	184	143	229	**131**	**4706**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



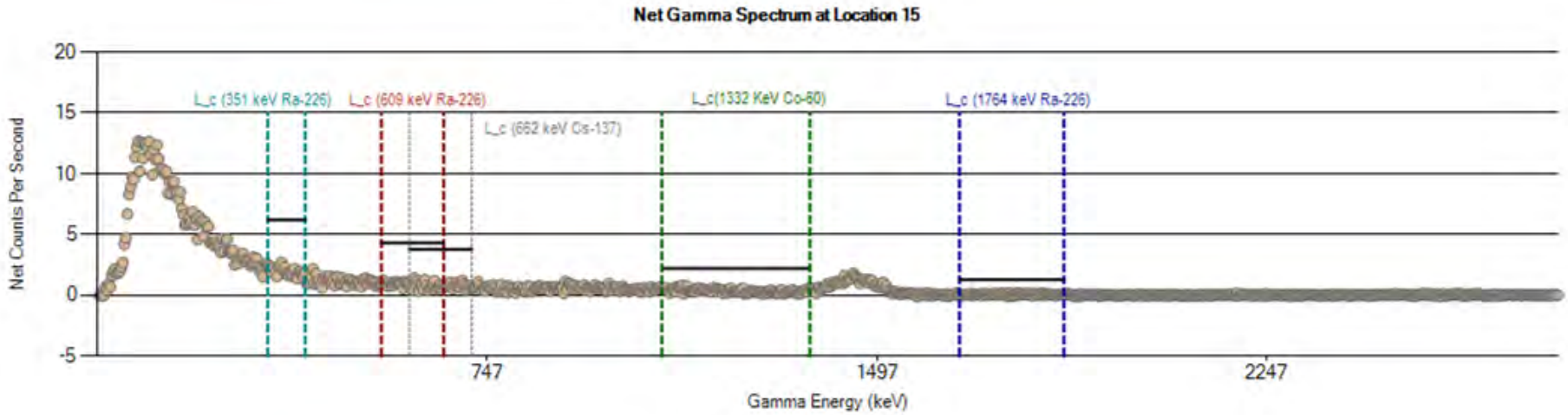


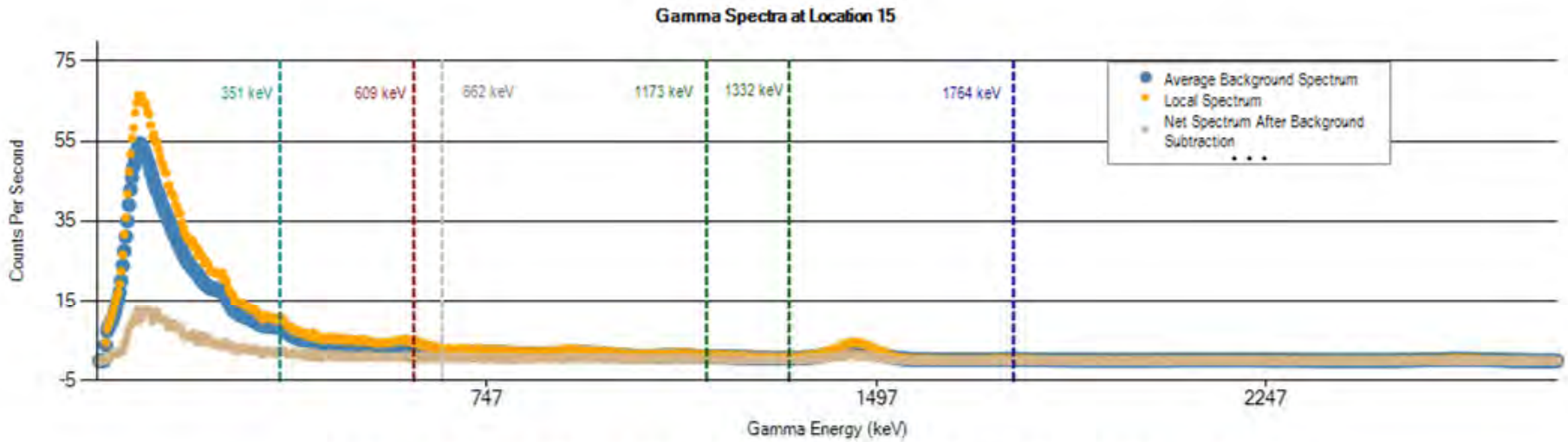
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	**1111**	**167**	24	28	192	174	138	216	120	**4539**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



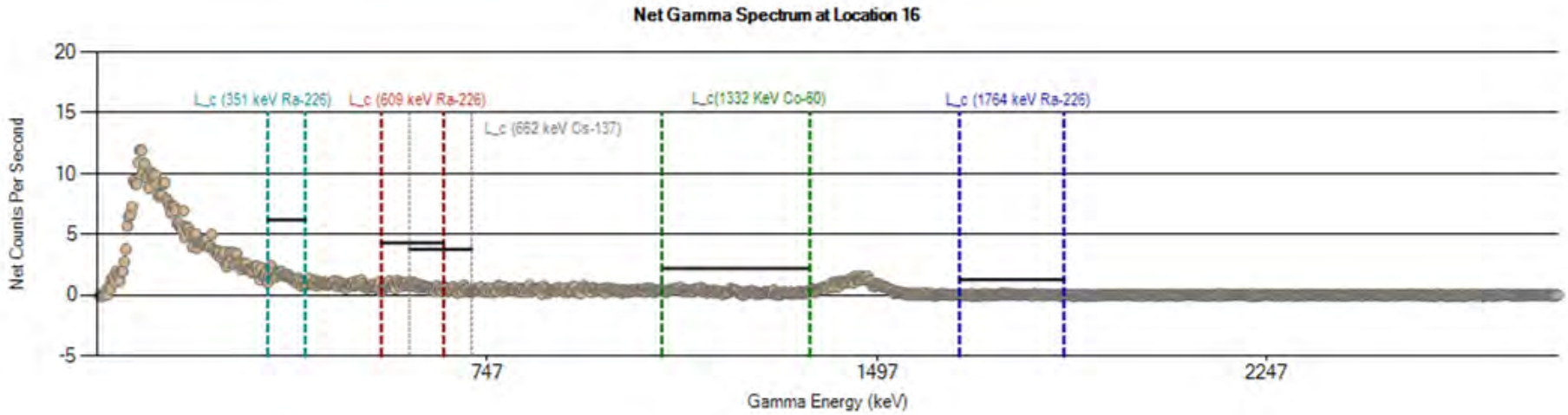


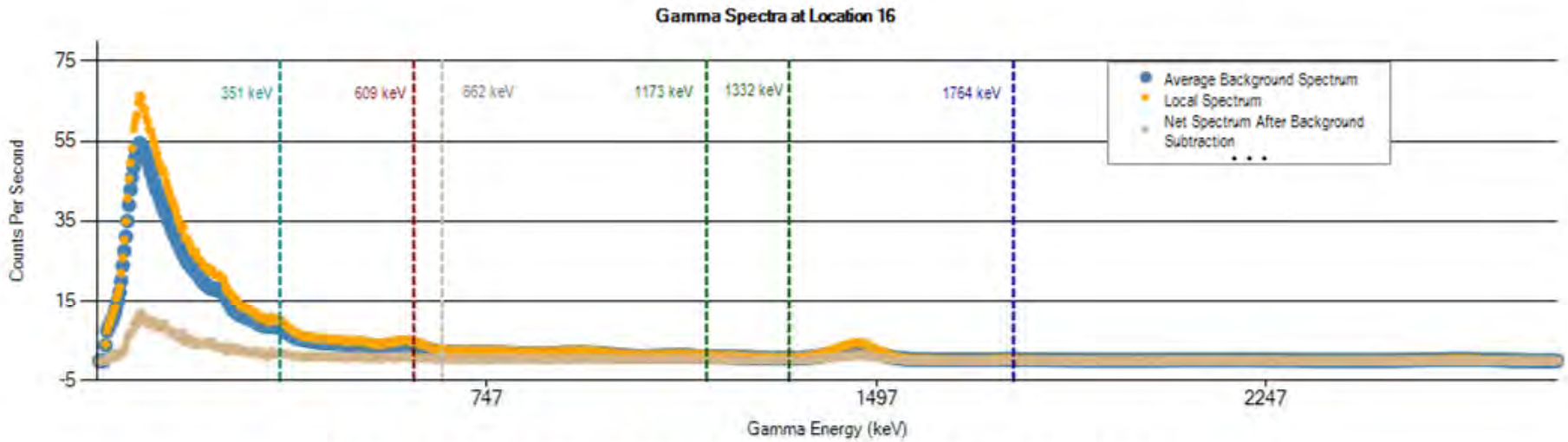
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	1028	**153**	21	24	178	164	129	208	112	**4270**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



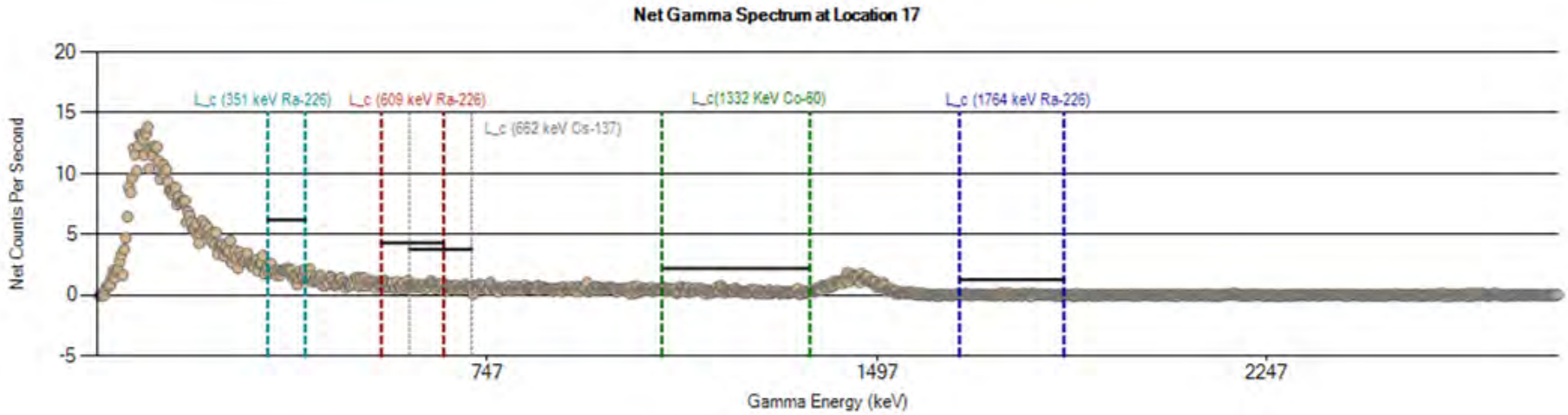


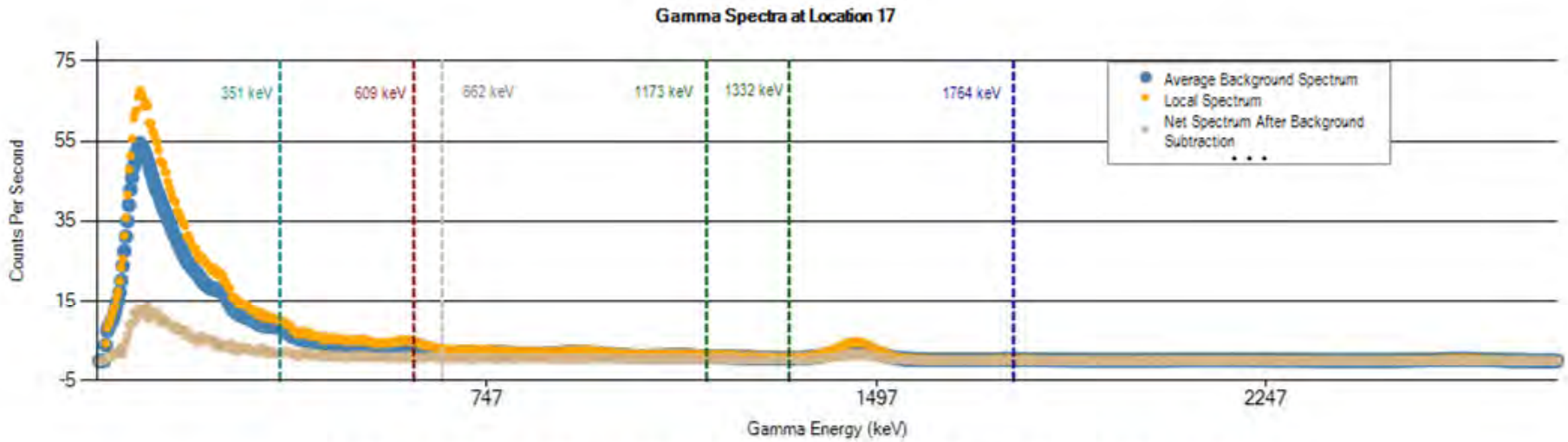
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	**1123**	**167**	25	28	193	176	140	222	**124**	**4550**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



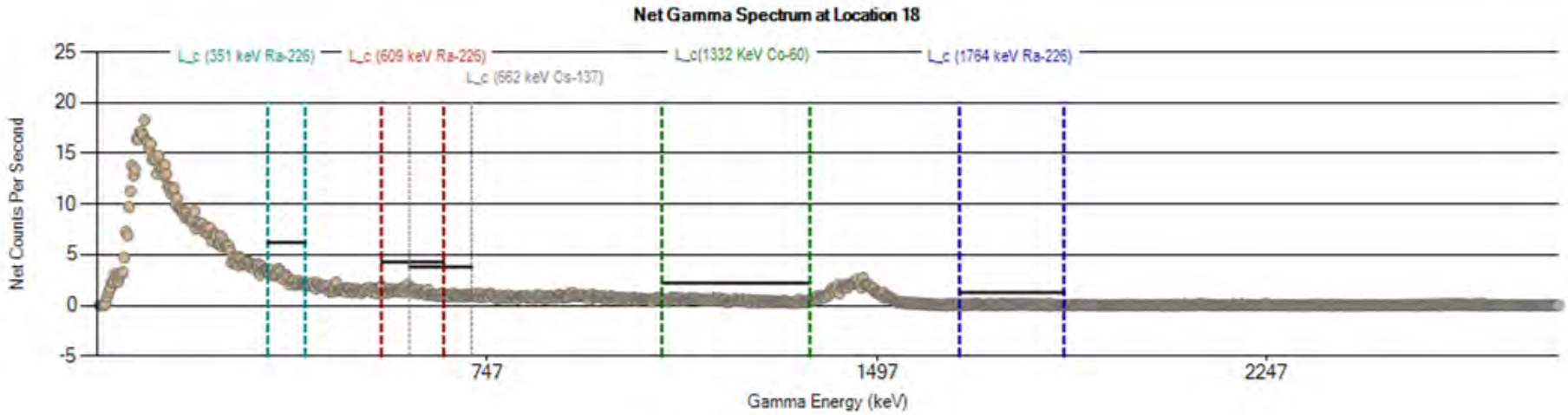


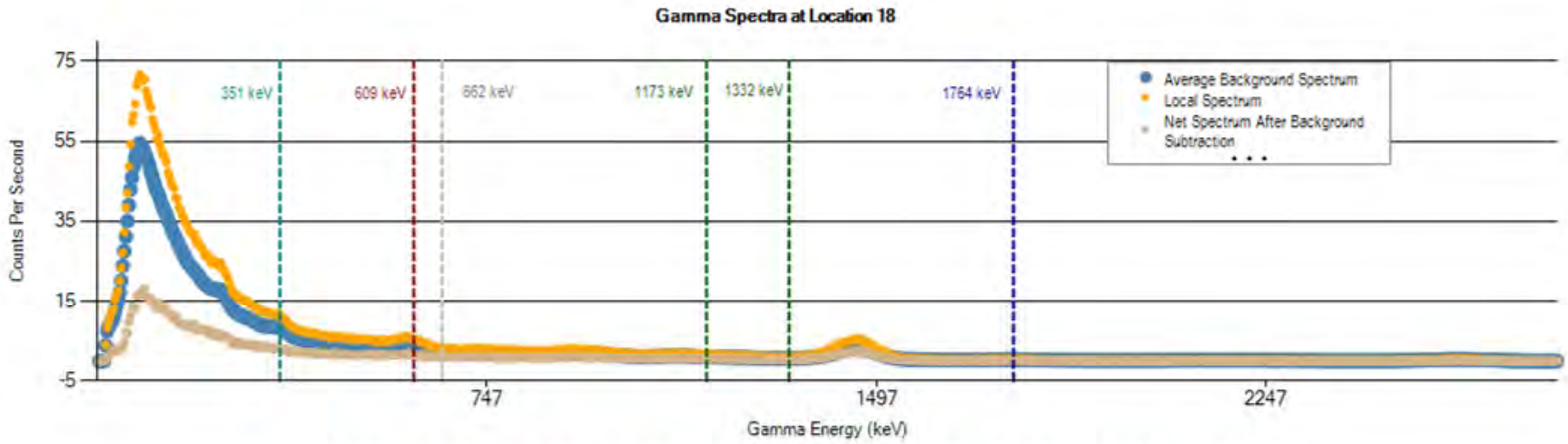
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	**1073**	**165**	23	26	184	171	131	212	117	**4379**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



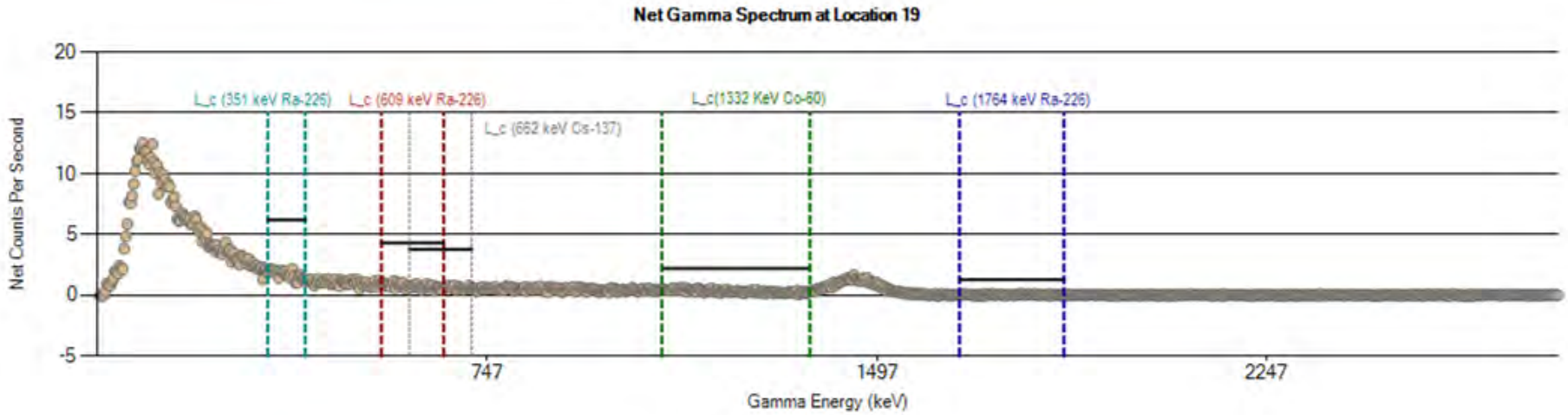


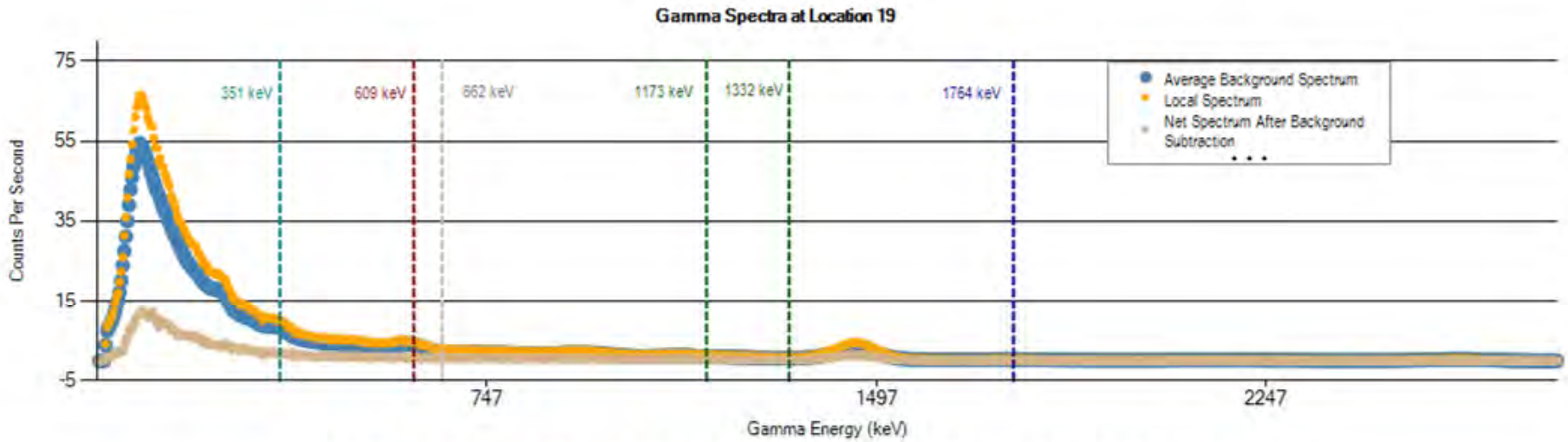
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	**1111**	**170**	23	27	191	174	137	220	**122**	**4543**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



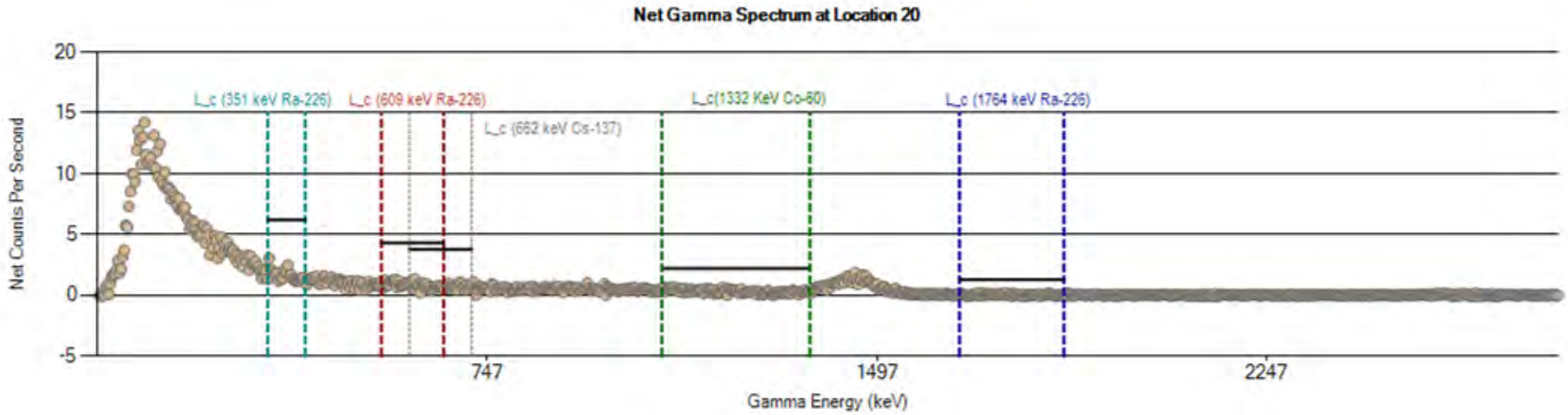


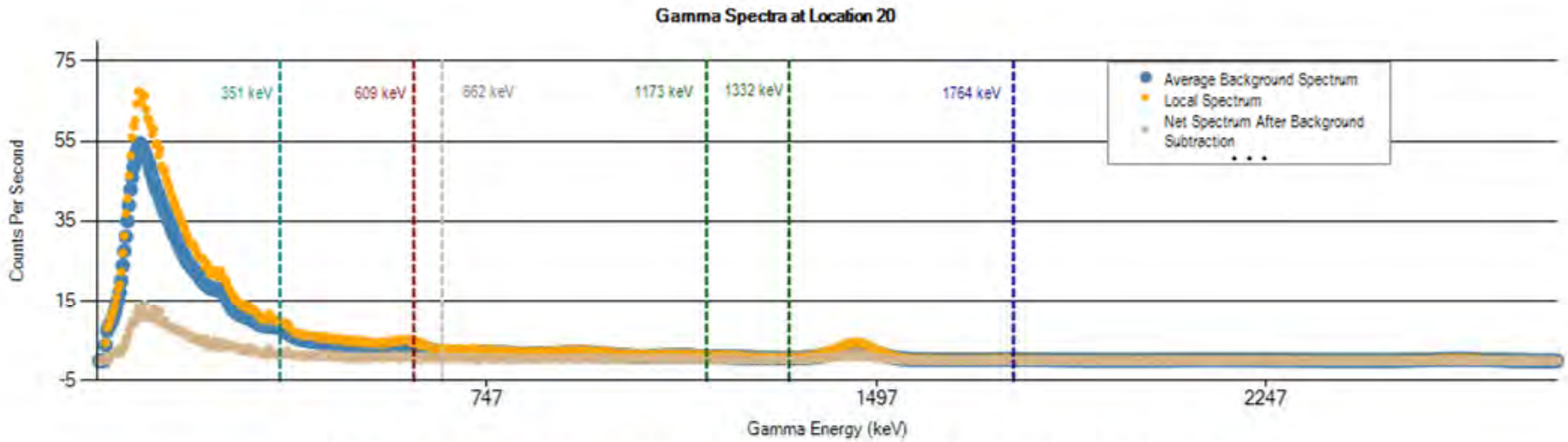
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	**1247**	**196**	26	29	**211**	**196**	**153**	**241**	**135**	**4916**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



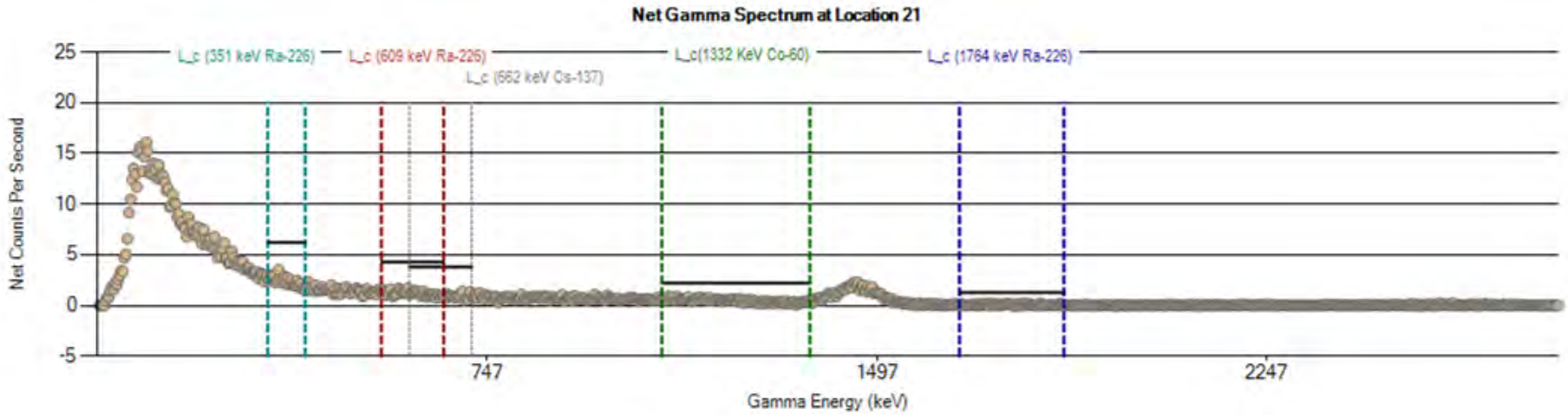


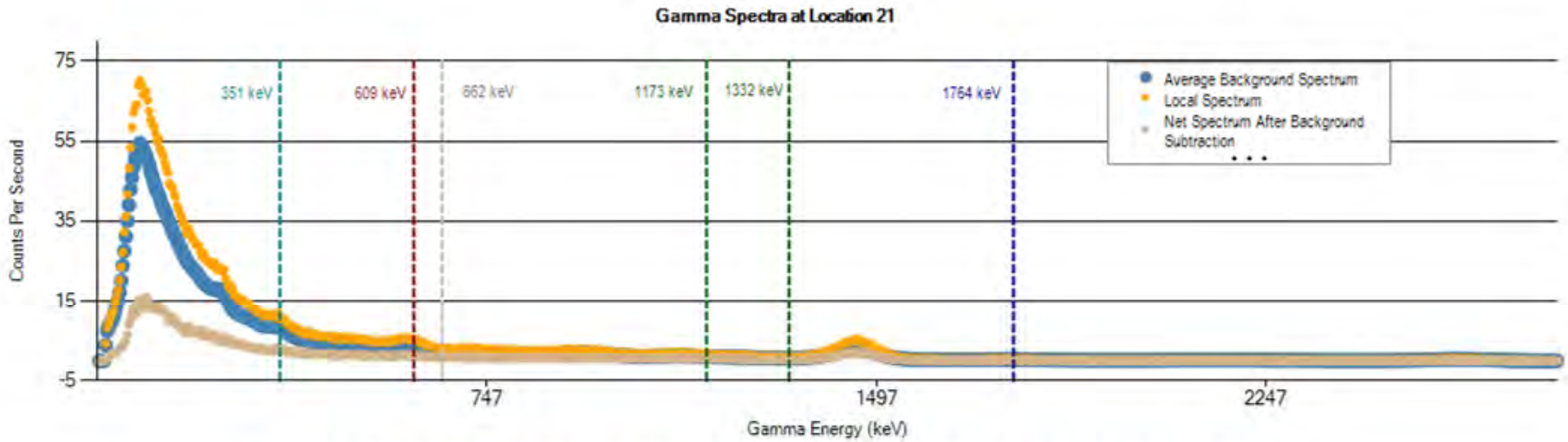
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	**1095**	**166**	23	26	189	171	134	217	120	**4473**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



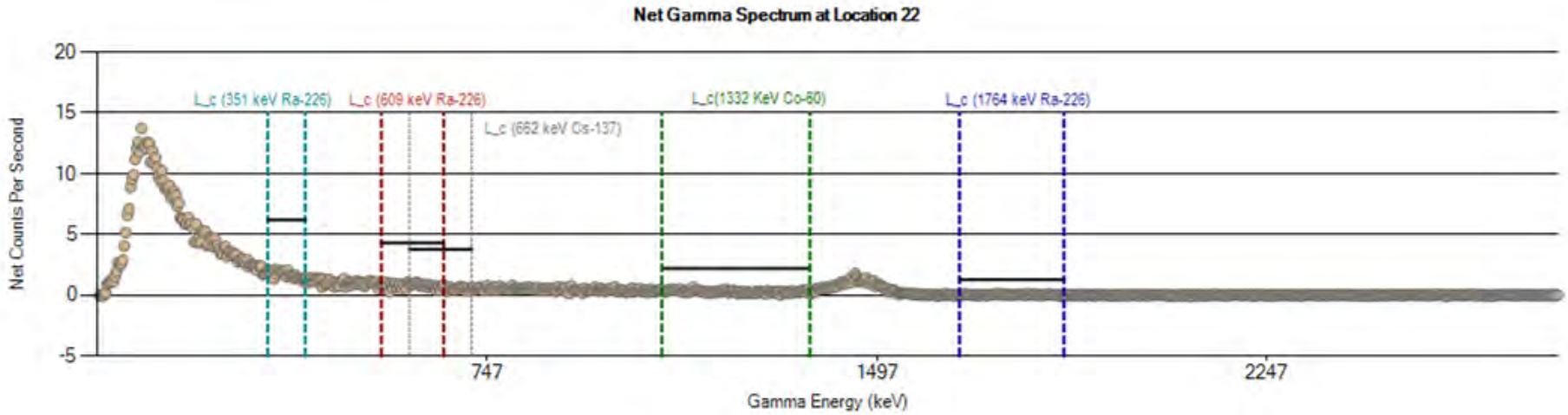


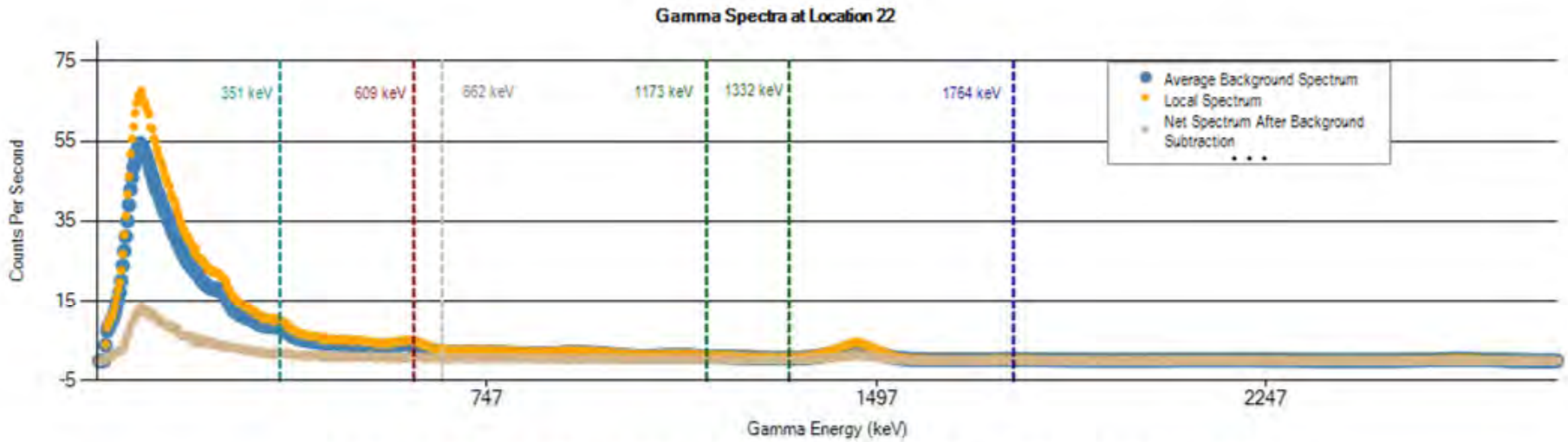
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	**1103**	**166**	23	27	189	174	137	214	120	**4503**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



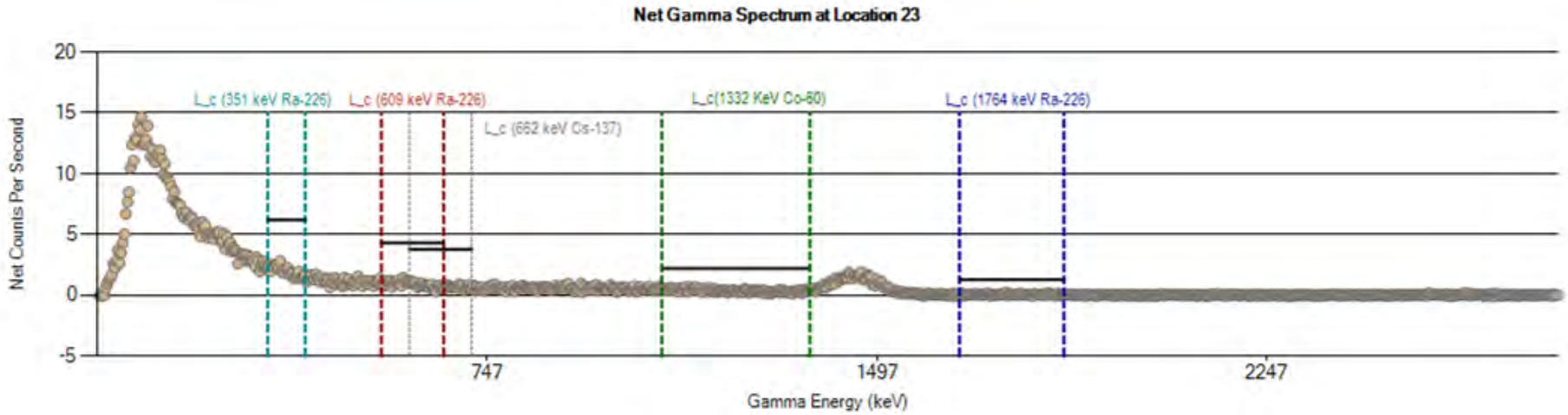


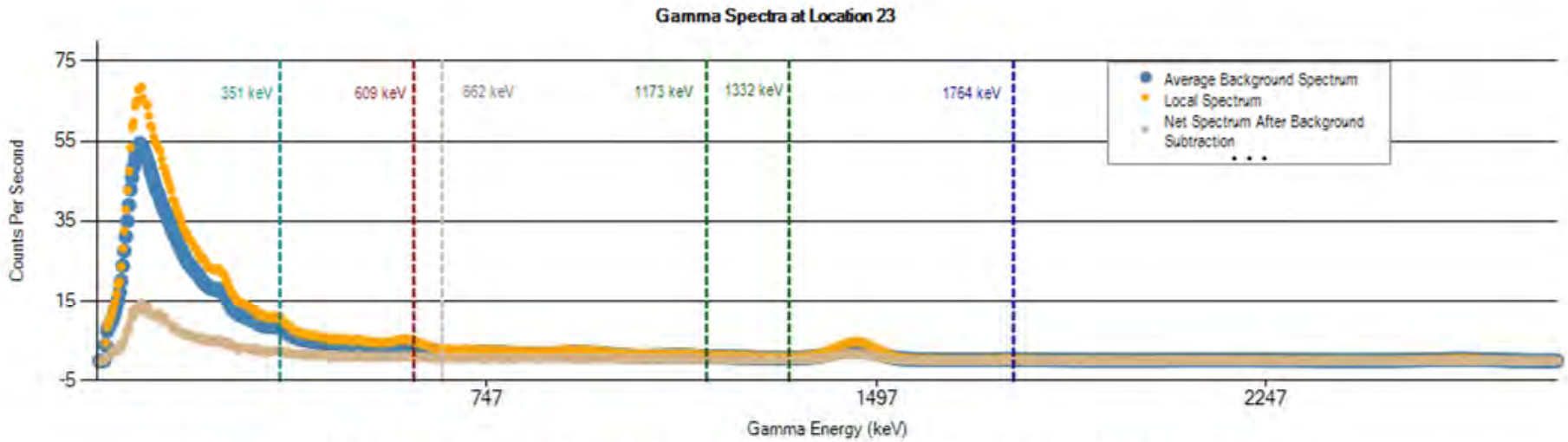
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	**1200**	**184**	25	29	**204**	188	**148**	**233**	**133**	**4767**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



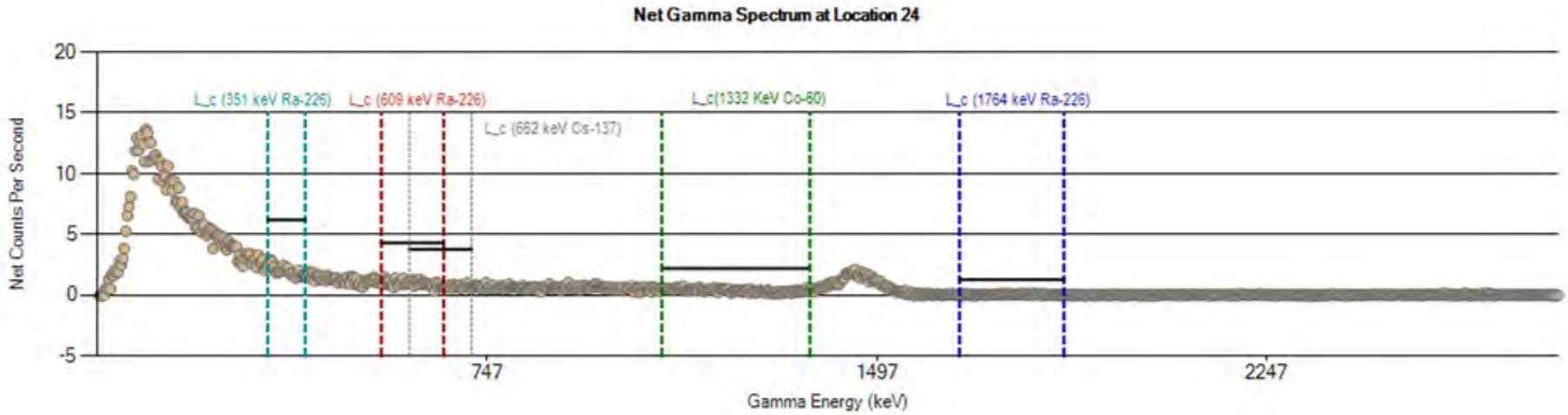


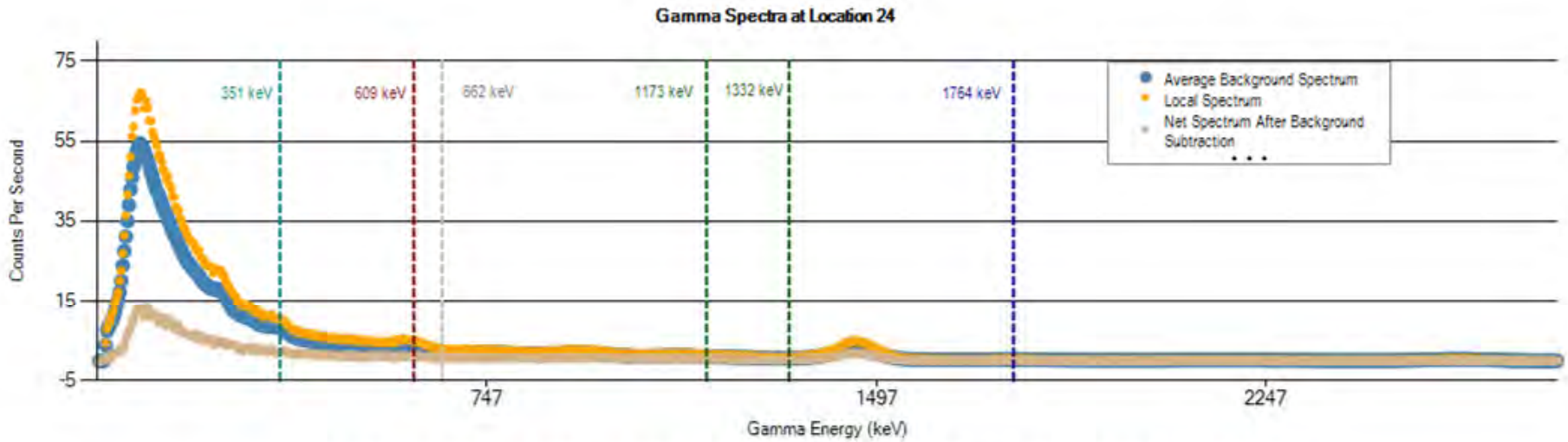
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	**1086**	**163**	23	26	189	173	135	216	118	**4477**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



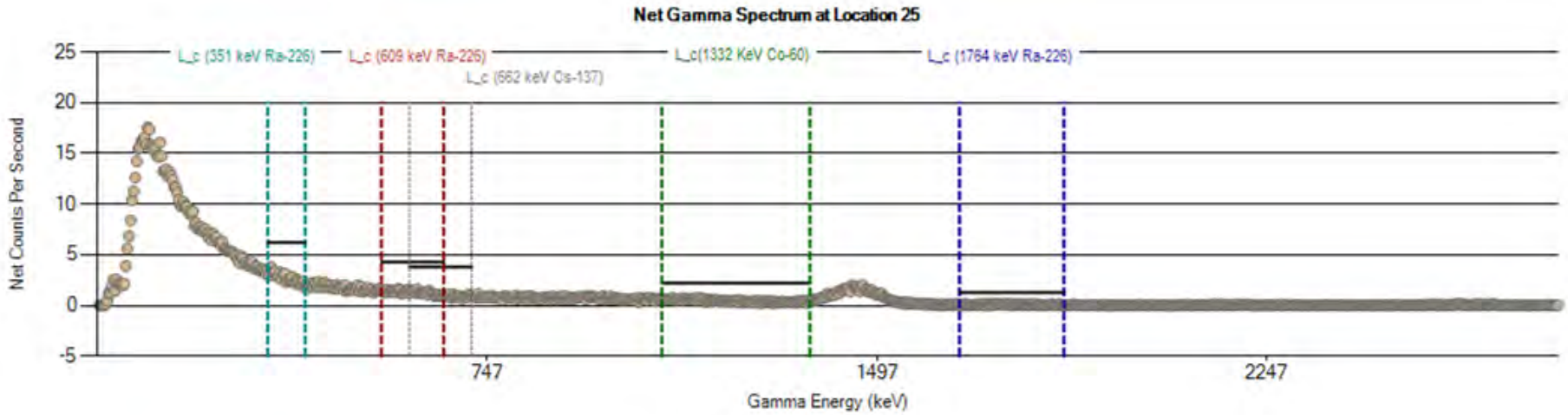


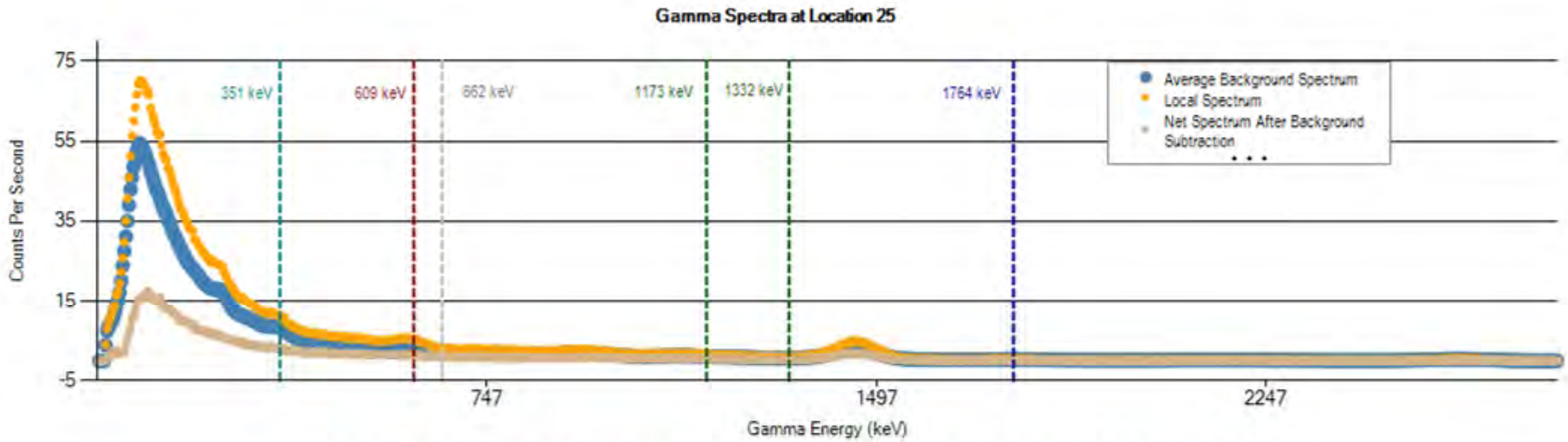
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 23 (cps)	**1133**	**176**	25	27	192	177	138	223	**125**	**4603**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



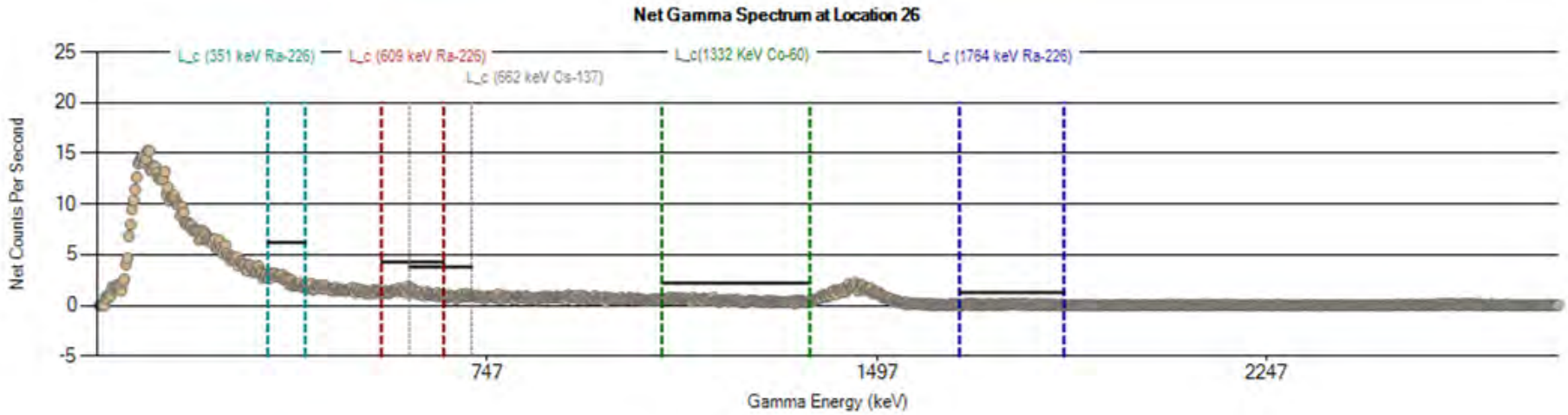


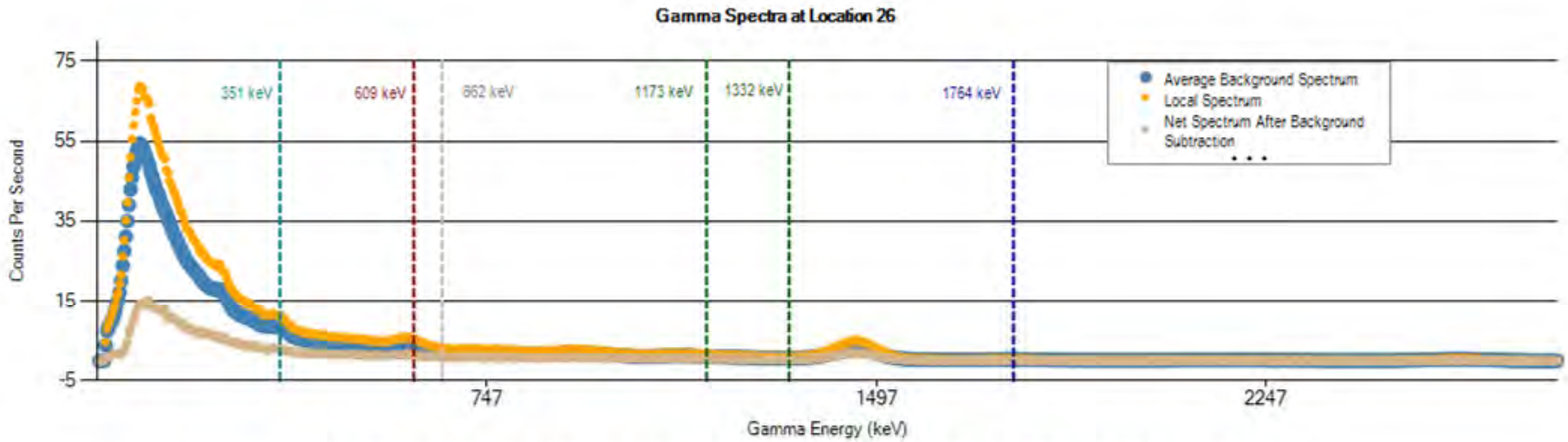
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 24 (cps)	**1156**	**178**	24	29	196	180	141	224	**127**	**4604**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255





	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 25 (cps)	**1219**	**181**	26	29	**213**	**193**	**151**	**241**	**132**	**4879**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255





	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 26 (cps)	**1217**	**185**	26	30	**207**	**193**	**150**	**236**	**134**	**4786**
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

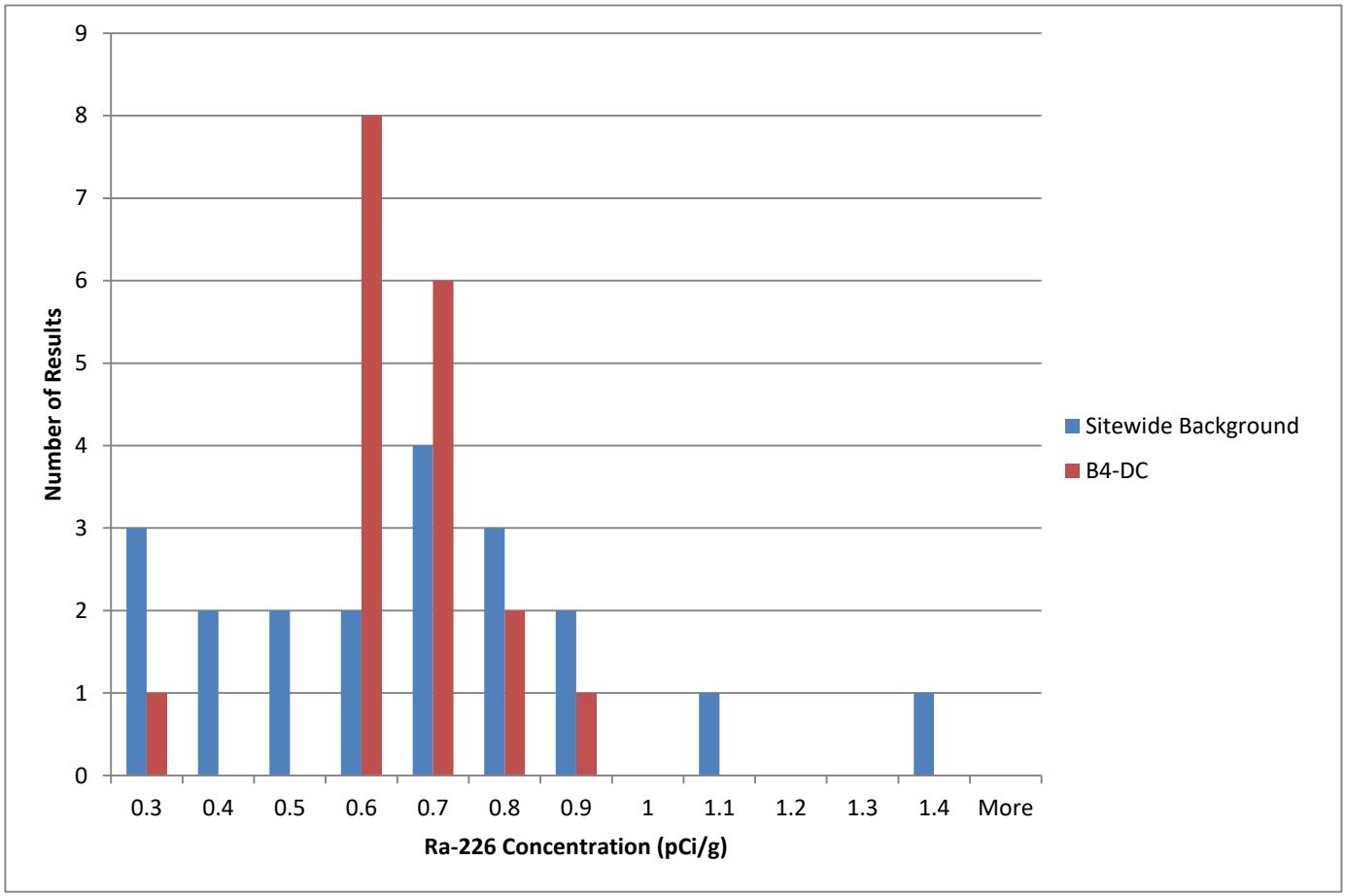
Histogram, RSY B4 (DC) vs. Sitewide Background

Background

Bin	*Frequency*
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

B4-DC

Bin	*Frequency*
0.3	1
0.4	0
0.5	0
0.6	8
0.7	6
0.8	2
0.9	1
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



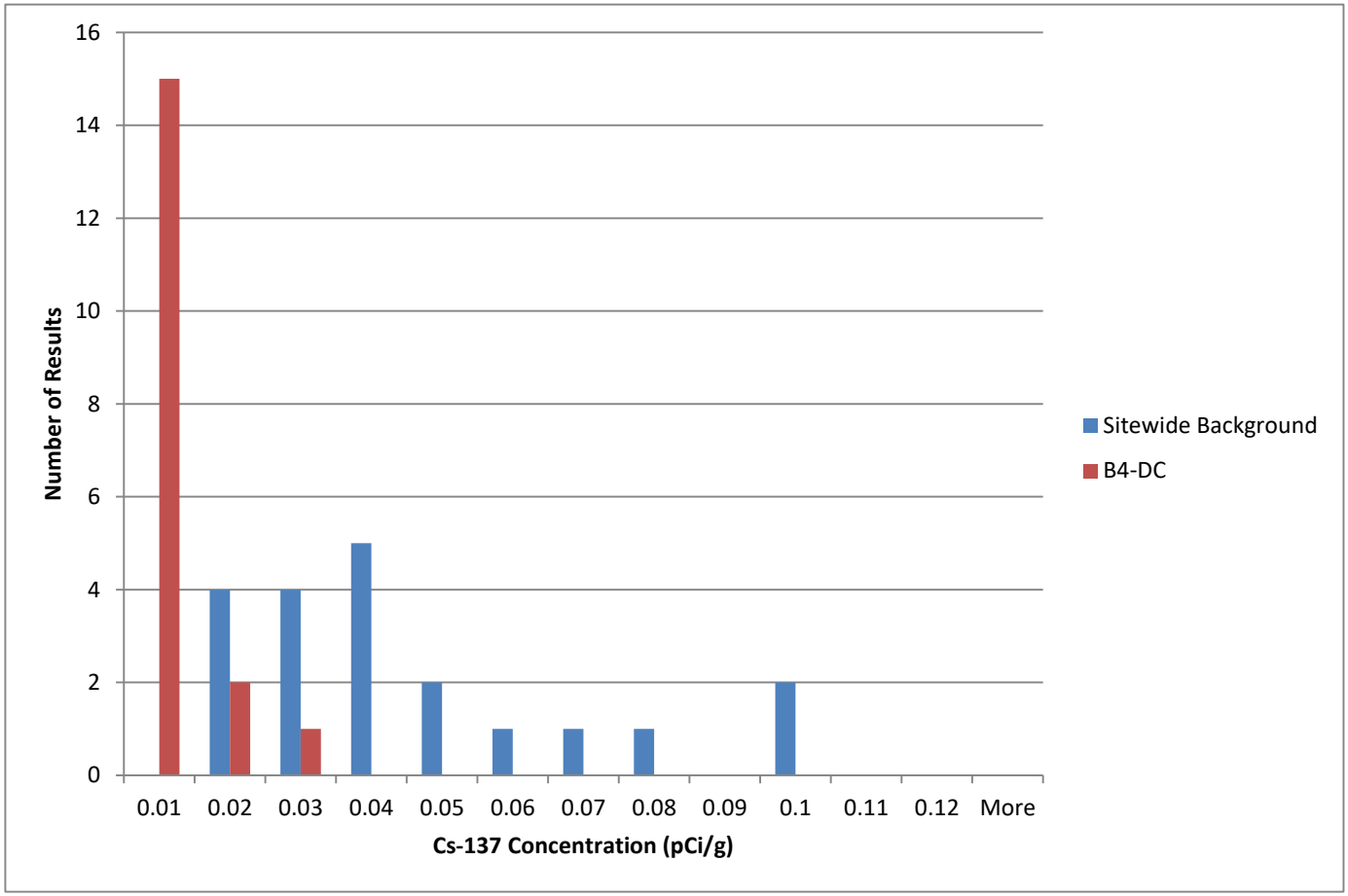
Histogram, RSY B4 (DC) vs. Sitewide Background

Background

Bin	*Frequency*
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

B4-DC

Bin	*Frequency*
0.01	15
0.02	2
0.03	1
0.04	0
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

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

TestAmerica Job ID: 160-31049-2
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

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

Attn: Eddie Kalombo

Micha Korrinhizer

Authorized for release by:
10/30/2018 10:46:40 AM
Micha Korrinhizer, Project Management Assistant II
(314)298-8566
micha.korrinhizer@testamericainc.com

Designee for

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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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Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Job ID: 160-31049-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-31049-2

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.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. 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.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup
Method 3665A: Sulfuric Acid/Permanganate Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Job ID: 160-31049-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

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

RECEIPT
The samples were received on 10/02/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0° C.

TOTAL BETA STRONTIUM (GFPC)
Samples PE2-RSYB4-DC-S001 (160-31049-1) and PE2-RSYB4-DC-S011 (160-31049-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/02/2018, prepared on 10/07/2018 and analyzed on 10/25/2018.

The following samples in batch 160-393536 could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYB4-DC-S001 (160-31049-1) and PE2-RSYB4-DC-S011 (160-31049-11). The samples contained detritus material and 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 PE2-RSYB4-DC-S001 (160-31049-1), PE2-RSYB4-DC-S002 (160-31049-2), PE2-RSYB4-DC-S003 (160-31049-3), PE2-RSYB4-DC-S004 (160-31049-4), PE2-RSYB4-DC-S005 (160-31049-5), PE2-RSYB4-DC-S006 (160-31049-6), PE2-RSYB4-DC-S007 (160-31049-7), PE2-RSYB4-DC-S008 (160-31049-8), PE2-RSYB4-DC-S009 (160-31049-9), PE2-RSYB4-DC-S010 (160-31049-10), PE2-RSYB4-DC-S011 (160-31049-11), PE2-RSYB4-DC-S012 (160-31049-12), PE2-RSYB4-DC-S013 (160-31049-13), PE2-RSYB4-DC-S014 (160-31049-14), PE2-RSYB4-DC-S015 (160-31049-15), PE2-RSYB4-DC-S016 (160-31049-16), PE2-RSYB4-DC-S017 (160-31049-17) and PE2-RSYB4-DC-S018 (160-31049-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/02/2018, prepared on 10/03/2018 and analyzed on 10/26/2018 and 10/29/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met for the following samples in batch 160-392909: PE2-RSYB4-DC-S003 (160-31049-3), PE2-RSYB4-DC-S004 (160-31049-4), PE2-RSYB4-DC-S007 (160-31049-7), PE2-RSYB4-DC-S011 (160-31049-11), PE2-RSYB4-DC-S012 (160-31049-12), PE2-RSYB4-DC-S015 (160-31049-15) and PE2-RSYB4-DC-S016 (160-31049-16). 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.

The following sample in batch 160-392909 exhibited a negative result greater in magnitude than the 3 sigma TPU: PE2-RSYB4-DC-S006 (160-31049-6). 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 # PE2_RSYB4_DC#590

Page 1 of 2

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

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): JOAQUIN RAMIREZ

Project Number: 500506
Project Name: CTO-013 RSYB4 Deconstruction Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 10.1.18
Waybill Number: 1266 4545 1395 4272 37
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sample ID Number	Sample Description	Collection Information: Date	Time	Method	Matrix	# of containers	Container Type	Gamma Spec (EPA 191.1 M) – (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr
							Preservative (water)							
							Preservative (soil)	N/A	N/A		N/A			
PE2-RSYB4-DC-S001	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0832	G	SO	1	16 oz. plastic jar	X	X		X			5
PE2-RSYB4-DC-S002	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0839	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S003	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0845	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S004	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0852	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S005	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0859	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S006	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0907	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S007	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0914	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S008	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0921	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S009	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0928	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S010	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0934	G	SO	1	16 oz. plastic jar	X						5

Special Instructions:

7 days ingrown draft and follow with 21 days final.
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.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II III Project Specific:

Relinquished By	Date	Time	Received By	Date	Time
JOAQUIN RAMIREZ	9.14.18	1130	Tobin Wells	9-14-18	11:30
Tobin Wells	10.1.18	1600	Michael Shaw	10-2-18	0840

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 Openning

160-31049 Chain of Custody

APTIM

CHAIN OF CUSTODY

Ref. Document # PE2_RSYB4_DC#590

Page 2 of 2

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

Project Number: 500506
Project Name: CTO-013 RSYB4 Deconstruction Systematic
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 10.1.18
Waybill Number: 1266 4545 1395 4 2 7237
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*

Sampler's Name(s): JOAQUIN RAMIREZ

Sample ID Number	Sample Description	Collection Information Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Gamma Spec (EPA 191.1 M) - (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr
							Preservative (water)							
							Preservative (soil)	N/A	N/A		N/A			
							Container Type							
PE2-RSYB4-DC-S011	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0942	G	SO	1	16 oz. plastic jar	X	X		X			5
PE2-RSYB4-DC-S012	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0949	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S013	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	0955	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S014	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	1002	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S015	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	1009	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S016	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	1017	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S017	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	1024	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-S018	Parcel E-2 RSYB4 Deconstruction Systematic	9/14/18	1030	G	SO	1	16 oz. plastic jar	X						5

Special Instructions:

7 days ingrown draft and follow with 21 days final.
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.

Standard TAT -10-day ☐ 24-hr ☐ 3-day ☐ 10-day

Level Of QC Required: I II III Project Specific

Relinquished By	Date	Time	Received By	Date	Time
JOAQUIN RAMIREZ	10.1.18	1130	Tobin Wells Tobin Wells	9-14-18	11:30
Tobin Wells Tobin Wells	10-01-18	16:30	[illegible]	10-2-18	0840

Method Codes C = Composite G = Grab

Matrix Codes
DW = Drinking Water
GW = Ground Water
WW = Waste Water
A = Air
SO = Soil
SL = Sludge
CP = Chip Samples

ABS=Asbestos, PO=Pipe Openning

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-31049-2

Login Number: 31049
List Number: 1
Creator: Press, Nicholas B

List Source: 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.	N/A	
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").	N/A	
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: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Method Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

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

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-31049-1	PE2-RSYB4-DC-S001	Solid	09/14/18 08:32	10/02/18 08:40
160-31049-2	PE2-RSYB4-DC-S002	Solid	09/14/18 08:39	10/02/18 08:40
160-31049-3	PE2-RSYB4-DC-S003	Solid	09/14/18 08:45	10/02/18 08:40
160-31049-4	PE2-RSYB4-DC-S004	Solid	09/14/18 08:52	10/02/18 08:40
160-31049-5	PE2-RSYB4-DC-S005	Solid	09/14/18 08:59	10/02/18 08:40
160-31049-6	PE2-RSYB4-DC-S006	Solid	09/14/18 09:07	10/02/18 08:40
160-31049-7	PE2-RSYB4-DC-S007	Solid	09/14/18 09:14	10/02/18 08:40
160-31049-8	PE2-RSYB4-DC-S008	Solid	09/14/18 09:21	10/02/18 08:40
160-31049-9	PE2-RSYB4-DC-S009	Solid	09/14/18 09:28	10/02/18 08:40
160-31049-10	PE2-RSYB4-DC-S010	Solid	09/14/18 09:34	10/02/18 08:40
160-31049-11	PE2-RSYB4-DC-S011	Solid	09/14/18 09:42	10/02/18 08:40
160-31049-12	PE2-RSYB4-DC-S012	Solid	09/14/18 09:49	10/02/18 08:40
160-31049-13	PE2-RSYB4-DC-S013	Solid	09/14/18 09:55	10/02/18 08:40
160-31049-14	PE2-RSYB4-DC-S014	Solid	09/14/18 10:02	10/02/18 08:40
160-31049-15	PE2-RSYB4-DC-S015	Solid	09/14/18 10:09	10/02/18 08:40
160-31049-16	PE2-RSYB4-DC-S016	Solid	09/14/18 10:17	10/02/18 08:40
160-31049-17	PE2-RSYB4-DC-S017	Solid	09/14/18 10:24	10/02/18 08:40
160-31049-18	PE2-RSYB4-DC-S018	Solid	09/14/18 10:30	10/02/18 08:40

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S001

Lab Sample ID: 160-31049-1
Date Collected: 09/14/18 08:32
Matrix: Solid
Date Received: 10/02/18 08:40

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	0.0149	U	0.0711	0.0711	0.331	0.0573	pCi/g	10/07/18 13:14	10/25/18 05:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*87.0*		*40 - 110*	*10/07/18 13:14*	*10/25/18 05:45*	*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 228	**0.456**		0.206	0.212		0.176	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Actinium-227	0.0298	U	0.125	0.125		0.389	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Bismuth-212	0.328	U	0.907	0.907		0.718	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Bismuth-214	**0.619**		0.159	0.171		0.0566	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Cesium-137	0.0183	U	0.0436	0.0436	0.0700	0.0330	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Cobalt-60	0.0268	U	0.0474	0.0475	0.200	0.0329	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Lead-210	-0.880	U	1.72	1.72		1.45	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Lead-212	**0.675**		0.118	0.146		0.0551	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Lead-214	**0.641**		0.156	0.170		0.0585	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Potassium-40	**16.7**		2.18	2.78		0.403	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Protactinium-231	0.000	U	0.962	0.962		2.70	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Radium-226	**0.619**		0.159	0.171	0.700	0.0566	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Radium-228	**0.456**		0.206	0.212		0.176	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Thallium-208	**0.217**		0.0790	0.0821		0.0302	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Thorium-228	**0.675**		0.118	0.146		0.0551	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Thorium-232	**0.456**		0.206	0.212		0.176	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Thorium-234	-0.297	U	1.47	1.47		1.22	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Uranium-235	-0.0179	U	0.779	0.779		0.484	pCi/g	10/03/18 15:14	10/29/18 11:36	1
Uranium-238	-0.297	U	1.47	1.47		1.22	pCi/g	10/03/18 15:14	10/29/18 11:36	1

Client Sample ID: PE2-RSYB4-DC-S002

Lab Sample ID: 160-31049-2
Date Collected: 09/14/18 08:39
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**1.04**		0.261	0.281		0.0360	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Actinium-227	0.263	U	0.511	0.512		0.457	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Bismuth-212	-0.875	U	1.46	1.46		1.15	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Bismuth-214	**0.864**		0.223	0.240		0.0870	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Cesium-137	0.0270	U	0.0802	0.0803	0.0700	0.0637	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Cobalt-60	**0.0741**		0.0519	0.0524	0.200	0.0335	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Lead-210	-0.699	U	2.26	2.26		1.88	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Lead-212	**0.841**		0.143	0.168		0.0728	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Lead-214	**0.871**		0.187	0.207		0.0848	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Potassium-40	**19.5**		2.30	3.03		0.473	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Protactinium-231	-1.37	U	4.64	4.64		3.79	pCi/g	10/03/18 15:14	10/26/18 11:49	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S002

Lab Sample ID: 160-31049-2
Date Collected: 09/14/18 08:39
Matrix: Solid
Date Received: 10/02/18 08:40

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	0.864		0.223	0.240	0.700	0.0870	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Radium-228	1.04		0.261	0.281		0.0360	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Thallium-208	0.340		0.0931	0.0993		0.0336	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Thorium-228	0.841		0.143	0.168		0.0728	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Thorium-232	1.04		0.261	0.281		0.0360	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Thorium-234	-0.891	U	0.917	0.922		1.53	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Uranium-235	-0.272	U	0.808	0.808		0.659	pCi/g	10/03/18 15:14	10/26/18 11:49	1
Uranium-238	-0.891	U	0.917	0.922		1.53	pCi/g	10/03/18 15:14	10/26/18 11:49	1

Client Sample ID: PE2-RSYB4-DC-S003

Lab Sample ID: 160-31049-3
Date Collected: 09/14/18 08:45
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	1.13		0.297	0.318		0.0756	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Actinium-227	0.130	U	0.535	0.535		0.466	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Bismuth-212	1.89		0.633	0.663		0.118	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Bismuth-214	0.823		0.208	0.225		0.0627	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Cesium-137	-0.0764	U	0.116	0.117	0.0700	0.0741	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Cobalt-60	-0.0679	U	0.123	0.123	0.200	0.0645	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Lead-210	0.373	U	1.64	1.64		1.33	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Lead-212	0.847		0.130	0.170		0.0560	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Lead-214	0.813		0.134	0.159		0.0625	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Potassium-40	15.2		2.02	2.55		0.281	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Protactinium-231	0.883	U	2.55	2.55		2.79	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Radium-226	0.823		0.208	0.225	0.700	0.0627	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Radium-228	1.13		0.297	0.318		0.0756	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Thallium-208	0.237		0.0683	0.0726		0.0222	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Thorium-228	0.847		0.130	0.170		0.0560	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Thorium-232	1.13		0.297	0.318		0.0756	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Thorium-234	0.675		0.748	0.752		0.564	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Uranium-235	0.0168	U	0.0565	0.0566		0.633	pCi/g	10/03/18 15:14	10/26/18 11:52	1
Uranium-238	0.675		0.748	0.752		0.564	pCi/g	10/03/18 15:14	10/26/18 11:52	1

Client Sample ID: PE2-RSYB4-DC-S004

Lab Sample ID: 160-31049-4
Date Collected: 09/14/18 08:52
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	0.938		0.260	0.277		0.0415	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Actinium-227	0.0621	U	0.316	0.317		0.471	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Bismuth-212	0.559	U	1.10	1.10		0.860	pCi/g	10/03/18 15:14	10/26/18 11:51	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S004

Lab Sample ID: 160-31049-4
Date Collected: 09/14/18 08:52
Matrix: Solid
Date Received: 10/02/18 08:40

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	**0.623**		0.220	0.229		0.0952	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Cesium-137	-0.0484	U	0.180	0.180	0.0700	0.0728	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Cobalt-60	**0.0450**		0.0833	0.0834	0.200	0.0389	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Lead-210	-1.70	U	1.55	1.56		1.92	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Lead-212	**0.819**		0.131	0.168		0.0541	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Lead-214	**0.799**		0.156	0.177		0.0725	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Potassium-40	**17.6**		2.28	2.90		0.268	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Protactinium-231	0.000	U	0.757	0.757		2.66	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Radium-226	**0.623**		0.220	0.229	0.700	0.0952	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Radium-228	**0.938**		0.260	0.277		0.0415	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Thallium-208	**0.355**		0.0850	0.0926		0.0233	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Thorium-228	**0.819**		0.131	0.168		0.0541	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Thorium-232	**0.938**		0.260	0.277		0.0415	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Thorium-234	-0.814	U	0.729	0.734		1.02	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Uranium-235	-0.212	U	0.390	0.391		0.417	pCi/g	10/03/18 15:14	10/26/18 11:51	1
Uranium-238	-0.814	U	0.729	0.734		1.02	pCi/g	10/03/18 15:14	10/26/18 11:51	1

Client Sample ID: PE2-RSYB4-DC-S005

Lab Sample ID: 160-31049-5
Date Collected: 09/14/18 08:59
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.775**		0.193	0.208		0.0592	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Actinium-227	-0.373	U	0.450	0.452		0.396	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Bismuth-212	0.000	U	0.616	0.616		0.630	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Bismuth-214	**0.702**		0.132	0.151		0.0407	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Cesium-137	0.0123	U	0.0460	0.0460	0.0700	0.0368	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Cobalt-60	**0.0256**		0.0455	0.0455	0.200	0.0206	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Lead-210	-0.883	U	1.34	1.34		1.53	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Lead-212	**0.715**		0.0996	0.136		0.0459	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Lead-214	**0.615**		0.109	0.127		0.0560	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Potassium-40	**17.0**		1.62	2.37		0.254	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Protactinium-231	0.000	U	0.460	0.461		2.22	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Radium-226	**0.702**		0.132	0.151	0.700	0.0407	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Radium-228	**0.775**		0.193	0.208		0.0592	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Thallium-208	**0.267**		0.0690	0.0743		0.0262	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Thorium-228	**0.715**		0.0996	0.136		0.0459	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Thorium-232	**0.775**		0.193	0.208		0.0592	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Thorium-234	-0.437	U	0.501	0.503		1.17	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Uranium-235	0.000	U	0.0737	0.0737		0.468	pCi/g	10/03/18 15:14	10/26/18 12:37	1
Uranium-238	-0.437	U	0.501	0.503		1.17	pCi/g	10/03/18 15:14	10/26/18 12:37	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S006

Lab Sample ID: 160-31049-6
Date Collected: 09/14/18 09:07
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.617**		0.192	0.203		0.0334	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Actinium-227	-0.472	U	0.929	0.931		0.540	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Bismuth-212	0.597	U	1.01	1.01		0.782	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Bismuth-214	**0.709**		0.156	0.173		0.0476	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Cesium-137	0.0109	U	0.0640	0.0640	0.0700	0.0513	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Cobalt-60	0.0000582	U	0.000557	0.000557	0.200	0.0488	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Lead-210	-0.202	U	1.30	1.30		1.89	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Lead-212	**0.717**		0.118	0.150		0.0551	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Lead-214	**0.734**		0.115	0.138		0.0543	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Potassium-40	**17.2**		2.03	2.68		0.252	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Protactinium-231	0.747	U	2.25	2.25		2.46	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Radium-226	**0.709**		0.156	0.173	0.700	0.0476	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Radium-228	**0.617**		0.192	0.203		0.0334	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Thallium-208	**0.248**		0.0860	0.0897		0.0377	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Thorium-228	**0.717**		0.118	0.150		0.0551	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Thorium-232	**0.617**		0.192	0.203		0.0334	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Thorium-234	-1.27	U	0.717	0.731		1.28	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Uranium-235	-0.270	U	0.389	0.390		0.491	pCi/g	10/03/18 15:14	10/26/18 12:39	1
Uranium-238	-1.27	U	0.717	0.731		1.28	pCi/g	10/03/18 15:14	10/26/18 12:39	1

Client Sample ID: PE2-RSYB4-DC-S007

Lab Sample ID: 160-31049-7
Date Collected: 09/14/18 09:14
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.401**		0.201	0.205		0.206	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Actinium-227	**0.503**		0.497	0.500		0.368	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Bismuth-212	0.450	U	0.880	0.881		0.669	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Bismuth-214	**0.642**		0.192	0.203		0.0806	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Cesium-137	-0.0415	U	0.177	0.177	0.0700	0.0990	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Cobalt-60	**0.0553**		0.0435	0.0439	0.200	0.0189	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Lead-210	0.430	U	1.63	1.63		1.14	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Lead-212	**0.416**		0.110	0.123		0.0561	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Lead-214	**0.664**		0.143	0.159		0.0707	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Potassium-40	**10.9**		1.92	2.22		0.305	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Protactinium-231	0.000	U	0.514	0.514		2.62	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Radium-226	**0.642**		0.192	0.203	0.700	0.0806	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Radium-228	**0.401**		0.201	0.205		0.206	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Thallium-208	**0.183**		0.0603	0.0632		0.0111	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Thorium-228	**0.416**		0.110	0.123		0.0561	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Thorium-232	**0.401**		0.201	0.205		0.206	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Thorium-234	-0.477	U	0.723	0.725		0.983	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Uranium-235	0.0258	U	0.151	0.151		0.341	pCi/g	10/03/18 15:14	10/26/18 12:40	1
Uranium-238	-0.477	U	0.723	0.725		0.983	pCi/g	10/03/18 15:14	10/26/18 12:40	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S008

Lab Sample ID: 160-31049-8
Date Collected: 09/14/18 09:21
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.838**		0.208	0.225		0.0385	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Actinium-227	0.184	U	0.475	0.476		0.410	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Bismuth-212	-0.0525	U	0.990	0.990		0.811	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Bismuth-214	**0.617**		0.177	0.188		0.0707	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Cesium-137	0.00919	U	0.0658	0.0658	0.0700	0.0529	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Cobalt-60	**0.104**		0.0531	0.0541	0.200	0.0154	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Lead-210	-0.414	U	1.76	1.76		1.25	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Lead-212	**0.673**		0.120	0.149		0.0565	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Lead-214	**0.739**		0.152	0.170		0.0774	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Potassium-40	**17.0**		2.15	2.77		0.248	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Protactinium-231	0.681	U	2.25	2.25		2.46	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Radium-226	**0.617**		0.177	0.188	0.700	0.0707	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Radium-228	**0.838**		0.208	0.225		0.0385	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thallium-208	**0.273**		0.0794	0.0843		0.0257	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thorium-228	**0.673**		0.120	0.149		0.0565	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thorium-232	**0.838**		0.208	0.225		0.0385	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thorium-234	-0.167	U	1.13	1.13		0.930	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Uranium-235	0.00229	U	0.0135	0.0135		0.366	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Uranium-238	-0.167	U	1.13	1.13		0.930	pCi/g	10/03/18 15:14	10/26/18 13:23	1

Client Sample ID: PE2-RSYB4-DC-S009

Lab Sample ID: 160-31049-9
Date Collected: 09/14/18 09:28
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.932**		0.189	0.212		0.0335	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Actinium-227	0.126	U	0.268	0.268		0.505	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Bismuth-212	0.227	U	1.04	1.04		0.839	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Bismuth-214	**0.774**		0.169	0.187		0.0551	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Cesium-137	-0.00322	U	0.0726	0.0726	0.0700	0.0598	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Cobalt-60	-0.0207	U	0.135	0.135	0.200	0.0581	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Lead-210	0.929	U	2.16	2.16		1.75	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Lead-212	**0.803**		0.121	0.160		0.0535	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Lead-214	**0.720**		0.129	0.149		0.0656	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Potassium-40	**19.4**		2.16	2.93		0.253	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Protactinium-231	-0.681	U	3.40	3.40		2.78	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Radium-226	**0.774**		0.169	0.187	0.700	0.0551	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Radium-228	**0.932**		0.189	0.212		0.0335	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thallium-208	**0.251**		0.0763	0.0806		0.0309	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thorium-228	**0.803**		0.121	0.160		0.0535	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thorium-232	**0.932**		0.189	0.212		0.0335	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thorium-234	**0.717**		0.707	0.711		0.512	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Uranium-235	-0.284	U	0.353	0.354		0.498	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Uranium-238	**0.717**		0.707	0.711		0.512	pCi/g	10/03/18 15:14	10/26/18 13:24	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S010

Lab Sample ID: 160-31049-10
Date Collected: 09/14/18 09:34
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.836**		0.178	0.197		0.0613	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Actinium-227	0.0397	U	0.164	0.164		0.335	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Bismuth-212	-0.476	U	0.857	0.858		0.679	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Bismuth-214	**0.682**		0.131	0.149		0.0415	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Cesium-137	-0.0358	U	0.0556	0.0557	0.0700	0.0432	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Cobalt-60	**0.0295**		0.0583	0.0584	0.200	0.0273	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Lead-210	0.650	U	1.24	1.24		0.992	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Lead-212	**0.709**		0.0956	0.132		0.0432	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Lead-214	**0.689**		0.131	0.150		0.0489	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Potassium-40	**15.9**		1.52	2.23		0.240	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Protactinium-231	0.686	U	1.83	1.83		2.00	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Radium-226	**0.682**		0.131	0.149	0.700	0.0415	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Radium-228	**0.836**		0.178	0.197		0.0613	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thallium-208	**0.299**		0.0651	0.0721		0.0215	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thorium-228	**0.709**		0.0956	0.132		0.0432	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thorium-232	**0.836**		0.178	0.197		0.0613	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Thorium-234	**1.17**		0.481	0.498		0.327	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Uranium-235	0.000	U	0.105	0.105		0.396	pCi/g	10/03/18 15:14	10/26/18 13:23	1
Uranium-238	**1.17**		0.481	0.498		0.327	pCi/g	10/03/18 15:14	10/26/18 13:23	1

Client Sample ID: PE2-RSYB4-DC-S011

Lab Sample ID: 160-31049-11
Date Collected: 09/14/18 09:42
Matrix: Solid
Date Received: 10/02/18 08:40

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	0.00197	U	0.0617	0.0617	0.331	0.0506	pCi/g	10/07/18 13:14	10/25/18 05:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*86.8*		*40 - 110*	*10/07/18 13:14*	*10/25/18 05:45*	*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 228	**0.686**		0.204	0.215		0.0872	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Actinium-227	0.351	U	0.678	0.679		0.405	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Bismuth-212	-0.417	U	0.992	0.993		0.778	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Bismuth-214	**0.249**		0.126	0.129		0.187	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Cesium-137	-0.0721	U	0.122	0.122	0.0700	0.0962	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Cobalt-60	-0.0288	U	0.118	0.118	0.200	0.0511	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Lead-210	0.568	U	1.75	1.75		1.23	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Lead-212	**0.482**		0.122	0.132		0.0691	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Lead-214	**0.657**		0.162	0.175		0.0632	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Potassium-40	**11.3**		1.79	2.12		0.399	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Protactinium-231	0.442	U	1.72	1.72		2.73	pCi/g	10/03/18 15:14	10/26/18 13:24	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S011

Lab Sample ID: 160-31049-11
Date Collected: 09/14/18 09:42
Matrix: Solid
Date Received: 10/02/18 08:40

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	0.249		0.126	0.129	0.700	0.187	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Radium-228	0.686		0.204	0.215		0.0872	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thallium-208	0.265		0.102	0.106		0.0394	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thorium-228	0.482		0.122	0.132		0.0691	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thorium-232	0.686		0.204	0.215		0.0872	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Thorium-234	0.583		0.596	0.599		0.583	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Uranium-235	0.00454	U	0.00885	0.00886		0.693	pCi/g	10/03/18 15:14	10/26/18 13:24	1
Uranium-238	0.583		0.596	0.599		0.583	pCi/g	10/03/18 15:14	10/26/18 13:24	1

Client Sample ID: PE2-RSYB4-DC-S012

Lab Sample ID: 160-31049-12
Date Collected: 09/14/18 09:49
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	0.637		0.219	0.228		0.0428	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Actinium-227	-0.000225	U	0.000611	0.000612		0.500	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Bismuth-212	0.577	U	0.972	0.974		0.742	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Bismuth-214	0.649		0.202	0.213		0.0891	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Cesium-137	-0.0219	U	0.179	0.179	0.0700	0.0808	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Cobalt-60	-0.0672	U	0.119	0.119	0.200	0.0687	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Lead-210	0.284	U	1.24	1.24		0.917	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Lead-212	0.840		0.132	0.171		0.0511	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Lead-214	0.772		0.154	0.173		0.0728	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Potassium-40	14.7		2.12	2.60		0.276	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Protactinium-231	0.000	U	0.467	0.467		2.83	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Radium-226	0.649		0.202	0.213	0.700	0.0891	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Radium-228	0.637		0.219	0.228		0.0428	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Thallium-208	0.262		0.101	0.105		0.0463	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Thorium-228	0.840		0.132	0.171		0.0511	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Thorium-232	0.637		0.219	0.228		0.0428	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Thorium-234	-0.799	U	0.735	0.741		1.07	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Uranium-235	0.256	U	0.369	0.370		0.350	pCi/g	10/03/18 15:14	10/26/18 14:00	1
Uranium-238	-0.799	U	0.735	0.741		1.07	pCi/g	10/03/18 15:14	10/26/18 14:00	1

Client Sample ID: PE2-RSYB4-DC-S013

Lab Sample ID: 160-31049-13
Date Collected: 09/14/18 09:55
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	0.535		0.311	0.316		0.144	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Actinium-227	0.0526	U	0.132	0.132		0.460	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Bismuth-212	-0.150	U	0.684	0.684		0.828	pCi/g	10/03/18 15:14	10/26/18 14:02	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S013

Lab Sample ID: 160-31049-13
Date Collected: 09/14/18 09:55
Matrix: Solid
Date Received: 10/02/18 08:40

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	**0.711**		0.145	0.163		0.0373	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Cesium-137	0.0155	U	0.0669	0.0669	0.0700	0.0534	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Cobalt-60	-0.0182	U	0.103	0.103	0.200	0.0475	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Lead-210	0.395	U	1.73	1.73		1.41	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Lead-212	**0.676**		0.113	0.143		0.0539	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Lead-214	**0.575**		0.150	0.161		0.0598	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Potassium-40	**15.9**		1.93	2.53		0.245	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Protactinium-231	-1.04	U	3.43	3.43		2.80	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Radium-226	**0.711**		0.145	0.163	0.700	0.0373	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Radium-228	**0.535**		0.311	0.316		0.144	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Thallium-208	**0.298**		0.0814	0.0871		0.0296	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Thorium-228	**0.676**		0.113	0.143		0.0539	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Thorium-232	**0.535**		0.311	0.316		0.144	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Thorium-234	**0.913**		0.760	0.767		0.464	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Uranium-235	0.0933	U	0.408	0.408		0.357	pCi/g	10/03/18 15:14	10/26/18 14:02	1
Uranium-238	**0.913**		0.760	0.767		0.464	pCi/g	10/03/18 15:14	10/26/18 14:02	1

Client Sample ID: PE2-RSYB4-DC-S014

Lab Sample ID: 160-31049-14
Date Collected: 09/14/18 10:02
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.328**		0.286	0.288		0.161	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Actinium-227	-0.215	U	0.481	0.482		0.358	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Bismuth-212	0.326	U	0.584	0.585		0.454	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Bismuth-214	**0.568**		0.138	0.150		0.0545	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Cesium-137	-0.0363	U	0.0722	0.0723	0.0700	0.0574	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Cobalt-60	**0.0488**		0.0397	0.0400	0.200	0.0199	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Lead-210	0.688	U	1.33	1.33		1.07	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Lead-212	**0.878**		0.102	0.153		0.0401	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Lead-214	**0.683**		0.101	0.124		0.0428	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Potassium-40	**16.1**		1.55	2.26		0.246	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Protactinium-231	0.000	U	0.672	0.672		2.22	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Radium-226	**0.568**		0.138	0.150	0.700	0.0545	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Radium-228	**0.328**		0.286	0.288		0.161	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thallium-208	**0.300**		0.0642	0.0714		0.0211	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thorium-228	**0.878**		0.102	0.153		0.0401	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thorium-232	**0.328**		0.286	0.288		0.161	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thorium-234	**1.04**		0.535	0.547		0.353	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Uranium-235	0.0283	U	0.252	0.252		0.462	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Uranium-238	**1.04**		0.535	0.547		0.353	pCi/g	10/03/18 15:14	10/26/18 14:01	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S015

Lab Sample ID: 160-31049-15
Date Collected: 09/14/18 10:09
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.688**		0.312	0.319		0.121	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Actinium-227	-0.448	U	0.856	0.857		0.511	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Bismuth-212	-0.741	U	1.24	1.24		0.970	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Bismuth-214	**0.737**		0.204	0.218		0.0810	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Cesium-137	-0.0182	U	0.0917	0.0917	0.0700	0.0741	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Cobalt-60	0.0162	U	0.102	0.102	0.200	0.0500	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Lead-210	0.782	U	1.63	1.63		1.16	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Lead-212	**0.565**		0.131	0.144		0.0744	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Lead-214	**0.681**		0.166	0.179		0.0653	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Potassium-40	**11.1**		1.76	2.09		0.390	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Protactinium-231	-1.28	U	4.17	4.17		3.40	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Radium-226	**0.737**		0.204	0.218	0.700	0.0810	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Radium-228	**0.688**		0.312	0.319		0.121	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thallium-208	**0.252**		0.0857	0.0894		0.0322	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thorium-228	**0.565**		0.131	0.144		0.0744	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thorium-232	**0.688**		0.312	0.319		0.121	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Thorium-234	-1.16	U	0.874	0.883		1.37	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Uranium-235	0.0501	U	0.311	0.312		0.648	pCi/g	10/03/18 15:14	10/26/18 14:01	1
Uranium-238	-1.16	U	0.874	0.883		1.37	pCi/g	10/03/18 15:14	10/26/18 14:01	1

Client Sample ID: PE2-RSYB4-DC-S016

Lab Sample ID: 160-31049-16
Date Collected: 09/14/18 10:17
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.818**		0.189	0.207		0.0321	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Actinium-227	0.203	U	0.406	0.407		0.300	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Bismuth-212	**1.37**		0.502	0.522		0.102	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Bismuth-214	**0.747**		0.147	0.166		0.0360	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Cesium-137	-0.0725	U	0.0885	0.0888	0.0700	0.0703	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Cobalt-60	-0.00319	U	0.104	0.104	0.200	0.0556	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-210	-0.542	U	1.03	1.03		1.56	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-212	**0.664**		0.113	0.142		0.0547	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-214	**0.592**		0.134	0.147		0.0687	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Potassium-40	**15.6**		1.90	2.48		0.242	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Protactinium-231	0.000	U	0.731	0.731		2.18	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Radium-226	**0.747**		0.147	0.166	0.700	0.0360	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Radium-228	**0.818**		0.189	0.207		0.0321	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thallium-208	**0.167**		0.0687	0.0708		0.0293	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-228	**0.664**		0.113	0.142		0.0547	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-232	**0.818**		0.189	0.207		0.0321	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-234	**1.10**		0.789	0.799		0.517	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Uranium-235	-0.280	U	0.358	0.359		0.480	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Uranium-238	**1.10**		0.789	0.799		0.517	pCi/g	10/03/18 15:14	10/26/18 14:42	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Client Sample ID: PE2-RSYB4-DC-S017

Lab Sample ID: 160-31049-17
Date Collected: 09/14/18 10:24
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.871**		0.183	0.204		0.0459	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Actinium-227	0.142	U	0.417	0.417		0.343	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Bismuth-212	0.334	U	0.547	0.548		0.414	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Bismuth-214	**0.646**		0.120	0.137		0.0305	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Cesium-137	-0.0510	U	0.0823	0.0825	0.0700	0.0649	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Cobalt-60	-0.0482	U	0.0408	0.0411	0.200	0.0522	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-210	0.701	U	1.60	1.61		1.29	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-212	**0.533**		0.0952	0.118		0.0469	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-214	**0.590**		0.132	0.146		0.0524	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Potassium-40	**12.9**		1.52	2.01		0.291	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Protactinium-231	0.000	U	0.578	0.578		2.28	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Radium-226	**0.646**		0.120	0.137	0.700	0.0305	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Radium-228	**0.871**		0.183	0.204		0.0459	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thallium-208	**0.196**		0.0492	0.0532		0.0126	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-228	**0.533**		0.0952	0.118		0.0469	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-232	**0.871**		0.183	0.204		0.0459	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-234	0.245	U	0.511	0.512		0.967	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Uranium-235	0.112	U	0.413	0.413		0.465	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Uranium-238	0.245	U	0.511	0.512		0.967	pCi/g	10/03/18 15:14	10/26/18 14:42	1

Client Sample ID: PE2-RSYB4-DC-S018

Lab Sample ID: 160-31049-18
Date Collected: 09/14/18 10:30
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.753**		0.253	0.264		0.143	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Actinium-227	0.208	U	0.494	0.494		0.399	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Bismuth-212	0.000	U	0.751	0.751		0.837	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Bismuth-214	**0.613**		0.176	0.187		0.0701	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Cesium-137	-0.0296	U	0.184	0.184	0.0700	0.0673	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Cobalt-60	0.00997	U	0.0720	0.0720	0.200	0.0429	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-210	0.522	U	1.50	1.50		1.00	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-212	**0.655**		0.136	0.160		0.0552	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Lead-214	0.137	U	0.0885	0.0896		0.203	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Potassium-40	**13.3**		2.09	2.50		0.296	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Protactinium-231	0.789	U	2.55	2.55		2.75	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Radium-226	**0.613**		0.176	0.187	0.700	0.0701	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Radium-228	**0.753**		0.253	0.264		0.143	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thallium-208	**0.267**		0.0807	0.0853		0.0229	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-228	**0.655**		0.136	0.160		0.0552	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-232	**0.753**		0.253	0.264		0.143	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Thorium-234	**0.762**		0.648	0.653		0.475	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Uranium-235	0.0158	U	0.0237	0.0238		0.344	pCi/g	10/03/18 15:14	10/26/18 14:42	1
Uranium-238	**0.762**		0.648	0.653		0.475	pCi/g	10/03/18 15:14	10/26/18 14:42	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-393536/14-A
Matrix: Solid
Analysis Batch: 397304

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 393536

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.1546		0.0773	0.0781	0.331	0.0517	pCi/g	10/07/18 13:14	10/25/18 07:00	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*84.2*		*40 - 110*	*10/07/18 13:14*	*10/25/18 07:00*	*1*

Lab Sample ID: LCS 160-393536/1-A
Matrix: Solid
Analysis Batch: 397293

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 393536

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Total Beta Strontium			8.17	8.226		0.666	0.331	0.0650	pCi/g	101	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*87.2*		*40 - 110*

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

Lab Sample ID: MB 160-392909/1-A
Matrix: Solid
Analysis Batch: 397943

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 392909

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.01621	U	0.0382	0.0382		0.186	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Actinium-227	0.2154	U	0.435	0.435		0.250	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Bismuth-212	0.0000	U	0.268	0.268		0.432	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Bismuth-214	0.005811	U	0.314	0.314		0.258	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Cesium-137	0.005193	U	0.0554	0.0554	0.0700	0.0448	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Cobalt-60	-0.02212	U	0.0421	0.0422	0.200	0.0447	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Lead-210	1.338		1.79	1.80		1.21	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Lead-212	0.06459	U	0.0886	0.0889		0.0657	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Lead-214	0.01176	U	0.0731	0.0731		0.107	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Potassium-40	0.01207	U	0.610	0.610		0.491	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Protactinium-231	0.1184	U	1.41	1.41		2.39	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Radium-226	0.005811	U	0.314	0.314	0.700	0.258	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Radium-228	-0.01621	U	0.0382	0.0382		0.186	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Thallium-208	0.03455	U	0.0502	0.0503		0.0410	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Thorium-228	0.06459	U	0.0886	0.0889		0.0657	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Thorium-232	-0.01621	U	0.0382	0.0382		0.186	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Thorium-234	-1.185	U	0.818	0.829		1.17	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Uranium-235	0.1955	U	0.502	0.502		0.512	pCi/g	10/03/18 15:14	10/29/18 08:52	1
Uranium-238	-1.185	U	0.818	0.829		1.17	pCi/g	10/03/18 15:14	10/29/18 08:52	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

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

Lab Sample ID: LCS 160-392909/2-A
Matrix: Solid
Analysis Batch: 397450

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 392909

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	99.45		11.7		0.582	pCi/g	103	87 - 116
Cesium-137	28.1	31.16		3.29	0.0700	0.154	pCi/g	111	87 - 120
Cobalt-60	12.5	13.01		1.38	0.200	0.130	pCi/g	104	87 - 115

Lab Sample ID: 160-31049-1 DU
Matrix: Solid
Analysis Batch: 397935

Client Sample ID: PE2-RSYB4-DC-S001
Prep Type: Total/NA
Prep Batch: 392909

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.456		0.9070		0.260		0.0685	pCi/g	0.96	1
Actinium-227	0.0298	U	0.2048	U	0.640		0.390	pCi/g	0.23	1
Bismuth-212	0.328	U	0.4523	U	0.869		0.677	pCi/g	0.07	1
Bismuth-214	0.619		0.6544		0.170		0.0593	pCi/g	0.10	1
Cesium-137	0.0183	U	-0.01656	U	0.0643	0.0700	0.0514	pCi/g	0.32	1
Cobalt-60	0.0268	U	-0.02529	U	0.100	0.200	0.0486	pCi/g	0.35	1
Lead-210	-0.880	U	0.6508	U	1.69		1.15	pCi/g	0.45	1
Lead-212	0.675		0.6810		0.136		0.0547	pCi/g	0.02	1
Lead-214	0.641		0.7615		0.158		0.0569	pCi/g	0.37	1
Potassium-40	16.7		16.51		2.48		0.119	pCi/g	0.04	1
Protactinium-231	0.000	U	0.0000	U	0.330		2.73	pCi/g	0	1
Radium-226	0.619		0.6544		0.170	0.700	0.0593	pCi/g	0.10	1
Radium-228	0.456		0.9070		0.260		0.0685	pCi/g	0.96	1
Thallium-208	0.217		0.2821		0.0876		0.0322	pCi/g	0.38	1
Thorium-228	0.675		0.6810		0.136		0.0547	pCi/g	0.02	1
Thorium-232	0.456		0.9070		0.260		0.0685	pCi/g	0.96	1
Thorium-234	-0.297	U	1.637		0.846		0.547	pCi/g	0.83	1
Uranium-235	-0.0179	U	0.1971	U	0.560		0.542	pCi/g	0.16	1
Uranium-238	-0.297	U	1.637		0.846		0.547	pCi/g	0.83	1

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Rad

Leach Batch: 392568

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31049-1	PE2-RSYB4-DC-S001	Total/NA	Solid	Dry and Grind	
160-31049-2	PE2-RSYB4-DC-S002	Total/NA	Solid	Dry and Grind	
160-31049-3	PE2-RSYB4-DC-S003	Total/NA	Solid	Dry and Grind	
160-31049-4	PE2-RSYB4-DC-S004	Total/NA	Solid	Dry and Grind	
160-31049-5	PE2-RSYB4-DC-S005	Total/NA	Solid	Dry and Grind	
160-31049-6	PE2-RSYB4-DC-S006	Total/NA	Solid	Dry and Grind	
160-31049-7	PE2-RSYB4-DC-S007	Total/NA	Solid	Dry and Grind	
160-31049-8	PE2-RSYB4-DC-S008	Total/NA	Solid	Dry and Grind	
160-31049-9	PE2-RSYB4-DC-S009	Total/NA	Solid	Dry and Grind	
160-31049-10	PE2-RSYB4-DC-S010	Total/NA	Solid	Dry and Grind	
160-31049-11	PE2-RSYB4-DC-S011	Total/NA	Solid	Dry and Grind	
160-31049-12	PE2-RSYB4-DC-S012	Total/NA	Solid	Dry and Grind	
160-31049-13	PE2-RSYB4-DC-S013	Total/NA	Solid	Dry and Grind	
160-31049-14	PE2-RSYB4-DC-S014	Total/NA	Solid	Dry and Grind	
160-31049-15	PE2-RSYB4-DC-S015	Total/NA	Solid	Dry and Grind	
160-31049-16	PE2-RSYB4-DC-S016	Total/NA	Solid	Dry and Grind	
160-31049-17	PE2-RSYB4-DC-S017	Total/NA	Solid	Dry and Grind	
160-31049-18	PE2-RSYB4-DC-S018	Total/NA	Solid	Dry and Grind	
160-31049-1 DU	PE2-RSYB4-DC-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 392909

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31049-1	PE2-RSYB4-DC-S001	Total/NA	Solid	Fill_Geo-21	392568
160-31049-2	PE2-RSYB4-DC-S002	Total/NA	Solid	Fill_Geo-21	392568
160-31049-3	PE2-RSYB4-DC-S003	Total/NA	Solid	Fill_Geo-21	392568
160-31049-4	PE2-RSYB4-DC-S004	Total/NA	Solid	Fill_Geo-21	392568
160-31049-5	PE2-RSYB4-DC-S005	Total/NA	Solid	Fill_Geo-21	392568
160-31049-6	PE2-RSYB4-DC-S006	Total/NA	Solid	Fill_Geo-21	392568
160-31049-7	PE2-RSYB4-DC-S007	Total/NA	Solid	Fill_Geo-21	392568
160-31049-8	PE2-RSYB4-DC-S008	Total/NA	Solid	Fill_Geo-21	392568
160-31049-9	PE2-RSYB4-DC-S009	Total/NA	Solid	Fill_Geo-21	392568
160-31049-10	PE2-RSYB4-DC-S010	Total/NA	Solid	Fill_Geo-21	392568
160-31049-11	PE2-RSYB4-DC-S011	Total/NA	Solid	Fill_Geo-21	392568
160-31049-12	PE2-RSYB4-DC-S012	Total/NA	Solid	Fill_Geo-21	392568
160-31049-13	PE2-RSYB4-DC-S013	Total/NA	Solid	Fill_Geo-21	392568
160-31049-14	PE2-RSYB4-DC-S014	Total/NA	Solid	Fill_Geo-21	392568
160-31049-15	PE2-RSYB4-DC-S015	Total/NA	Solid	Fill_Geo-21	392568
160-31049-16	PE2-RSYB4-DC-S016	Total/NA	Solid	Fill_Geo-21	392568
160-31049-17	PE2-RSYB4-DC-S017	Total/NA	Solid	Fill_Geo-21	392568
160-31049-18	PE2-RSYB4-DC-S018	Total/NA	Solid	Fill_Geo-21	392568
MB 160-392909/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-392909/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-31049-1 DU	PE2-RSYB4-DC-S001	Total/NA	Solid	Fill_Geo-21	392568

Prep Batch: 393536

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31049-1	PE2-RSYB4-DC-S001	Total/NA	Solid	DPS-0	392568
160-31049-11	PE2-RSYB4-DC-S011	Total/NA	Solid	DPS-0	392568
MB 160-393536/14-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-393536/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31049-2

Method: 905.0 - Total Beta Strontium (GFPC)

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

		Percent Yield (Acceptance Limits)							
Lab Sample ID	**Client Sample ID**	**Sr Carrier (40-110)**							
160-31049-1	PE2-RSYB4-DC-S001	87.0							
160-31049-11	PE2-RSYB4-DC-S011	86.8							
LCS 160-393536/1-A	Lab Control Sample	87.2							
MB 160-393536/14-A	Method Blank	84.2							

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

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

TestAmerica Job ID: 160-31041-2
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

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

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
10/26/2018 2:33:35 PM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

LINKS

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Have a Question? Ask The Expert

Visit us at:
www.testamericainc.com

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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Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Job ID: 160-31041-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-31041-2

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.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. 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.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Job ID: 160-31041-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

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

RECEIPT
The samples were received on 10/02/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

TOTAL BETA STRONTIUM (GFPC)
Sample PE2-RSYB4-DC-B-S001 (160-31041-1) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/02/2018, prepared on 10/07/2018 and analyzed on 10/25/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYB4-DC-B-S001 (160-31041-1). The samples contained detritus material and 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 PE2-RSYB4-DC-B-S001 (160-31041-1), PE2-RSYB4-DC-B-S002 (160-31041-2), PE2-RSYB4-DC-B-S003 (160-31041-3), PE2-RSYB4-DC-B-S004 (160-31041-4) and PE2-RSYB4-DC-B-S005 (160-31041-5) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/02/2018, prepared on 10/03/2018 and analyzed on 10/24/2018.

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. PE2-RSYB4-DC-B-S002 (160-31041-2), PE2-RSYB4-DC-B-S004 (160-31041-4) and (160-31039-A-1-E DU)

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 # PE2_RSYB4_DC_BIASED#624

Page 1 of 1

APTIM
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: *Nels Johnson*
(Name & phone #)

Send Report To: *Eddie Kalombo*
Phone/Fax Number: *415-987-0760*
Address: *4005 Port Chicago Hwy*
City: *Concord, CA, 94520*
Sampler's Name(s): Joaquin Ramirez

Project Number: 500506
Project Name: CTO-013 RSYB4 Deconstruction biased sample
Project Location: HPNS - Parcel E-2
Purchase Order #: 202296
Shipment/Pickup Date: 10.1.18
Waybill Number: 1266V5451397817455
Lab Destination: TestAmerica (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63045
Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Sample ID Number	Sample Description	Collection Information Date	Time	Method	Matrix	# of containers	Preservative (water) / Preservative (soil) / Container Type	Gamma Spec (EPA 191.1 M) – (7 day in-growth preliminary results and full 21 day in growth for full gamma results)	Total Strontium (EPA 905 MOD)		Strontium 90 (EPA 905 MOD)			Dose Rate µR/Hr
							Preservative (water)							
							Preservative (soil)	N/A	N/A		N/A			
PE2-RSYB4-DC-B-S001	Parcel E-2 RSYB4 Biased	9/28/18	1319	G	SO	1	16 oz. plastic jar	X	X		X			5
PE2-RSYB4-DC-B-S002	Parcel E-2 RSYB4 Biased	9/28/18	1322	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-B-S003	Parcel E-2 RSYB4 Biased	9/28/18	1325	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-B-S004	Parcel E-2 RSYB4 Biased	9/28/18	1328	G	SO	1	16 oz. plastic jar	X						5
PE2-RSYB4-DC-B-S005	Parcel E-2 RSYB4 Biased	9/28/18	1331	G	SO	1	16 oz. plastic jar	X						5

Special Instructions:

7 days ingrown draft and follow with 21 days final.
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.

☐ 24-hr
Standard TAT -10-day ☐ 3-day ☐ 10-day

Level Of QC Required: I II III Project Specific:

Relinquished By	Date / Time	Received By	Date / Time
Joaquin Ramirez	10.1.18 1000	Eddie Kalombo	10.1.18 1000
Eddie Kalombo	10.1.18 1600	Nicholas Press	10-2-18 0840

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 Openning

160-31041 Chain of Custody

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-31041-2

Login Number: 31041
List Number: 1
Creator: Press, Nicholas B

List Source: 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.	N/A	
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").	N/A	
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: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

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
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)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
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)

Method Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

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

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-31041-1	PE2-RSYB4-DC-B-S001	Solid	09/28/18 13:19	10/02/18 08:40
160-31041-2	PE2-RSYB4-DC-B-S002	Solid	09/28/18 13:22	10/02/18 08:40
160-31041-3	PE2-RSYB4-DC-B-S003	Solid	09/28/18 13:25	10/02/18 08:40
160-31041-4	PE2-RSYB4-DC-B-S004	Solid	09/28/18 13:28	10/02/18 08:40
160-31041-5	PE2-RSYB4-DC-B-S005	Solid	09/28/18 13:31	10/02/18 08:40

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Client Sample ID: PE2-RSYB4-DC-B-S001

Lab Sample ID: 160-31041-1
Date Collected: 09/28/18 13:19
Matrix: Solid
Date Received: 10/02/18 08:40

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	**0.124**		0.0876	0.0881	0.331	0.0641	pCi/g	10/07/18 13:14	10/25/18 05:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*87.2*		*40 - 110*	*10/07/18 13:14*	*10/25/18 05:44*	*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 228	**0.692**		0.188	0.201		0.0810	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Actinium-227	0.178	U	0.373	0.374		0.288	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Bismuth-212	**1.11**		0.591	0.602		0.233	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Bismuth-214	**0.535**		0.112	0.125		0.0503	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Cesium-137	0.0114	U	0.0464	0.0464	0.0700	0.0373	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Cobalt-60	-0.00998	U	0.110	0.110	0.200	0.0307	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Lead-210	-0.795	U	1.46	1.46		1.38	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Lead-212	**0.725**		0.0919	0.131		0.0408	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Lead-214	**0.696**		0.124	0.144		0.0450	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Potassium-40	**17.7**		1.53	2.37		0.220	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Protactinium-231	0.000	U	0.342	0.342		2.04	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Radium-226	**0.535**		0.112	0.125	0.700	0.0503	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Radium-228	**0.692**		0.188	0.201		0.0810	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Thallium-208	**0.246**		0.0517	0.0577		0.0168	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Thorium-228	**0.725**		0.0919	0.131		0.0408	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Thorium-232	**0.692**		0.188	0.201		0.0810	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Thorium-234	**0.468**		0.419	0.422		0.323	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Uranium-235	0.000	U	0.182	0.182		0.370	pCi/g	10/03/18 11:44	10/24/18 18:46	1
Uranium-238	**0.468**		0.419	0.422		0.323	pCi/g	10/03/18 11:44	10/24/18 18:46	1

Client Sample ID: PE2-RSYB4-DC-B-S002

Lab Sample ID: 160-31041-2
Date Collected: 09/28/18 13:22
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.940**		0.212	0.232		0.0710	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Actinium-227	0.203	U	0.495	0.495		0.399	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Bismuth-212	**1.49**		0.822	0.836		0.316	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Bismuth-214	**0.654**		0.191	0.202		0.0783	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Cesium-137	-0.0367	U	0.106	0.106	0.0700	0.0851	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Cobalt-60	**0.0610**		0.0599	0.0602	0.200	0.0296	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Lead-210	0.358	U	1.76	1.76		1.23	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Lead-212	**0.770**		0.127	0.150		0.0607	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Lead-214	**0.749**		0.164	0.181		0.0720	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Potassium-40	**21.0**		2.12	3.00		0.125	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Protactinium-231	0.000	U	0.650	0.650		2.89	pCi/g	10/03/18 11:44	10/24/18 18:45	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Client Sample ID: PE2-RSYB4-DC-B-S002

Lab Sample ID: 160-31041-2
Date Collected: 09/28/18 13:22
Matrix: Solid
Date Received: 10/02/18 08:40

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	0.654		0.191	0.202	0.700	0.0783	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Radium-228	0.940		0.212	0.232		0.0710	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Thallium-208	0.351		0.0800	0.0876		0.0240	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Thorium-228	0.770		0.127	0.150		0.0607	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Thorium-232	0.940		0.212	0.232		0.0710	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Thorium-234	0.879		0.800	0.806		0.592	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Uranium-235	0.00206	U	0.0126	0.0126		0.593	pCi/g	10/03/18 11:44	10/24/18 18:45	1
Uranium-238	0.879		0.800	0.806		0.592	pCi/g	10/03/18 11:44	10/24/18 18:45	1

Client Sample ID: PE2-RSYB4-DC-B-S003

Lab Sample ID: 160-31041-3
Date Collected: 09/28/18 13:25
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	1.20		0.280	0.306		0.0798	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Actinium-227	-0.408	U	0.868	0.869		0.526	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Bismuth-212	0.588	U	1.01	1.02		0.782	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Bismuth-214	0.627		0.162	0.174		0.0693	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Cesium-137	-0.0214	U	0.163	0.163	0.0700	0.0649	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Cobalt-60	0.0206	U	0.0403	0.0403	0.200	0.0512	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Lead-210	1.14		1.28	1.28		0.818	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Lead-212	0.715		0.123	0.154		0.0560	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Lead-214	0.702		0.141	0.159		0.0514	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Potassium-40	17.6		2.21	2.85		0.252	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Protactinium-231	0.129	U	1.59	1.59		2.46	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Radium-226	0.627		0.162	0.174	0.700	0.0693	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Radium-228	1.20		0.280	0.306		0.0798	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thallium-208	0.287		0.0747	0.0804		0.0191	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thorium-228	0.715		0.123	0.154		0.0560	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thorium-232	1.20		0.280	0.306		0.0798	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thorium-234	0.994		0.677	0.686		0.465	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Uranium-235	0.113	U	0.416	0.416		0.306	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Uranium-238	0.994		0.677	0.686		0.465	pCi/g	10/03/18 11:44	10/24/18 19:32	1

Client Sample ID: PE2-RSYB4-DC-B-S004

Lab Sample ID: 160-31041-4
Date Collected: 09/28/18 13:28
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	0.458		0.223	0.228		0.126	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Actinium-227	-0.0992	U	0.784	0.784		0.462	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Bismuth-212	-0.0734	U	0.645	0.645		0.820	pCi/g	10/03/18 11:44	10/24/18 19:33	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Client Sample ID: PE2-RSYB4-DC-B-S004

Lab Sample ID: 160-31041-4
Date Collected: 09/28/18 13:28
Matrix: Solid
Date Received: 10/02/18 08:40

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	**0.308**		0.146	0.149		0.167	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Cesium-137	-0.0300	U	0.124	0.124	0.0700	0.0864	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Cobalt-60	0.00929	U	0.00756	0.00762	0.200	0.0678	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Lead-210	0.662	U	2.17	2.17		1.76	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Lead-212	**0.603**		0.111	0.135		0.0454	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Lead-214	**0.537**		0.197	0.204		0.0859	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Potassium-40	**12.2**		1.86	2.24		0.296	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Protactinium-231	-1.32	U	4.56	4.56		3.72	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Radium-226	**0.308**		0.146	0.149	0.700	0.167	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Radium-228	**0.458**		0.223	0.228		0.126	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Thallium-208	**0.250**		0.0817	0.0857		0.0309	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Thorium-228	**0.603**		0.111	0.135		0.0454	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Thorium-232	**0.458**		0.223	0.228		0.126	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Thorium-234	**0.843**		0.669	0.675		0.574	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Uranium-235	0.0736	U	0.155	0.155		0.474	pCi/g	10/03/18 11:44	10/24/18 19:33	1
Uranium-238	**0.843**		0.669	0.675		0.574	pCi/g	10/03/18 11:44	10/24/18 19:33	1

Client Sample ID: PE2-RSYB4-DC-B-S005

Lab Sample ID: 160-31041-5
Date Collected: 09/28/18 13:31
Matrix: Solid
Date Received: 10/02/18 08:40

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 228	**0.701**		0.187	0.200		0.0575	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Actinium-227	-0.170	U	1.07	1.07		0.376	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Bismuth-212	**1.33**		0.484	0.504		0.140	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Bismuth-214	**0.576**		0.130	0.143		0.0453	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Cesium-137	0.0119	U	0.0573	0.0573	0.0700	0.0463	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Cobalt-60	-0.0303	U	0.111	0.111	0.200	0.0432	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Lead-210	**0.591**		0.785	0.788		0.535	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Lead-212	**0.743**		0.100	0.139		0.0417	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Lead-214	**0.552**		0.102	0.117		0.0520	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Potassium-40	**12.8**		1.46	1.96		0.269	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Protactinium-231	0.000	U	0.454	0.454		2.17	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Radium-226	**0.576**		0.130	0.143	0.700	0.0453	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Radium-228	**0.701**		0.187	0.200		0.0575	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thallium-208	**0.256**		0.0588	0.0645		0.0189	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thorium-228	**0.743**		0.100	0.139		0.0417	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thorium-232	**0.701**		0.187	0.200		0.0575	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Thorium-234	-0.263	U	0.445	0.446		0.972	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Uranium-235	0.0309	U	0.280	0.280		0.378	pCi/g	10/03/18 11:44	10/24/18 19:32	1
Uranium-238	-0.263	U	0.445	0.446		0.972	pCi/g	10/03/18 11:44	10/24/18 19:32	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-393536/14-A
Matrix: Solid
Analysis Batch: 397304

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 393536

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.1546		0.0773	0.0781	0.331	0.0517	pCi/g	10/07/18 13:14	10/25/18 07:00	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*84.2*		*40 - 110*	*10/07/18 13:14*	*10/25/18 07:00*	*1*

Lab Sample ID: LCS 160-393536/1-A
Matrix: Solid
Analysis Batch: 397293

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 393536

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits		
Total Beta Strontium			8.17	8.226		0.666	0.331	0.0650	pCi/g	101	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*87.2*		*40 - 110*

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

Lab Sample ID: MB 160-392870/1-A
Matrix: Solid
Analysis Batch: 396905

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 392870

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	-0.02862	U	0.0944	0.0944		0.122	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Actinium-227	-0.2022	U	0.614	0.614		0.368	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Bismuth-212	-0.4717	U	0.881	0.883		0.657	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Bismuth-214	-0.09220	U	0.224	0.224		0.191	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Cesium-137	-0.006984	U	0.0687	0.0687	0.0700	0.0571	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Cobalt-60	0.04524		0.0428	0.0431	0.200	0.0218	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Lead-210	-0.6495	U	1.10	1.11		0.876	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Lead-212	-0.02311	U	0.0833	0.0833		0.0905	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Lead-214	-0.06380	U	0.107	0.107		0.0947	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Potassium-40	-0.2411	U	0.620	0.620		0.352	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Protactinium-231	0.0000	U	0.651	0.651		1.68	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Radium-226	-0.09220	U	0.224	0.224	0.700	0.191	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Radium-228	-0.02862	U	0.0944	0.0944		0.122	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Thallium-208	0.02448	U	0.0759	0.0760		0.0288	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Thorium-228	-0.02311	U	0.0833	0.0833		0.0905	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Thorium-232	-0.02862	U	0.0944	0.0944		0.122	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Thorium-234	-0.4317	U	0.764	0.766		0.650	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Uranium-235	-0.04296	U	0.0803	0.0804		0.267	pCi/g	10/03/18 11:44	10/24/18 17:38	1
Uranium-238	-0.4317	U	0.764	0.766		0.650	pCi/g	10/03/18 11:44	10/24/18 17:38	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

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

Lab Sample ID: LCS 160-392870/2-A
Matrix: Solid
Analysis Batch: 396906

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 392870

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	99.48		10.5		0.654	pCi/g	103	87 - 116
Cesium-137	28.1	28.46		3.05	0.0700	0.0963	pCi/g	101	87 - 120
Cobalt-60	12.5	12.40		1.31	0.200	0.0246	pCi/g	99	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Rad

Leach Batch: 392481

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31041-1	PE2-RSYB4-DC-B-S001	Total/NA	Solid	Dry and Grind	
160-31041-2	PE2-RSYB4-DC-B-S002	Total/NA	Solid	Dry and Grind	
160-31041-3	PE2-RSYB4-DC-B-S003	Total/NA	Solid	Dry and Grind	
160-31041-4	PE2-RSYB4-DC-B-S004	Total/NA	Solid	Dry and Grind	
160-31041-5	PE2-RSYB4-DC-B-S005	Total/NA	Solid	Dry and Grind	

Prep Batch: 392870

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31041-1	PE2-RSYB4-DC-B-S001	Total/NA	Solid	Fill_Geo-21	392481
160-31041-2	PE2-RSYB4-DC-B-S002	Total/NA	Solid	Fill_Geo-21	392481
160-31041-3	PE2-RSYB4-DC-B-S003	Total/NA	Solid	Fill_Geo-21	392481
160-31041-4	PE2-RSYB4-DC-B-S004	Total/NA	Solid	Fill_Geo-21	392481
160-31041-5	PE2-RSYB4-DC-B-S005	Total/NA	Solid	Fill_Geo-21	392481
MB 160-392870/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-392870/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 393536

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-31041-1	PE2-RSYB4-DC-B-S001	Total/NA	Solid	DPS-0	392481
MB 160-393536/14-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-393536/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-31041-2

Method: 905.0 - Total Beta Strontium (GFPC)

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

		Percent Yield (Acceptance Limits)							
Lab Sample ID	**Client Sample ID**	**Sr Carrier (40-110)**							
160-31041-1	PE2-RSYB4-DC-B-S001	87.2							
LCS 160-393536/1-A	Lab Control Sample	87.2							
MB 160-393536/14-A	Method Blank	84.2							

Tracer/Carrier Legend

Sr Carrier = Sr Carrier