

ANALYTICAL REPORT

Job Number: 160-18567-1

Job Description: EA and Cabrera - Hill AFB WR111

For:

EA Engineering, Science, and Technology
7995 E. Prentice Ave, Suite 206E
Greenwood Village, CO 80111

Attention: Pamela J Moss



Approved for release.
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Project Manager I
9/9/2016 4:09 PM

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09/09/2016

The test results in this report relate only to the samples in this report and meet all requirements of NELAP, with any exceptions noted. Pursuant to NELAP, this report shall not be reproduced except in full, without the written approval of the laboratory. All questions regarding this report should be directed to the TestAmerica Denver Project Manager.

The Lab Certification ID# is 4025.

Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

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Definitions/Glossary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

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. |
|----------------|---|
| α | 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, RA, RE, IN | Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample |
| DLC | Decision level concentration |
| MDA | Minimum detectable activity |
| EDL | Estimated Detection Limit |
| MDC | Minimum detectable concentration |
| 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 |
| 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) |

CASE NARRATIVE

Client: EA Engineering, Science, and Technology

Project: EA and Cabrera - Hill AFB WR111

Report Number: 160-18567-1

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

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.

RECEIPT

The samples were received on 08/10/2016; the samples arrived in good condition. The temperature of the coolers at receipt was 20.0 C. Thermal preservation is not required for the requested analyses; therefore, the laboratory will proceed with the requested analyses. Corrective action is deemed unnecessary.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples SU03-S-058-SS-P-00 (160-18567-1), SU03-S-059-SS-P-00 (160-18567-2), SU03-S-060-SS-P-00 (160-18567-3), SU03-S-061-SS-P-00 (160-18567-4), SU03-S-062-SS-P-00 (160-18567-5), SU03-S-063-SS-P-00 (160-18567-6), SU03-S-064-SS-P-00 (160-18567-7), SU03-S-065-SS-P-00 (160-18567-8), SU03-S-066-SS-P-00 (160-18567-9), SU03-S-067-SS-P-00 (160-18567-10), SU03-S-068-SS-P-00 (160-18567-11), SU03-S-069-SS-P-00 (160-18567-12), SU03-S-070-SS-P-00 (160-18567-13), SU03-S-071-SS-P-00 (160-18567-14), SU03-S-072-SS-P-00 (160-18567-15), SU03-S-073-SS-P-00 (160-18567-16), SU03-S-074-SS-P-00 (160-18567-17), SU03-S-075-SS-P-00 (160-18567-18), SU03-S-074-SS-DUP-00 (160-18567-19) and SU03-S-060-SS-DUP-00 (160-18567-20) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with EPA 901.1. The samples were leached on 08/10/2016, prepared on 08/17/2016 and analyzed on 09/07/2016.

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

ISOTOPIC THORIUM

Samples SU03-S-058-SS-P-00 (160-18567-1), SU03-S-059-SS-P-00 (160-18567-2), SU03-S-060-SS-P-00 (160-18567-3), SU03-S-061-SS-P-00 (160-18567-4), SU03-S-062-SS-P-00 (160-18567-5), SU03-S-063-SS-P-00 (160-18567-6), SU03-S-064-SS-P-00 (160-18567-7), SU03-S-065-SS-P-00 (160-18567-8), SU03-S-066-SS-P-00 (160-18567-9), SU03-S-067-SS-P-00 (160-18567-10), SU03-S-068-SS-P-00 (160-18567-11), SU03-S-069-SS-P-00 (160-18567-12), SU03-S-070-SS-P-00 (160-18567-13), SU03-S-071-SS-P-00 (160-18567-14), SU03-S-072-SS-P-00 (160-18567-15), SU03-S-073-SS-P-00 (160-18567-16), SU03-S-074-SS-P-00 (160-18567-17), SU03-S-075-SS-P-00 (160-18567-18), SU03-S-074-SS-DUP-00 (160-18567-19) and SU03-S-060-SS-DUP-00 (160-18567-20) were analyzed for D Isotopic Thorium accordance with A01R_Th. The samples were leached on 08/10/2016, prepared on 08/25/2016 and analyzed on 09/07/2016 and 09/08/2016.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: SU03-S-071-SS-P-00 (160-18567-14), SU03-S-072-SS-P-00 (160-18567-15), SU03-S-073-SS-P-00 (160-18567-16), SU03-S-074-SS-P-00 (160-18567-17), SU03-S-075-SS-P-00 (160-18567-18), SU03-S-074-SS-DUP-00 (160-18567-19), SU03-S-060-SS-DUP-00 (160-18567-20) and (160-18567-A-14-A DU). The samples contain rocks.

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

Detection Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-058-SS-P-00

Lab Sample ID: 160-18567-1

☐ No Detections.

Client Sample ID: SU03-S-059-SS-P-00

Lab Sample ID: 160-18567-2

☐ No Detections.

Client Sample ID: SU03-S-060-SS-P-00

Lab Sample ID: 160-18567-3

☐ No Detections.

Client Sample ID: SU03-S-061-SS-P-00

Lab Sample ID: 160-18567-4

☐ No Detections.

Client Sample ID: SU03-S-062-SS-P-00

Lab Sample ID: 160-18567-5

☐ No Detections.

Client Sample ID: SU03-S-063-SS-P-00

Lab Sample ID: 160-18567-6

☐ No Detections.

Client Sample ID: SU03-S-064-SS-P-00

Lab Sample ID: 160-18567-7

☐ No Detections.

Client Sample ID: SU03-S-065-SS-P-00

Lab Sample ID: 160-18567-8

☐ No Detections.

Client Sample ID: SU03-S-066-SS-P-00

Lab Sample ID: 160-18567-9

☐ No Detections.

Client Sample ID: SU03-S-067-SS-P-00

Lab Sample ID: 160-18567-10

☐ No Detections.

Client Sample ID: SU03-S-068-SS-P-00

Lab Sample ID: 160-18567-11

☐ No Detections.

Client Sample ID: SU03-S-069-SS-P-00

Lab Sample ID: 160-18567-12

☐ No Detections.

Client Sample ID: SU03-S-070-SS-P-00

Lab Sample ID: 160-18567-13

☐ No Detections.

Client Sample ID: SU03-S-071-SS-P-00

Lab Sample ID: 160-18567-14

☐ No Detections.

This Detection Summary does not include radiochemical test results.

TestAmerica St. Louis

Detection Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-072-SS-P-00

Lab Sample ID: 160-18567-15

☐ No Detections.

Client Sample ID: SU03-S-073-SS-P-00

Lab Sample ID: 160-18567-16

☐ No Detections.

Client Sample ID: SU03-S-074-SS-P-00

Lab Sample ID: 160-18567-17

☐ No Detections.

Client Sample ID: SU03-S-075-SS-P-00

Lab Sample ID: 160-18567-18

☐ No Detections.

Client Sample ID: SU03-S-074-SS-DUP-00

Lab Sample ID: 160-18567-19

☐ No Detections.

Client Sample ID: SU03-S-060-SS-DUP-00

Lab Sample ID: 160-18567-20

☐ No Detections.

This Detection Summary does not include radiochemical test results.

TestAmerica St. Louis

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-058-SS-P-00

Date Collected: 08/09/16 09:45

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-1

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.03 | | 0.215 | 0.241 | 0.500 | 0.167 | pCi/g | 08/17/16 10:53 | 09/07/16 15:22 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.621 | | 0.117 | 0.128 | 0.100 | 0.0437 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.16 | | 0.158 | 0.186 | 0.100 | 0.0299 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 80.6 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-059-SS-P-00

Date Collected: 08/09/16 10:00

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-2

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.23 | | 0.207 | 0.243 | 0.500 | 0.156 | pCi/g | 08/17/16 10:53 | 09/07/16 16:27 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.767 | | 0.122 | 0.138 | 0.100 | 0.0146 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.25 | | 0.157 | 0.189 | 0.100 | 0.0391 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 89.3 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-060-SS-P-00

Date Collected: 08/09/16 09:31

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-3

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.12 | | 0.259 | 0.284 | 0.500 | 0.204 | pCi/g | 08/17/16 10:53 | 09/07/16 16:29 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.47 | | 0.176 | 0.215 | 0.100 | 0.0344 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.80 | | 0.194 | 0.245 | 0.100 | 0.0288 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

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Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-060-SS-P-00

Date Collected: 08/09/16 09:31

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-3

Matrix: Solid

| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|----------|----------------|----------------|---------|
| Thorium-229 | 87.2 | | 30 - 110 | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-061-SS-P-00

Date Collected: 08/09/16 09:36

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-4

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.07 | | 0.208 | 0.236 | 0.500 | 0.138 | pCi/g | 08/17/16 10:53 | 09/07/16 16:30 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|----------------|---------|-------|----------------|----------------|---------|
| Thorium-230 | 1.11 | | 0.152 | 0.178 | 0.100 | 0.0392 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.90 | | 0.198 | 0.255 | 0.100 | 0.0379 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac | | | | |
| Thorium-229 | 89.6 | | 30 - 110 | 08/25/16 15:54 | 09/07/16 14:38 | 1 | | | | |

Client Sample ID: SU03-S-062-SS-P-00

Date Collected: 08/09/16 09:40

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-5

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.34 | | 0.255 | 0.291 | 0.500 | 0.209 | pCi/g | 08/17/16 10:53 | 09/07/16 17:48 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|----------------|---------|-------|----------------|----------------|---------|
| Thorium-230 | 0.806 | | 0.125 | 0.142 | 0.100 | 0.0300 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Thorium-232 | 1.45 | | 0.166 | 0.206 | 0.100 | 0.0263 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac | | | | |
| Thorium-229 | 88.6 | | 30 - 110 | 08/25/16 15:54 | 09/08/16 15:56 | 1 | | | | |

Client Sample ID: SU03-S-063-SS-P-00

Date Collected: 08/09/16 09:24

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-6

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.30 | | 0.233 | 0.270 | 0.500 | 0.176 | pCi/g | 08/17/16 10:53 | 09/07/16 17:44 | 1 |

TestAmerica St. Louis

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-063-SS-P-00

Date Collected: 08/09/16 09:24

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-6

Matrix: Solid

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.883 | | 0.133 | 0.153 | 0.100 | 0.0256 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Thorium-232 | 1.77 | | 0.188 | 0.239 | 0.100 | 0.0150 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 93.8 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/08/16 15:56 | 1 |

Client Sample ID: SU03-S-064-SS-P-00

Date Collected: 08/09/16 09:44

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-7

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.17 | | 0.294 | 0.318 | 0.500 | 0.242 | pCi/g | 08/17/16 10:53 | 09/07/16 17:50 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.58 | | 0.182 | 0.226 | 0.100 | 0.0290 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.81 | | 0.195 | 0.247 | 0.100 | 0.0288 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 82.9 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-065-SS-P-00

Date Collected: 08/09/16 09:27

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-8

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.13 | | 0.194 | 0.227 | 0.500 | 0.191 | pCi/g | 08/17/16 10:53 | 09/07/16 17:50 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.34 | | 0.160 | 0.196 | 0.100 | 0.0265 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.42 | | 0.165 | 0.204 | 0.100 | 0.0264 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 89.7 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-066-SS-P-00

Date Collected: 08/09/16 09:10

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-9

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.32 | | 0.292 | 0.322 | 0.500 | 0.236 | pCi/g | 08/17/16 10:53 | 09/07/16 17:51 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.19 | | 0.161 | 0.190 | 0.100 | 0.0300 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.89 | | 0.203 | 0.258 | 0.100 | 0.0300 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 87.3 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-067-SS-P-00

Date Collected: 08/09/16 08:30

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-10

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.32 | | 0.206 | 0.248 | 0.500 | 0.101 | pCi/g | 08/17/16 10:53 | 09/07/16 17:52 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.910 | | 0.138 | 0.157 | 0.100 | 0.0286 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Thorium-232 | 2.07 | | 0.207 | 0.270 | 0.100 | 0.0339 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 89.3 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/08/16 15:56 | 1 |

Client Sample ID: SU03-S-068-SS-P-00

Date Collected: 08/09/16 08:40

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-11

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.71 | | 0.304 | 0.352 | 0.500 | 0.188 | pCi/g | 08/17/16 10:53 | 09/07/16 17:53 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.852 | | 0.128 | 0.146 | 0.100 | 0.0144 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |
| Thorium-232 | 1.83 | | 0.187 | 0.242 | 0.100 | 0.0263 | pCi/g | 08/25/16 15:54 | 09/08/16 15:56 | 1 |

TestAmerica St. Louis

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-068-SS-P-00

Date Collected: 08/09/16 08:40

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-11

Matrix: Solid

| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|----------|----------------|----------------|---------|
| Thorium-229 | 88.6 | | 30 - 110 | 08/25/16 15:54 | 09/08/16 15:56 | 1 |

Client Sample ID: SU03-S-069-SS-P-00

Date Collected: 08/09/16 08:45

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-12

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.57 | | 0.270 | 0.315 | 0.500 | 0.211 | pCi/g | 08/17/16 10:53 | 09/07/16 18:30 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| | | | Count Uncert. | Total Uncert. | | | | | | |
|-------------|--------|-----------|------------------|------------------|-------|--------|-------|----------------|----------------|---------|
| Analyte | Result | Qualifier | (2σ+/-) | (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
| Thorium-230 | 1.71 | | 0.182 | 0.232 | 0.100 | 0.0145 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 1.63 | | 0.177 | 0.224 | 0.100 | 0.0265 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 91.9 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-070-SS-P-00

Date Collected: 08/09/16 10:10

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-13

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.61 | | 0.304 | 0.347 | 0.500 | 0.228 | pCi/g | 08/17/16 10:53 | 09/07/16 18:30 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| | | | Count Uncert. | Total Uncert. | | | | | | |
|-------------|--------|-----------|------------------|------------------|-------|--------|-------|----------------|----------------|---------|
| Analyte | Result | Qualifier | (2σ+/-) | (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
| Thorium-230 | 2.20 | | 0.211 | 0.281 | 0.100 | 0.0373 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 2.40 | | 0.221 | 0.299 | 0.100 | 0.0498 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 86.7 | | 30 - 110 | | | | | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Client Sample ID: SU03-S-071-SS-P-00

Date Collected: 08/09/16 09:49

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-14

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.78 | | 0.280 | 0.336 | 0.500 | 0.112 | pCi/g | 08/17/16 10:53 | 09/07/16 18:31 | 1 |

TestAmerica St. Louis

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-071-SS-P-00

Lab Sample ID: 160-18567-14

Date Collected: 08/09/16 09:49

Matrix: Solid

Date Received: 08/10/16 09:20

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.83 | | 0.188 | 0.243 | 0.100 | 0.0144 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 1.38 | | 0.162 | 0.199 | 0.100 | 0.0144 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 88.3 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Client Sample ID: SU03-S-072-SS-P-00

Lab Sample ID: 160-18567-15

Date Collected: 08/09/16 10:12

Matrix: Solid

Date Received: 08/10/16 09:20

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.68 | | 0.334 | 0.376 | 0.500 | 0.237 | pCi/g | 08/17/16 10:53 | 09/07/16 18:32 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 8.49 | | 0.417 | 0.826 | 0.100 | 0.0154 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 2.75 | | 0.237 | 0.331 | 0.100 | 0.0335 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 86.6 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Client Sample ID: SU03-S-073-SS-P-00

Lab Sample ID: 160-18567-16

Date Collected: 08/09/16 09:53

Matrix: Solid

Date Received: 08/10/16 09:20

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.30 | | 0.217 | 0.256 | 0.500 | 0.171 | pCi/g | 08/17/16 10:53 | 09/07/16 18:33 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 16.3 | | 0.580 | 1.49 | 0.100 | 0.0415 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 3.86 | | 0.281 | 0.429 | 0.100 | 0.0283 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 84.9 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-074-SS-P-00

Date Collected: 08/09/16 08:55

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-17

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.16 | | 0.291 | 0.315 | 0.500 | 0.237 | pCi/g | 08/17/16 10:53 | 09/07/16 18:33 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.52 | | 0.178 | 0.219 | 0.100 | 0.0156 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 1.26 | | 0.162 | 0.194 | 0.100 | 0.0417 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 83.7 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Client Sample ID: SU03-S-075-SS-P-00

Date Collected: 08/09/16 09:00

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-18

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.41 | | 0.271 | 0.309 | 0.500 | 0.217 | pCi/g | 08/17/16 10:53 | 09/07/16 18:34 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.57 | | 0.182 | 0.225 | 0.100 | 0.0344 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 1.28 | | 0.164 | 0.196 | 0.100 | 0.0287 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 87.4 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Client Sample ID: SU03-S-074-SS-DUP-00

Date Collected: 08/09/16 08:55

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-19

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|--------|-----------|-----------------------------|-----------------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | 1.39 | | 0.242 | 0.281 | 0.500 | 0.181 | pCi/g | 08/17/16 10:53 | 09/07/16 18:35 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|--------|-----------|-----------------------------|-----------------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 1.51 | | 0.172 | 0.214 | 0.100 | 0.0369 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 1.51 | | 0.171 | 0.213 | 0.100 | 0.0357 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

TestAmerica St. Louis

Client Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-074-SS-DUP-00

Date Collected: 08/09/16 08:55

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-19

Matrix: Solid

| <i>Tracer</i> | <i>%Yield</i> | <i>Qualifier</i> | <i>Limits</i> | <i>Prepared</i> | <i>Analyzed</i> | <i>Dil Fac</i> |
|---------------|---------------|------------------|---------------|-----------------|-----------------|----------------|
| Thorium-229 | 95.3 | | 30 - 110 | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Client Sample ID: SU03-S-060-SS-DUP-00

Date Collected: 08/09/16 09:31

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-20

Matrix: Solid

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| <i>Analyte</i> | <i>Result</i> | <i>Qualifier</i> | <i>Count Uncert. (2σ+/-)</i> | <i>Total Uncert. (2σ+/-)</i> | <i>LOQ</i> | <i>MDC</i> | <i>Unit</i> | <i>Prepared</i> | <i>Analyzed</i> | <i>Dil Fac</i> |
|----------------|---------------|------------------|--------------------------------------|--------------------------------------|------------|------------|-------------|-----------------|-----------------|----------------|
| Radium-226 | 1.27 | | 0.231 | 0.266 | 0.500 | 0.224 | pCi/g | 08/17/16 10:53 | 09/07/16 19:11 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| | | | Count | Total | | | | | | |
|-------------|--------|-----------|----------|---------|-------|--------|-------|----------------|----------------|---------|
| | | | Uncert. | Uncert. | | | | | | |
| Analyte | Result | Qualifier | (2σ+/-) | (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
| Thorium-230 | 1.09 | | 0.151 | 0.177 | 0.100 | 0.0646 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 1.23 | | 0.157 | 0.188 | 0.100 | 0.0278 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | %Yield | Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 88.1 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Tracer/Carrier Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

| | | Percent Yield (Acceptance Limits) | | | | | |
|--------------------|----------------------|-----------------------------------|--|--|--|--|--|
| Lab Sample ID | Client Sample ID | Th-229 (30-110) | | | | | |
| 160-18567-1 | SU03-S-058-SS-P-00 | 80.6 | | | | | |
| 160-18567-2 | SU03-S-059-SS-P-00 | 89.3 | | | | | |
| 160-18567-3 | SU03-S-060-SS-P-00 | 87.2 | | | | | |
| 160-18567-4 | SU03-S-061-SS-P-00 | 89.6 | | | | | |
| 160-18567-5 | SU03-S-062-SS-P-00 | 88.6 | | | | | |
| 160-18567-6 | SU03-S-063-SS-P-00 | 93.8 | | | | | |
| 160-18567-7 | SU03-S-064-SS-P-00 | 82.9 | | | | | |
| 160-18567-8 | SU03-S-065-SS-P-00 | 89.7 | | | | | |
| 160-18567-9 | SU03-S-066-SS-P-00 | 87.3 | | | | | |
| 160-18567-10 | SU03-S-067-SS-P-00 | 89.3 | | | | | |
| 160-18567-11 | SU03-S-068-SS-P-00 | 88.6 | | | | | |
| 160-18567-12 | SU03-S-069-SS-P-00 | 91.9 | | | | | |
| 160-18567-13 | SU03-S-070-SS-P-00 | 86.7 | | | | | |
| 160-18567-14 | SU03-S-071-SS-P-00 | 88.3 | | | | | |
| 160-18567-14 DU | SU03-S-071-SS-P-00 | 96.3 | | | | | |
| 160-18567-15 | SU03-S-072-SS-P-00 | 86.6 | | | | | |
| 160-18567-16 | SU03-S-073-SS-P-00 | 84.9 | | | | | |
| 160-18567-17 | SU03-S-074-SS-P-00 | 83.7 | | | | | |
| 160-18567-18 | SU03-S-075-SS-P-00 | 87.4 | | | | | |
| 160-18567-19 | SU03-S-074-SS-DUP-00 | 95.3 | | | | | |
| 160-18567-20 | SU03-S-060-SS-DUP-00 | 88.1 | | | | | |
| LCS 160-266565/2-A | Lab Control Sample | 97.0 | | | | | |
| LCS 160-266566/2-A | Lab Control Sample | 88.6 | | | | | |
| MB 160-266565/1-A | Method Blank | 96.5 | | | | | |
| MB 160-266566/1-A | Method Blank | 90.7 | | | | | |

Tracer/Carrier Legend

Th-229 = Thorium-229

QC Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-265170/1-A
Matrix: Solid
Analysis Batch: 268245

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 265170

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|------------|-----------|--------------|-----------------------|-----------------------|-------|-------|-------|----------------|----------------|---------|
| Radium-226 | -0.05210 | U | 0.132 | 0.132 | 0.500 | 0.389 | pCi/g | 08/17/16 10:53 | 09/07/16 16:23 | 1 |

Lab Sample ID: LCS 160-265170/2-A
Matrix: Solid
Analysis Batch: 268246

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 265170

| Analyte | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | %Rec | %Rec. Limits |
|---------------|-------------|------------|----------|-----------------------|-----|--------|-------|------|--------------|
| Americium-241 | 97.1 | 96.96 | | 10.2 | | 1.12 | pCi/g | 100 | 87 - 116 |
| Cesium-137 | 29.5 | 29.30 | | 3.12 | | 0.236 | pCi/g | 99 | 87 - 120 |
| Cobalt-60 | 16.6 | 16.39 | | 1.70 | | 0.0748 | pCi/g | 99 | 87 - 115 |

Lab Sample ID: 160-18567-1 DU
Matrix: Solid
Analysis Batch: 268247

Client Sample ID: SU03-S-058-SS-P-00
Prep Type: Total/NA
Prep Batch: 265170

| Analyte | Sample Result | Sample Qual | DU Result | DU Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | RER | RER Limit |
|------------|---------------|-------------|-----------|---------|-----------------------|-------|-------|-------|------|-----------|
| Radium-226 | 1.03 | | 1.124 | | 0.236 | 0.500 | 0.152 | pCi/g | 0.20 | 1 |

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-266565/1-A
Matrix: Solid
Analysis Batch: 268478

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 266565

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|-----------|--------------|-----------------------|-----------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.09373 | | 0.0422 | 0.0430 | 0.100 | 0.0143 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |
| Thorium-232 | 0.004736 | U | 0.00947 | 0.00948 | 0.100 | 0.0142 | pCi/g | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

| Tracer | MB %Yield | MB Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|-------------|-----------|--------------|----------|----------------|----------------|---------|
| Thorium-229 | 96.5 | | 30 - 110 | 08/25/16 15:54 | 09/07/16 14:38 | 1 |

Lab Sample ID: LCS 160-266565/2-A
Matrix: Solid
Analysis Batch: 268479

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 266565

| Analyte | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | %Rec | %Rec. Limits |
|-------------|-------------|------------|----------|-----------------------|-------|--------|-------|------|--------------|
| Thorium-230 | 24.5 | 25.18 | | 2.33 | 0.100 | 0.0287 | pCi/g | 103 | 81 - 118 |

| Tracer | LCS %Yield | LCS Qualifier | Limits |
|-------------|------------|---------------|----------|
| Thorium-229 | 97.0 | | 30 - 110 |

QC Sample Results

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: MB 160-266566/1-A

Matrix: Solid

Analysis Batch: 268671

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 266566

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|-------------|-----------|--------------|-----------------------|-----------------------|-------|--------|-------|----------------|----------------|---------|
| Thorium-230 | 0.05109 | | 0.0339 | 0.0341 | 0.100 | 0.0330 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Thorium-232 | 0.01000 | U | 0.0141 | 0.0142 | 0.100 | 0.0150 | pCi/g | 08/25/16 15:56 | 09/08/16 11:49 | 1 |
| Tracer | MB %Yield | MB Qualifier | Limits | | | | | Prepared | Analyzed | Dil Fac |
| Thorium-229 | 90.7 | | 30 - 110 | | | | | 08/25/16 15:56 | 09/08/16 11:49 | 1 |

Lab Sample ID: LCS 160-266566/2-A

Matrix: Solid

Analysis Batch: 268672

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 266566

| Analyte | | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | %Rec | %Rec. Limits |
|-------------|------------|---------------|------------|----------|-----------------------|-------|--------|-------|------|--------------|
| Thorium-230 | | 24.5 | 25.59 | | 2.37 | 0.100 | 0.0776 | pCi/g | 104 | 81 - 118 |
| Tracer | LCS %Yield | LCS Qualifier | Limits | | | | | | | |
| Thorium-229 | 88.6 | | 30 - 110 | | | | | | | |

Lab Sample ID: 160-18567-14 DU

Matrix: Solid

Analysis Batch: 268674

Client Sample ID: SU03-S-071-SS-P-00

Prep Type: Total/NA

Prep Batch: 266566

| Analyte | Sample Result | Sample Qual | DU Result | DU Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | RER | RER Limit |
|-------------|---------------|--------------|-----------|---------|-----------------------|-------|--------|-------|------|-----------|
| Thorium-230 | 1.83 | | 2.112 | | 0.269 | 0.100 | 0.0357 | pCi/g | 0.54 | 1 |
| Thorium-232 | 1.38 | | 1.524 | | 0.214 | 0.100 | 0.0388 | pCi/g | 0.36 | 1 |
| Tracer | DU %Yield | DU Qualifier | Limits | | | | | | | |
| Thorium-229 | 96.3 | | 30 - 110 | | | | | | | |

QC Association Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Rad

Leach Batch: 264321

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|-----------------|----------------------|-----------|--------|---------------|------------|
| 160-18567-1 | SU03-S-058-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-2 | SU03-S-059-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-3 | SU03-S-060-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-4 | SU03-S-061-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-5 | SU03-S-062-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-6 | SU03-S-063-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-7 | SU03-S-064-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-8 | SU03-S-065-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-9 | SU03-S-066-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-10 | SU03-S-067-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-11 | SU03-S-068-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-12 | SU03-S-069-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-13 | SU03-S-070-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-14 | SU03-S-071-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-15 | SU03-S-072-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-16 | SU03-S-073-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-17 | SU03-S-074-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-18 | SU03-S-075-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-19 | SU03-S-074-SS-DUP-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-20 | SU03-S-060-SS-DUP-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-1 DU | SU03-S-058-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-18567-14 DU | SU03-S-071-SS-P-00 | Total/NA | Solid | Dry and Grind | |

Prep Batch: 265170

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|--------------------|----------------------|-----------|--------|-------------|------------|
| 160-18567-1 | SU03-S-058-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-2 | SU03-S-059-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-3 | SU03-S-060-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-4 | SU03-S-061-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-5 | SU03-S-062-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-6 | SU03-S-063-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-7 | SU03-S-064-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-8 | SU03-S-065-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-9 | SU03-S-066-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-10 | SU03-S-067-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-11 | SU03-S-068-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-12 | SU03-S-069-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-13 | SU03-S-070-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-14 | SU03-S-071-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-15 | SU03-S-072-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-16 | SU03-S-073-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-17 | SU03-S-074-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-18 | SU03-S-075-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-19 | SU03-S-074-SS-DUP-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| 160-18567-20 | SU03-S-060-SS-DUP-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |
| MB 160-265170/1-A | Method Blank | Total/NA | Solid | Fill_Geo-21 | |
| LCS 160-265170/2-A | Lab Control Sample | Total/NA | Solid | Fill_Geo-21 | |
| 160-18567-1 DU | SU03-S-058-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 264321 |

QC Association Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Rad (Continued)

Prep Batch: 266565

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|--------------------|--------------------|-----------|--------|----------|------------|
| 160-18567-1 | SU03-S-058-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-2 | SU03-S-059-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-3 | SU03-S-060-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-4 | SU03-S-061-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-5 | SU03-S-062-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-6 | SU03-S-063-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-7 | SU03-S-064-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-8 | SU03-S-065-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-9 | SU03-S-066-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-10 | SU03-S-067-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-11 | SU03-S-068-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-12 | SU03-S-069-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-13 | SU03-S-070-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| MB 160-266565/1-A | Method Blank | Total/NA | Solid | ExtChrom | |
| LCS 160-266565/2-A | Lab Control Sample | Total/NA | Solid | ExtChrom | |

Prep Batch: 266566

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|--------------------|----------------------|-----------|--------|----------|------------|
| 160-18567-14 | SU03-S-071-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-15 | SU03-S-072-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-16 | SU03-S-073-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-17 | SU03-S-074-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-18 | SU03-S-075-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-19 | SU03-S-074-SS-DUP-00 | Total/NA | Solid | ExtChrom | 264321 |
| 160-18567-20 | SU03-S-060-SS-DUP-00 | Total/NA | Solid | ExtChrom | 264321 |
| MB 160-266566/1-A | Method Blank | Total/NA | Solid | ExtChrom | |
| LCS 160-266566/2-A | Lab Control Sample | Total/NA | Solid | ExtChrom | |
| 160-18567-14 DU | SU03-S-071-SS-P-00 | Total/NA | Solid | ExtChrom | 264321 |

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-058-SS-P-00

Date Collected: 08/09/16 09:45

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-1

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268245 | 09/07/16 15:22 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268488 | 09/07/16 14:38 | ALD | TAL SL |

Client Sample ID: SU03-S-059-SS-P-00

Date Collected: 08/09/16 10:00

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-2

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268241 | 09/07/16 16:27 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268489 | 09/07/16 14:38 | ALD | TAL SL |

Client Sample ID: SU03-S-060-SS-P-00

Date Collected: 08/09/16 09:31

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-3

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268237 | 09/07/16 16:29 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268490 | 09/07/16 14:38 | ALD | TAL SL |

Client Sample ID: SU03-S-061-SS-P-00

Date Collected: 08/09/16 09:36

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-4

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268239 | 09/07/16 16:30 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268491 | 09/07/16 14:38 | ALD | TAL SL |

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-062-SS-P-00

Date Collected: 08/09/16 09:40

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-5

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268247 | 09/07/16 17:48 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268650 | 09/08/16 15:56 | ALD | TAL SL |

Client Sample ID: SU03-S-063-SS-P-00

Date Collected: 08/09/16 09:24

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-6

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268246 | 09/07/16 17:44 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268651 | 09/08/16 15:56 | ALD | TAL SL |

Client Sample ID: SU03-S-064-SS-P-00

Date Collected: 08/09/16 09:44

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-7

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268245 | 09/07/16 17:50 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268494 | 09/07/16 14:38 | ALD | TAL SL |

Client Sample ID: SU03-S-065-SS-P-00

Date Collected: 08/09/16 09:27

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-8

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268241 | 09/07/16 17:50 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268495 | 09/07/16 14:38 | ALD | TAL SL |

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-066-SS-P-00

Lab Sample ID: 160-18567-9

Date Collected: 08/09/16 09:10

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268239 | 09/07/16 17:51 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268496 | 09/07/16 14:38 | ALD | TAL SL |

Client Sample ID: SU03-S-067-SS-P-00

Lab Sample ID: 160-18567-10

Date Collected: 08/09/16 08:30

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268238 | 09/07/16 17:52 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268652 | 09/08/16 15:56 | ALD | TAL SL |

Client Sample ID: SU03-S-068-SS-P-00

Lab Sample ID: 160-18567-11

Date Collected: 08/09/16 08:40

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268237 | 09/07/16 17:53 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268653 | 09/08/16 15:56 | ALD | TAL SL |

Client Sample ID: SU03-S-069-SS-P-00

Lab Sample ID: 160-18567-12

Date Collected: 08/09/16 08:45

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268236 | 09/07/16 18:30 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268499 | 09/07/16 14:38 | ALD | TAL SL |

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-070-SS-P-00

Lab Sample ID: 160-18567-13

Date Collected: 08/09/16 10:10

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268237 | 09/07/16 18:30 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266565 | 08/25/16 15:54 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268500 | 09/07/16 14:38 | ALD | TAL SL |

Client Sample ID: SU03-S-071-SS-P-00

Lab Sample ID: 160-18567-14

Date Collected: 08/09/16 09:49

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268238 | 09/07/16 18:31 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268673 | 09/08/16 11:49 | ALD | TAL SL |

Client Sample ID: SU03-S-072-SS-P-00

Lab Sample ID: 160-18567-15

Date Collected: 08/09/16 10:12

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268239 | 09/07/16 18:32 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268675 | 09/08/16 11:49 | ALD | TAL SL |

Client Sample ID: SU03-S-073-SS-P-00

Lab Sample ID: 160-18567-16

Date Collected: 08/09/16 09:53

Matrix: Solid

Date Received: 08/10/16 09:20

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268241 | 09/07/16 18:33 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268676 | 09/08/16 11:49 | ALD | TAL SL |

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Client Sample ID: SU03-S-074-SS-P-00

Date Collected: 08/09/16 08:55

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-17

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268245 | 09/07/16 18:33 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268677 | 09/08/16 11:49 | ALD | TAL SL |

Client Sample ID: SU03-S-075-SS-P-00

Date Collected: 08/09/16 09:00

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-18

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268246 | 09/07/16 18:34 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268678 | 09/08/16 11:49 | ALD | TAL SL |

Client Sample ID: SU03-S-074-SS-DUP-00

Date Collected: 08/09/16 08:55

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-19

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268247 | 09/07/16 18:35 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268679 | 09/08/16 11:49 | ALD | TAL SL |

Client Sample ID: SU03-S-060-SS-DUP-00

Date Collected: 08/09/16 09:31

Date Received: 08/10/16 09:20

Lab Sample ID: 160-18567-20

Matrix: Solid

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|-----------|------------|---------------|-----|-----------------|--------------|----------------------|---------|--------|
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 265170 | 08/17/16 10:53 | R1S | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 268236 | 09/07/16 19:11 | ALS | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 264321 | 08/10/16 13:23 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 266566 | 08/25/16 15:56 | SCB | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 268680 | 09/08/16 11:49 | ALD | TAL SL |

Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Laboratory References:

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

Certification Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

Laboratory: TestAmerica St. Louis

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

| Authority | Program | EPA Region | Certification ID | Expiration Date |
|-------------------|---------------|------------|------------------|-----------------|
| Alaska | State Program | 10 | MO00054 | 06-30-17 |
| California | State Program | 9 | 2886 | 03-31-18 |
| Connecticut | State Program | 1 | PH-0241 | 03-31-17 |
| Florida | NELAP | 4 | E87689 | 06-30-17 |
| Illinois | NELAP | 5 | 003757 | 11-30-16 * |
| Iowa | State Program | 7 | 373 | 12-01-16 * |
| Kansas | NELAP | 7 | E-10236 | 10-31-16 * |
| Kentucky (DW) | State Program | 4 | 90125 | 12-31-16 |
| L-A-B | DoD ELAP | | L2305 | 04-06-19 |
| Louisiana | NELAP | 6 | 04080 | 06-30-17 |
| Louisiana (DW) | NELAP | 6 | LA160008 | 12-31-16 |
| Maryland | State Program | 3 | 310 | 09-30-17 |
| Missouri | State Program | 7 | 780 | 06-30-17 |
| Nevada | State Program | 9 | MO000542016-1 | 07-31-17 |
| New Jersey | NELAP | 2 | MO002 | 06-30-17 |
| New York | NELAP | 2 | 11616 | 03-31-17 |
| North Dakota | State Program | 8 | R207 | 06-30-17 |
| NRC | NRC | | 24-24817-01 | 12-31-22 |
| Oklahoma | State Program | 6 | 9997 | 08-31-17 |
| Pennsylvania | NELAP | 3 | 68-00540 | 02-28-17 * |
| South Carolina | State Program | 4 | 85002001 | 06-30-16 * |
| Texas | NELAP | 6 | T104704193-15-9 | 07-31-17 |
| USDA | Federal | | P330-07-00122 | 01-09-17 |
| Utah | NELAP | 8 | MO000542016-8 | 07-31-17 |
| Virginia | NELAP | 3 | 460230 | 06-14-17 |
| Washington | State Program | 10 | C592 | 08-30-17 |
| West Virginia DEP | State Program | 3 | 381 | 08-31-16 * |

Laboratory: TestAmerica Denver

The certifications listed below are applicable to this report.

| Authority | Program | EPA Region | Certification ID | Expiration Date |
|-----------|----------|------------|------------------|-----------------|
| A2LA | DoD ELAP | | 2907.01 | 10-31-17 |
| Utah | NELAP | 8 | CO00026 | 07-31-16 * |

* Certification renewal pending - certification considered valid.

TestAmerica St. Louis

Method Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

| Method | Method Description | Protocol | Laboratory |
|--------|--|----------|------------|
| 901.1 | Radium-226 & Other Gamma Emitters (GS) | EPA | TAL SL |
| A-01-R | Isotopic Thorium (Alpha Spectrometry) | DOE | TAL SL |

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency

Laboratory References:

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

Sample Summary

Client: EA Engineering, Science, and Technology
Project/Site: EA and Cabrera - Hill AFB WR111

TestAmerica Job ID: 160-18567-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received |
|---------------|----------------------|--------|----------------|----------------|
| 160-18567-1 | SU03-S-058-SS-P-00 | Solid | 08/09/16 09:45 | 08/10/16 09:20 |
| 160-18567-2 | SU03-S-059-SS-P-00 | Solid | 08/09/16 10:00 | 08/10/16 09:20 |
| 160-18567-3 | SU03-S-060-SS-P-00 | Solid | 08/09/16 09:31 | 08/10/16 09:20 |
| 160-18567-4 | SU03-S-061-SS-P-00 | Solid | 08/09/16 09:36 | 08/10/16 09:20 |
| 160-18567-5 | SU03-S-062-SS-P-00 | Solid | 08/09/16 09:40 | 08/10/16 09:20 |
| 160-18567-6 | SU03-S-063-SS-P-00 | Solid | 08/09/16 09:24 | 08/10/16 09:20 |
| 160-18567-7 | SU03-S-064-SS-P-00 | Solid | 08/09/16 09:44 | 08/10/16 09:20 |
| 160-18567-8 | SU03-S-065-SS-P-00 | Solid | 08/09/16 09:27 | 08/10/16 09:20 |
| 160-18567-9 | SU03-S-066-SS-P-00 | Solid | 08/09/16 09:10 | 08/10/16 09:20 |
| 160-18567-10 | SU03-S-067-SS-P-00 | Solid | 08/09/16 08:30 | 08/10/16 09:20 |
| 160-18567-11 | SU03-S-068-SS-P-00 | Solid | 08/09/16 08:40 | 08/10/16 09:20 |
| 160-18567-12 | SU03-S-069-SS-P-00 | Solid | 08/09/16 08:45 | 08/10/16 09:20 |
| 160-18567-13 | SU03-S-070-SS-P-00 | Solid | 08/09/16 10:10 | 08/10/16 09:20 |
| 160-18567-14 | SU03-S-071-SS-P-00 | Solid | 08/09/16 09:49 | 08/10/16 09:20 |
| 160-18567-15 | SU03-S-072-SS-P-00 | Solid | 08/09/16 10:12 | 08/10/16 09:20 |
| 160-18567-16 | SU03-S-073-SS-P-00 | Solid | 08/09/16 09:53 | 08/10/16 09:20 |
| 160-18567-17 | SU03-S-074-SS-P-00 | Solid | 08/09/16 08:55 | 08/10/16 09:20 |
| 160-18567-18 | SU03-S-075-SS-P-00 | Solid | 08/09/16 09:00 | 08/10/16 09:20 |
| 160-18567-19 | SU03-S-074-SS-DUP-00 | Solid | 08/09/16 08:55 | 08/10/16 09:20 |
| 160-18567-20 | SU03-S-060-SS-DUP-00 | Solid | 08/09/16 09:31 | 08/10/16 09:20 |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|-----------------|----------|---------------------------------|---------------|----------------------|---------------------|--------------|---------------|---------------|
| | | | | | Reagent ID | Volume Added | | |
| 82232-334_00001 | 06/03/60 | Eckert & Ziegler, Lot 82232-334 | | | (Purchased Reagent) | | Americium-241 | 7.281 Bq |
| | | | | | | | Pu-239 | 7.137 Bq |
| | | | | | | | Pulser | |
| | | | | | | | Thorium-230 | 7.63 Bq |
| | | | | | | | U | |
| 82233-334_00001 | 06/03/60 | Eckert & Zigler, Lot 82233-334 | | | (Purchased Reagent) | | Americium-241 | 5.114 Bq |
| | | | | | | | Pu-239 | 6.064 Bq |
| | | | | | | | Pulser | |
| | | | | | | | Thorium-230 | 4.95 Bq |
| | | | | | | | U | |
| 82234-334_00001 | 06/02/60 | Eckert & Zigler, Lot 82234-334 | | | (Purchased Reagent) | | Americium-241 | 5.652 Bq |
| | | | | | | | Pu-239 | 5.936 Bq |
| | | | | | | | Thorium-230 | 5.685 Bq |
| 82235-334_00001 | 06/04/60 | Eckert & Ziegler, Lot 82235-334 | | | (Purchased Reagent) | | Americium-241 | 7.466 Bq |
| | | | | | | | Pu-239 | 6.897 Bq |
| | | | | | | | Thorium-230 | 7.167 Bq |
| 82236-334_00001 | 06/02/60 | Eckert & Ziegler, Lot 82236-334 | | | (Purchased Reagent) | | Americium-241 | 6.891 Bq |
| | | | | | | | Pu-239 | 6.664 Bq |
| | | | | | | | Thorium-230 | 7.107 Bq |
| 82237-334_00003 | 06/01/60 | Eckert & Ziegler, Lot 82237-334 | | | (Purchased Reagent) | | Americium-241 | 5.608 Bq |
| | | | | | | | Pu-239 | 6.424 Bq |
| | | | | | | | Thorium-230 | 5.856 Bq |
| 82240-334_00001 | 06/08/60 | Eckert & Ziegler, Lot 82240-334 | | | (Purchased Reagent) | | Americium-241 | 8.298 Bq |
| | | | | | | | Pu-239 | 7.163 Bq |
| | | | | | | | Thorium-230 | 6.304 Bq |
| 82241-334_00001 | 06/08/60 | Eckert & Ziegler, Lot 82241-334 | | | (Purchased Reagent) | | Americium-241 | 6.638 Bq |
| | | | | | | | Pu-239 | 6.797 Bq |
| | | | | | | | Thorium-230 | 6.629 Bq |
| 82242-334_00001 | 06/08/60 | Eckert & Ziegler, Lot 82242-334 | | | (Purchased Reagent) | | Americium-241 | 7.145 Bq |
| | | | | | | | Pu-239 | 6.414 Bq |
| | | | | | | | Thorium-230 | 6.583 Bq |
| 82243-334_00001 | 06/09/60 | Eckert & Ziegler, Lot 82243-334 | | | (Purchased Reagent) | | Americium-241 | 6.39 Bq |
| | | | | | | | Pu-239 | 5.979 Bq |
| | | | | | | | Thorium-230 | 5.856 Bq |
| 82244-334_00001 | 06/09/60 | Eckert & Zigler, Lot 82244-334 | | | (Purchased Reagent) | | Americium-241 | 6.897 Bq |
| | | | | | | | Pu-239 | 6.717 Bq |
| | | | | | | | Thorium-230 | 7.352 Bq |
| 82245-334_00001 | 06/09/60 | Eckert & Ziegler, Lot 82245-334 | | | (Purchased Reagent) | | Americium-241 | 5.528 Bq |
| | | | | | | | Pu-239 | 5.437 Bq |
| | | | | | | | Thorium-230 | 6.727 Bq |
| 82246-334_00001 | 06/09/60 | Eckert & Ziegler, Lot 82246-334 | | | (Purchased Reagent) | | Americium-241 | 6.002 Bq |
| | | | | | | | Pu-239 | 5.353 Bq |
| | | | | | | | Thorium-230 | 5.57 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|----------------------|----------|---------------------------------|----------------------|----------------------|---------------------|--------------|---------------|---------------|
| | | | | | Reagent ID | Volume Added | | |
| 82247-334_00001 | 06/10/60 | Eckert & Ziegler, Lot 82247-334 | | | (Purchased Reagent) | | Americium-241 | 6.291 Bq |
| | | | | | | | Pu-239 | 5.746 Bq |
| | | | | | | | Thorium-230 | 6.251 Bq |
| Marn Soil_00002 | 03/01/16 | Eckert & Ziegler, Lot 83814-334 | | | (Purchased Reagent) | | Americium-241 | 2870 Bq |
| | | | | | | | Cd-109 | 39231 Bq |
| | | | | | | | Ce-139 | 1302 Bq |
| | | | | | | | Cesium-137 | 1087 Bq |
| | | | | | | | Co-57 | 849 Bq |
| | | | | | | | Cobalt-60 | 1788 Bq |
| | | | | | | | Hg-203 | 2820 Bq |
| | | | | | | | Pb-210 | 35040 Bq |
| | | | | | | | Sn-113 | 2306 Bq |
| MarnSolid_00002 | 02/09/17 | Eckert & Ziegler, Lot 90099 | | | (Purchased Reagent) | | Americium-241 | 2797 Bq |
| | | | | | | | Cd-109 | 39337 Bq |
| | | | | | | | Ce-139 | 1320 Bq |
| | | | | | | | Cesium-137 | 1122 Bq |
| | | | | | | | Co-57 | 870 Bq |
| | | | | | | | Hg-203 | 2814 Bq |
| | | | | | | | Pb-210 | 35883 Bq |
| | | | | | | | Sn-113 | 2322 Bq |
| | | | | | | | Y-88 | 3821 Bq |
| Source C_00001 | 04/01/59 | 02/23/12 | water, Lot 79670-334 | 1.0148 g | Gamma Ampuole_00001 | 1.0148 g | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| .Gamma Ampuole_00001 | 04/07/59 | Analytics, Lot 79670-334 | | | (Purchased Reagent) | | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| Source D_00001 | 04/01/59 | 02/23/11 | water, Lot 79670-334 | 0.9781 g | Gamma Ampuole_00001 | 0.9781 g | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|----------------------|----------|-----------|--------------------------|----------------------|---------------------|--------------|---------------|----------------|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| .Gamma Ampuole_00001 | 04/07/59 | | Analytics, Lot 79670-334 | | (Purchased Reagent) | | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| Source H_00002 | 01/01/51 | 01/01/12 | wataer, Lot 83725-334 | 10 mL | Gamma Ampuole_00003 | 2.1184 g | Americium-241 | 1924.27 Bq |
| | | | | | | | Cd-109 | 27950 Bq |
| | | | | | | | Ce-139 | 927.965 Bq |
| | | | | | | | Cesium-137 | 774.911 Bq |
| | | | | | | | Co-57 | 605.079 Bq |
| | | | | | | | Cobalt-60 | 1273.92 Bq |
| | | | | | | | Hg-203 | 2007.23 Bq |
| | | | | | | | Sn-113 | 1643.41 Bq |
| | | | | | | | Y-88 | 2681.34 Bq |
| .Gamma Ampuole_00003 | 01/19/61 | | Analytics, Lot 83725-334 | | (Purchased Reagent) | | Americium-241 | 9083.6 Bq |
| | | | | | | | Cd-109 | 131939 Bq |
| | | | | | | | Ce-139 | 4380.5 Bq |
| | | | | | | | Cesium-137 | 3658 Bq |
| | | | | | | | Co-57 | 2856.3 Bq |
| | | | | | | | Cobalt-60 | 6013.6 Bq |
| | | | | | | | Hg-203 | 9475.2 Bq |
| | | | | | | | Sn-113 | 7757.8 Bq |
| | | | | | | | Y-88 | 12657.4 Bq |
| Th-229_00021 | 08/01/17 | 07/20/16 | 0.1M HNO3, Lot n/a | 500 mL | Th-229_00017 | 15 mL | At-217 | 67.2296 dpm/mL |
| | | | | | | | Thorium-229 | 67.2296 dpm/mL |
| .Th-229_00017 | 08/01/17 | 08/20/14 | 0.1M HNO3, Lot n/a | 100 mL | Th-229_00016 | 5.0464 g | At-217 | 2240.99 dpm/mL |
| | | | | | | | Thorium-229 | 2240.99 dpm/mL |
| ..Th-229_00016 | 08/06/64 | | Analytics, Lot 97790 | | (Purchased Reagent) | | At-217 | 740.127 Bq/g |
| | | | | | | | Thorium-229 | 740.127 Bq/g |
| TRM-2_00001 | 03/20/50 | | DOE, Lot TRM-2 | | (Purchased Reagent) | | Pb-210 | 22.1 pCi/g |
| | | | | | | | Radium-226 | 25.4 pCi/g |
| | | | | | | | Thorium-230 | 24.5 pCi/g |
| | | | | | | | U-234 | 6.2 pCi/g |
| | | | | | | | U-238 | 6 pCi/g |
| Tuna Can LCS_00005 | 10/29/16 | | Analytics, Lot 74139-334 | | (Purchased Reagent) | | Americium-241 | 219 dpm/g |
| | | | | | | | Cesium-137 | 82.3 dpm/g |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|-----------------------|----------|---------------------------------|---------------|----------------------|---------------------|--------------|---------------|---------------|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Cobalt-60 | 136 dpm/g |
| Tuna Can_00002 | 02/03/15 | Eckert & Ziegler, Lot 81427-334 | | | (Purchased Reagent) | | Americium-241 | 1164 Bq |
| | | | | | | | Cd-109 | 16063 Bq |
| | | | | | | | Ce-139 | 546 Bq |
| | | | | | | | Cesium-137 | 465 Bq |
| | | | | | | | Co-57 | 357 Bq |
| | | | | | | | Cobalt-60 | 742 Bq |
| | | | | | | | Hg-203 | 1208 Bq |
| | | | | | | | Pb-210 | 15186 Bq |
| | | | | | | | Sn-113 | 943 Bq |
| Tuna Can_00003 | 02/09/17 | Eckert & Ziegler, Lot 90099 | | | (Purchased Reagent) | | Y-88 | 1571 Bq |
| | | | | | | | Americium-241 | 1164 Bq |
| | | | | | | | Cd-109 | 16373 Bq |
| | | | | | | | Ce-139 | 549 Bq |
| | | | | | | | Cesium-137 | 467 Bq |
| | | | | | | | Co-57 | 362 Bq |
| | | | | | | | Cobalt-60 | 735 Bq |
| | | | | | | | Hg-203 | 1171 Bq |
| | | | | | | | Pb-210 | 14936 Bq |
| Tuna Can_00006 | 03/01/16 | Eckert & Ziegler, Lot 83814-334 | | | (Purchased Reagent) | | Sn-113 | 967 Bq |
| | | | | | | | Y-88 | 1590 Bq |
| | | | | | | | Americium-241 | 1195 Bq |
| | | | | | | | Cd-109 | 16353 Bq |
| | | | | | | | Ce-139 | 543 Bq |
| | | | | | | | Cesium-137 | 453 Bq |
| | | | | | | | Co-57 | 354 Bq |
| | | | | | | | Cobalt-60 | 745 Bq |
| | | | | | | | Hg-203 | 1175 Bq |
| | | | | | | | Pb-210 | 14606 Bq |
| | | | | | | | Sn-113 | 961 Bq |
| | | | | | | | Y-88 | 1568 Bq |

ALPHA SPECTROSCOPY

Method A-01-R Th

Isotopic Thorium (Alpha
Spectrometry) by Method A-01-R

Prep Batch: 266565

Preparation, Extraction
Chromatography Resin Actinide
Separation

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266565

Lab ID: MB 160-266565/1-A
 Client ID:
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV171
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|-----------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.09373 | 0.0422 | 0.0430 | | pCi/g | 0.100 | 0.0143 | 268478 | |
| Thorium-232 | 0.004736 | 0.00947 | 0.00948 | U | pCi/g | 0.100 | 0.0142 | 268478 | |
| Tracer | MB Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.922 | 0.232 | 0.338 | | pCi/g | 0.0339 | 3.03 | 96.5 | 30 - 110 |

Lab ID: LCS 160-266565/2-A
 Client ID:
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV172
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|------------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 25.18 | 0.982 | 2.33 | | pCi/g | 0.100 | 0.0287 | 268479 | |
| Tracer | LCS Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 5.865 | 0.467 | 0.679 | | pCi/g | 0.0685 | 6.05 | 97.0 | 30 - 110 |

Lab ID: 160-18567-1
 Client ID: SU03-S-058-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV195
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.621 | 0.117 | 0.128 | | pCi/g | 0.100 | 0.0437 | 268488 | |
| Thorium-232 | 1.16 | 0.158 | 0.186 | | pCi/g | 0.100 | 0.0299 | 268488 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.44 | 0.207 | 0.291 | | pCi/g | 0.0323 | 3.03 | 80.6 | 30 - 110 |

Lab ID: 160-18567-2
 Client ID: SU03-S-059-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV198
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.767 | 0.122 | 0.138 | | pCi/g | 0.100 | 0.0146 | 268489 | |
| Thorium-232 | 1.25 | 0.157 | 0.189 | | pCi/g | 0.100 | 0.0391 | 268489 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.70 | 0.217 | 0.314 | | pCi/g | 0.0241 | 3.03 | 89.3 | 30 - 110 |

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266565

Lab ID: 160-18567-3
 Client ID: SU03-S-060-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV199
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.47 | 0.176 | 0.215 | | pCi/g | 0.100 | 0.0344 | 268490 | |
| Thorium-232 | 1.80 | 0.194 | 0.245 | | pCi/g | 0.100 | 0.0288 | 268490 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.64 | 0.220 | 0.312 | | pCi/g | 0.0337 | 3.03 | 87.2 | 30 - 110 |

Lab ID: 160-18567-4
 Client ID: SU03-S-061-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV200
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.11 | 0.152 | 0.178 | | pCi/g | 0.100 | 0.0392 | 268491 | |
| Thorium-232 | 1.90 | 0.198 | 0.255 | | pCi/g | 0.100 | 0.0379 | 268491 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.71 | 0.224 | 0.320 | | pCi/g | 0.0304 | 3.03 | 89.6 | 30 - 110 |

Lab ID: 160-18567-5
 Client ID: SU03-S-062-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 15:56
 Detector: AV148
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.806 | 0.125 | 0.142 | | pCi/g | 0.100 | 0.0300 | 268650 | |
| Thorium-232 | 1.45 | 0.166 | 0.206 | | pCi/g | 0.100 | 0.0263 | 268650 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.68 | 0.214 | 0.311 | | pCi/g | 0.0366 | 3.03 | 88.6 | 30 - 110 |

Lab ID: 160-18567-6
 Client ID: SU03-S-063-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 15:56
 Detector: AV149
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.883 | 0.133 | 0.153 | | pCi/g | 0.100 | 0.0256 | 268651 | |
| Thorium-232 | 1.77 | 0.188 | 0.239 | | pCi/g | 0.100 | 0.0150 | 268651 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.85 | 0.232 | 0.333 | | pCi/g | 0.0141 | 3.03 | 93.8 | 30 - 110 |

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266565

Lab ID: 160-18567-7
 Client ID: SU03-S-064-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV203
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.58 | 0.182 | 0.226 | | pCi/g | 0.100 | 0.0290 | 268494 | |
| Thorium-232 | 1.81 | 0.195 | 0.247 | | pCi/g | 0.100 | 0.0288 | 268494 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.51 | 0.210 | 0.298 | | pCi/g | 0.0459 | 3.03 | 82.9 | 30 - 110 |

Lab ID: 160-18567-8
 Client ID: SU03-S-065-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV204
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.34 | 0.160 | 0.196 | | pCi/g | 0.100 | 0.0265 | 268495 | |
| Thorium-232 | 1.42 | 0.165 | 0.204 | | pCi/g | 0.100 | 0.0264 | 268495 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.72 | 0.216 | 0.314 | | pCi/g | 0.0283 | 3.03 | 89.7 | 30 - 110 |

Lab ID: 160-18567-9
 Client ID: SU03-S-066-SS-P-00
 Sigma: 2

Analyzed: 09/07/16 14:38
 Detector: AV205
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.19 | 0.161 | 0.190 | | pCi/g | 0.100 | 0.0300 | 268496 | |
| Thorium-232 | 1.89 | 0.203 | 0.258 | | pCi/g | 0.100 | 0.0300 | 268496 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.64 | 0.225 | 0.316 | | pCi/g | 0.0381 | 3.02 | 87.3 | 30 - 110 |

Lab ID: 160-18567-10
 Client ID: SU03-S-067-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 15:56
 Detector: AV150
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.910 | 0.138 | 0.157 | | pCi/g | 0.100 | 0.0286 | 268652 | |
| Thorium-232 | 2.07 | 0.207 | 0.270 | | pCi/g | 0.100 | 0.0339 | 268652 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.71 | 0.224 | 0.319 | | pCi/g | 0.0341 | 3.03 | 89.3 | 30 - 110 |

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266565

Lab ID: 160-18567-11
Client ID: SU03-S-068-SS-P-00
Sigma: 2

Analyzed: 09/08/16 15:56
Detector: AV153
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.852 | 0.128 | 0.146 | | pCi/g | 0.100 | 0.0144 | 268653 | |
| Thorium-232 | 1.83 | 0.187 | 0.242 | | pCi/g | 0.100 | 0.0263 | 268653 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.68 | 0.213 | 0.310 | | pCi/g | 0.0279 | 3.02 | 88.6 | 30 - 110 |

Lab ID: 160-18567-12
Client ID: SU03-S-069-SS-P-00
Sigma: 2

Analyzed: 09/07/16 14:38
Detector: AV208
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.71 | 0.182 | 0.232 | | pCi/g | 0.100 | 0.0145 | 268499 | |
| Thorium-232 | 1.63 | 0.177 | 0.224 | | pCi/g | 0.100 | 0.0265 | 268499 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.78 | 0.222 | 0.323 | | pCi/g | 0.0294 | 3.03 | 91.9 | 30 - 110 |

Lab ID: 160-18567-13
Client ID: SU03-S-070-SS-P-00
Sigma: 2

Analyzed: 09/07/16 14:38
Detector: AV209
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 2.20 | 0.211 | 0.281 | | pCi/g | 0.100 | 0.0373 | 268500 | |
| Thorium-232 | 2.40 | 0.221 | 0.299 | | pCi/g | 0.100 | 0.0498 | 268500 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.62 | 0.215 | 0.308 | | pCi/g | 0.0465 | 3.02 | 86.7 | 30 - 110 |

Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|------------------------|-------------|---------------|-------------|------------|-----------|-------|-------|--------------|-----|-----|-----|-----------|---------------------|
| MB 160-266565/1-A | Thorium-230 | | | 0.09373 | | pCi/g | | | | | | | 4.362439 |
| MB 160-266565/1-A | Thorium-232 | | | 0.004736 | U | pCi/g | | | | | | | 07 .9991191 7 |
| Lab Control Sample ID: | Analyte | Parent Result | Spike Added | LCS Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
| LCS 160-266565/2-A | Thorium-230 | | 24.5 | 25.18 | | pCi/g | 103 | 81 - 118 | | | | | .4226744 371 |

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266565

Glossary:

Ts = Count Duration, Sample

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

Batch Number: 266565 Batch Start Date: 08/25/16 15:54 Batch Analyst: Bernsen, Sarah CBatch Method: ExtChrom Batch End Date: 08/31/16 11:14

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | Th-229 00021 | TRM-2 00001 | AnalysisComment | | |
|---------------------|--------------------|---------------------|-------|---------------|--------------|-------------|-----------------|--|--|
| MB 160-266565/1 | | ExtChrom, A-01-R | | 1.0 g | 0.1 mL | | | | |
| LCS 160-266565/2 | | ExtChrom, A-01-R | | 0.5006 g | 0.1 mL | 0.5006 g | TRM | | |
| 160-18567-A-1-A | SU03-S-058-SS-P-00 | ExtChrom, A-01-R | T | 0.9992 g | 0.1 mL | | | | |
| 160-18567-A-2-A | SU03-S-059-SS-P-00 | ExtChrom, A-01-R | T | 1.0004 g | 0.1 mL | | | | |
| 160-18567-A-3-A | SU03-S-060-SS-P-00 | ExtChrom, A-01-R | T | 1.0005 g | 0.1 mL | | | | |
| 160-18567-A-4-A | SU03-S-061-SS-P-00 | ExtChrom, A-01-R | T | 0.9999 g | 0.1 mL | | | | |
| 160-18567-A-5-A | SU03-S-062-SS-P-00 | ExtChrom, A-01-R | T | 0.9989 g | 0.1 mL | | | | |
| 160-18567-A-6-A | SU03-S-063-SS-P-00 | ExtChrom, A-01-R | T | 0.9984 g | 0.1 mL | | | | |
| 160-18567-A-7-A | SU03-S-064-SS-P-00 | ExtChrom, A-01-R | T | 1.0005 g | 0.1 mL | | | | |
| 160-18567-A-8-A | SU03-S-065-SS-P-00 | ExtChrom, A-01-R | T | 1.0001 g | 0.1 mL | | | | |
| 160-18567-A-9-A | SU03-S-066-SS-P-00 | ExtChrom, A-01-R | T | 1.0018 g | 0.1 mL | | | | |
| 160-18567-A-10-A | SU03-S-067-SS-P-00 | ExtChrom, A-01-R | T | 0.9988 g | 0.1 mL | | | | |
| 160-18567-A-11-A | SU03-S-068-SS-P-00 | ExtChrom, A-01-R | T | 1.0017 g | 0.1 mL | | | | |
| 160-18567-A-12-A | SU03-S-069-SS-P-00 | ExtChrom, A-01-R | T | 0.9988 g | 0.1 mL | | | | |
| 160-18567-A-13-A | SU03-S-070-SS-P-00 | ExtChrom, A-01-R | T | 1.0024 g | 0.1 mL | | | | |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

A-01-R

Page 1 of 2

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

Batch Number: 266565 Batch Start Date: 08/25/16 15:54 Batch Analyst: Bernsen, Sarah CBatch Method: ExtChrom Batch End Date: 08/31/16 11:14

| Batch Notes | |
|-----------------------------------|--|
| Balance ID | 0034150065 |
| Analyst ID - Column | nmn per scb |
| Column Date | 8/30/16 |
| Analyst ID - CoPrecipitation | scb |
| CoPrecipitation Date | 8/31/16 |
| Pipette ID | rad104 |
| Analyst ID - Reagent Drop Witness | rjs |
| Analyst ID - Reagent Drop | ats |
| SOP Number | st-rc-0003, st-rc-0004, st-rc-0100, st-rc-0242 |

| Basis | Basis Description |
|-------|-------------------|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Prep Batch: 266566

Preparation, Extraction
Chromatography Resin Actinide
Separation

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266566

Lab ID: MB 160-266566/1-A
 Client ID:
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV188
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|-----------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 0.05109 | 0.0339 | 0.0341 | | pCi/g | 0.100 | 0.0330 | 268671 | |
| Thorium-232 | 0.01000 | 0.0141 | 0.0142 | U | pCi/g | 0.100 | 0.0150 | 268671 | |
| Tracer | MB Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.748 | 0.224 | 0.322 | | pCi/g | 0.0300 | 3.03 | 90.7 | 30 - 110 |

Lab ID: LCS 160-266566/2-A
 Client ID:
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV189
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|------------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 25.59 | 0.994 | 2.37 | | pCi/g | 0.100 | 0.0776 | 268672 | |
| Tracer | LCS Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 5.347 | 0.427 | 0.620 | | pCi/g | 0.0311 | 6.04 | 88.6 | 30 - 110 |

Lab ID: 160-18567-14
 Client ID: SU03-S-071-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV190
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.83 | 0.188 | 0.243 | | pCi/g | 0.100 | 0.0144 | 268673 | |
| Thorium-232 | 1.38 | 0.162 | 0.199 | | pCi/g | 0.100 | 0.0144 | 268673 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.67 | 0.214 | 0.310 | | pCi/g | 0.0368 | 3.02 | 88.3 | 30 - 110 |

Lab ID: 160-18567-14 DU
 Client ID: SU03-S-071-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV191
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | DU Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|-----------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 2.112 | 0.203 | 0.269 | | pCi/g | 0.100 | 0.0357 | 268674 | |
| Thorium-232 | 1.524 | 0.172 | 0.214 | | pCi/g | 0.100 | 0.0388 | 268674 | |
| Tracer | DU Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.915 | 0.233 | 0.338 | | pCi/g | 0.0307 | 3.03 | 96.3 | 30 - 110 |

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266566

Lab ID: 160-18567-15
 Client ID: SU03-S-072-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV193
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 8.49 | 0.417 | 0.826 | | pCi/g | 0.100 | 0.0154 | 268675 | |
| Thorium-232 | 2.75 | 0.237 | 0.331 | | pCi/g | 0.100 | 0.0335 | 268675 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.62 | 0.216 | 0.309 | | pCi/g | 0.0292 | 3.03 | 86.6 | 30 - 110 |

Lab ID: 160-18567-16
 Client ID: SU03-S-073-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV195
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 16.3 | 0.580 | 1.49 | | pCi/g | 0.100 | 0.0415 | 268676 | |
| Thorium-232 | 3.86 | 0.281 | 0.429 | | pCi/g | 0.100 | 0.0283 | 268676 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.57 | 0.212 | 0.303 | | pCi/g | 0.0323 | 3.03 | 84.9 | 30 - 110 |

Lab ID: 160-18567-17
 Client ID: SU03-S-074-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV198
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.52 | 0.178 | 0.219 | | pCi/g | 0.100 | 0.0156 | 268677 | |
| Thorium-232 | 1.26 | 0.162 | 0.194 | | pCi/g | 0.100 | 0.0417 | 268677 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.53 | 0.210 | 0.299 | | pCi/g | 0.0241 | 3.03 | 83.7 | 30 - 110 |

Lab ID: 160-18567-18
 Client ID: SU03-S-075-SS-P-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV199
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.57 | 0.182 | 0.225 | | pCi/g | 0.100 | 0.0344 | 268678 | |
| Thorium-232 | 1.28 | 0.164 | 0.196 | | pCi/g | 0.100 | 0.0287 | 268678 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.65 | 0.220 | 0.313 | | pCi/g | 0.0337 | 3.03 | 87.4 | 30 - 110 |

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 266566

Lab ID: 160-18567-19
 Client ID: SU03-S-074-SS-DUP-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV200
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.51 | 0.172 | 0.214 | | pCi/g | 0.100 | 0.0369 | 268679 | |
| Thorium-232 | 1.51 | 0.171 | 0.213 | | pCi/g | 0.100 | 0.0357 | 268679 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.89 | 0.232 | 0.335 | | pCi/g | 0.0305 | 3.03 | 95.3 | 30 - 110 |

Lab ID: 160-18567-20
 Client ID: SU03-S-060-SS-DUP-00
 Sigma: 2

Analyzed: 09/08/16 11:49
 Detector: AV201
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch | |
|-------------|--------|-----------|-----------|-----------|-------|--------|-------------|------------|--------------|
| Thorium-230 | 1.09 | 0.151 | 0.177 | | pCi/g | 0.100 | 0.0646 | 268680 | |
| Thorium-232 | 1.23 | 0.157 | 0.188 | | pCi/g | 0.100 | 0.0278 | 268680 | |
| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
| Thorium-229 | 2.67 | 0.219 | 0.313 | | pCi/g | 0.0489 | 3.02 | 88.1 | 30 - 110 |

Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|------------------------|-------------|---------------|-------------|------------|-----------|-------|-------|--------------|-----|------|------|-----------|----------------------|
| MB 160-266566/1-A | Thorium-230 | | | 0.05109 | | pCi/g | | | | | | | 2.994141 |
| MB 160-266566/1-A | Thorium-232 | | | 0.01000 | U | pCi/g | | | | | | | 94 1.411725 47 |
| Lab Control Sample ID: | Analyte | Parent Result | Spike Added | LCS Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
| LCS 160-266566/2-A | Thorium-230 | | 24.5 | 25.59 | | pCi/g | 104 | 81 - 118 | | | | | .6653575 112 |
| Duplicate ID: | Analyte | Parent Result | Spike Added | DU Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
| 160-18567-14 | Thorium-230 | 1.83 | | 2.112 | | pCi/g | | | 14 | 0.54 | 1.53 | 1 | |
| 160-18567-14 | Thorium-232 | 1.38 | | 1.524 | | pCi/g | | | 10 | 0.36 | 1.01 | 1 | |

Glossary:
 Ts = Count Duration, Sample

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

Batch Number: 266566 Batch Start Date: 08/25/16 15:56 Batch Analyst: Bernsen, Sarah CBatch Method: ExtChrom Batch End Date: 09/01/16 15:04

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | Th-229 00021 | TRM-2 00001 | AnalysisComment | | |
|---------------------|--------------------------|---------------------|-------|---------------|--------------|-------------|-----------------|--|--|
| MB 160-266566/1 | | ExtChrom, A-01-R | | 1.0 g | 0.1 mL | | | | |
| LCS 160-266566/2 | | ExtChrom, A-01-R | | 0.5016 g | 0.1 mL | 0.5016 g | TRM | | |
| 160-18567-A-14-A | SU03-S-071-SS-P-00 | ExtChrom, A-01-R | T | 1.0018 g | 0.1 mL | | | | |
| 160-18567-A-14-A DU | SU03-S-071-SS-P-00 | ExtChrom, A-01-R | T | 1.0008 g | 0.1 mL | | | | |
| 160-18567-A-15-A | SU03-S-072-SS-P-00 | ExtChrom, A-01-R | T | 1.0002 g | 0.1 mL | | | | |
| 160-18567-A-16-A | SU03-S-073-SS-P-00 | ExtChrom, A-01-R | T | 0.9998 g | 0.1 mL | | | | |
| 160-18567-A-17-A | SU03-S-074-SS-P-00 | ExtChrom, A-01-R | T | 1.0009 g | 0.1 mL | | | | |
| 160-18567-A-18-A | SU03-S-075-SS-P-00 | ExtChrom, A-01-R | T | 1.0003 g | 0.1 mL | | | | |
| 160-18567-A-19-A | SU03-S-074-SS-DU P-00 | ExtChrom, A-01-R | T | 0.9992 g | 0.1 mL | | | | |
| 160-18567-A-20-A | SU03-S-060-SS-DU P-00 | ExtChrom, A-01-R | T | 1.0014 g | 0.1 mL | | | | |

| Batch Notes | |
|-----------------------------------|--|
| Balance ID | 0034150065 |
| Analyst ID - Column | ats per scb |
| Column Date | 9/1/16 |
| Analyst ID - CoPrecipitation | scb |
| CoPrecipitation Date | 9/1/16 |
| Pipette ID | rad104 |
| Analyst ID - Reagent Drop Witness | jdl |
| Analyst ID - Reagent Drop | ats |
| SOP Number | st-rc-0003, st-rc-0004, st-rc-0100, st-rc-0242 |

| Basis | Basis Description |
|-------|-------------------|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

A-01-R

Page 1 of 1

Run Logs

Alpha Spectroscopy Run Log

Detector: AV148

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/16/15 16:27 | 140 | IC 160-223445/1 | | 223445 | | | PS |
| 10/26/15 19:10 | 60 | ICV 160-223563/1 | | 223563 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268020/1 | | 268020 | | | PS |
| 09/06/16 15:23 | 60 | CCV 160-268313/1 | | 268313 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268650/1 | | 268650 | | | ALD |
| 09/08/16 15:56 | 400 | 160-18567-5 | SU03-S-062-SS-P-00 | 268650 | 266565 | A-01-R | ALD |

Detector: AV149

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/16/15 15:51 | 140 | IC 160-223446/1 | | 223446 | | | PS |
| 10/26/15 19:10 | 60 | ICV 160-223564/1 | | 223564 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268021/1 | | 268021 | | | PS |
| 09/06/16 15:23 | 60 | CCV 160-268314/1 | | 268314 | | | |
| 09/06/16 16:41 | 60 | CCV 160-268314/2 | | 268314 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268651/1 | | 268651 | | | ALD |
| 09/08/16 15:56 | 400 | 160-18567-6 | SU03-S-063-SS-P-00 | 268651 | 266565 | A-01-R | ALD |

Detector: AV150

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/16/15 15:51 | 140 | IC 160-223447/1 | | 223447 | | | PS |
| 10/26/15 19:10 | 60 | ICV 160-223565/1 | | 223565 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268022/1 | | 268022 | | | PS |
| 09/06/16 15:23 | 60 | CCV 160-268315/1 | | 268315 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268652/1 | | 268652 | | | ALD |
| 09/08/16 15:56 | 400 | 160-18567-10 | SU03-S-067-SS-P-00 | 268652 | 266565 | A-01-R | ALD |

Detector: AV153

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/16/15 15:52 | 140 | IC 160-223450/1 | | 223450 | | | PS |
| 10/26/15 19:11 | 60 | ICV 160-223568/1 | | 223568 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268025/1 | | 268025 | | | PS |
| 09/06/16 12:40 | 60 | CCV 160-268316/1 | | 268316 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268653/1 | | 268653 | | | ALD |
| 09/08/16 15:56 | 400 | 160-18567-11 | SU03-S-068-SS-P-00 | 268653 | 266565 | A-01-R | ALD |

Detector: AV171

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|------------------|-------------------|---------------|--------|---------------------|
| 10/16/15 18:59 | 140 | IC 160-223468/1 | | 223468 | | | PS |
| 10/26/15 20:28 | 60 | ICV 160-223586/1 | | 223586 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268043/1 | | 268043 | | | PS |
| 09/06/16 13:58 | 60 | CCV 160-268329/1 | | 268329 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268478/1 | | 268478 | | | ALD |
| 09/07/16 14:38 | 400 | MB 160-266565/1-A | | 268478 | 266565 | A-01-R | ALD |

Detector: AV172

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|-----------------|------------------|-------------------|---------------|--------|---------------------|
| 10/16/15 18:59 | 140 | IC 160-223469/1 | | 223469 | | | PS |

Alpha Spectroscopy Run Log

Detector: AV172 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|------------------|-------------------|---------------|--------|---------------------|
| 10/26/15 20:29 | 60 | ICV 160-223587/1 | | 223587 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268044/1 | | 268044 | | | PS |
| 09/06/16 13:58 | 60 | CCV 160-268330/1 | | 268330 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268479/1 | | 268479 | | | ALD |
| 09/07/16 14:38 | 400 | LCS 160-266565/2-A | | 268479 | 266565 | A-01-R | ALD |

Detector: AV175

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 14:48 | 140 | IC 160-223472/1 | | 223472 | | | PS |
| 10/31/15 14:14 | 60 | ICV 160-223590/1 | | 223590 | | | |
| 10/31/15 17:26 | 60 | ICV 160-223590/2 | | 223590 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268047/1 | | 268047 | | | PS |
| 09/07/16 08:37 | 60 | CCV 160-268386/1 | | 268386 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268481/1 | | 268481 | | | ALD |
| 09/07/16 14:38 | 400 | ZZZZZ | | 268481 | | | |

Detector: AV188

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 14:51 | 140 | IC 160-223485/1 | | 223485 | | | PS |
| 10/31/15 14:17 | 60 | ICV 160-223603/1 | | 223603 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268052/1 | | 268052 | | | PS |
| 09/06/16 13:58 | 60 | CCV 160-268333/1 | | 268333 | | | |
| 09/06/16 16:43 | 60 | CCV 160-268333/2 | | 268333 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268671/1 | | 268671 | | | ALD |
| 09/08/16 11:49 | 400 | MB 160-266566/1-A | | 268671 | 266566 | A-01-R | ALD |
| 09/08/16 20:50 | 180 | ZZZZZ | | 268671 | | | |

Detector: AV189

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:19 | 140 | IC 160-223486/1 | | 223486 | | | PS |
| 11/01/15 14:23 | 60 | ICV 160-223604/1 | | 223604 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268053/1 | | 268053 | | | PS |
| 09/06/16 14:01 | 60 | CCV 160-268334/1 | | 268334 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268672/1 | | 268672 | | | ALD |
| 09/08/16 11:49 | 400 | LCS 160-266566/2-A | | 268672 | 266566 | A-01-R | ALD |
| 09/08/16 20:50 | 180 | ZZZZZ | | 268672 | | | |

Detector: AV190

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:13 | 140 | IC 160-223487/1 | | 223487 | | | PS |
| 11/01/15 14:23 | 60 | ICV 160-223605/1 | | 223605 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268054/1 | | 268054 | | | PS |
| 09/06/16 14:01 | 60 | CCV 160-268335/1 | | 268335 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268673/1 | | 268673 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-14 | SU03-S-071-SS-P-00 | 268673 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268673 | | | |

Alpha Spectroscopy Run Log

Detector: AV191

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|-----------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:13 | 140 | IC 160-223488/1 | | 223488 | | | PS |
| 11/01/15 14:23 | 60 | ICV 160-223606/1 | | 223606 | | | |
| 11/01/15 18:11 | 60 | ICV 160-223606/2 | | 223606 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268055/1 | | 268055 | | | PS |
| 09/06/16 14:00 | 60 | CCV 160-268336/1 | | 268336 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268674/1 | | 268674 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-14 DU | SU03-S-071-SS-P-00 DU | 268674 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268674 | | | |

Detector: AV193

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:13 | 140 | IC 160-223490/1 | | 223490 | | | PS |
| 11/01/15 14:24 | 60 | ICV 160-223608/1 | | 223608 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268057/1 | | 268057 | | | PS |
| 09/06/16 14:00 | 60 | CCV 160-268338/1 | | 268338 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268675/1 | | 268675 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-15 | SU03-S-072-SS-P-00 | 268675 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268675 | | | |

Detector: AV195

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:19 | 140 | IC 160-223492/1 | | 223492 | | | PS |
| 11/01/15 14:28 | 60 | ICV 160-223610/1 | | 223610 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268059/1 | | 268059 | | | PS |
| 09/06/16 08:59 | 60 | CCV 160-268339/1 | | 268339 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268488/1 | | 268488 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-1 | SU03-S-058-SS-P-00 | 268488 | 266565 | A-01-R | ALD |
| 09/08/16 10:49 | 1 | PULSER 160-268676/1 | | 268676 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-16 | SU03-S-073-SS-P-00 | 268676 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268676 | | | |

Detector: AV198

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:15 | 140 | IC 160-223495/1 | | 223495 | | | PS |
| 11/01/15 14:25 | 60 | ICV 160-223613/1 | | 223613 | | | PS |
| 09/02/16 10:55 | 960 | ICB 160-268132/1 | | 268132 | | | PS |
| 09/06/16 12:40 | 60 | CCV 160-268340/1 | | 268340 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268489/1 | | 268489 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-2 | SU03-S-059-SS-P-00 | 268489 | 266565 | A-01-R | ALD |
| 09/08/16 10:49 | 1 | PULSER 160-268677/1 | | 268677 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-17 | SU03-S-074-SS-P-00 | 268677 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268677 | | | |

Detector: AV199

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|------------------|------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:15 | 140 | IC 160-223496/1 | | 223496 | | | PS |
| 11/01/15 14:25 | 60 | ICV 160-223614/1 | | 223614 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268062/1 | | 268062 | | | PS |
| 09/06/16 12:41 | 60 | CCV 160-268341/1 | | 268341 | | | |

Alpha Spectroscopy Run Log

Detector: AV199 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 09/06/16 15:22 | 60 | CCV 160-268341/2 | | 268341 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268490/1 | | 268490 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-3 | SU03-S-060-SS-P-00 | 268490 | 266565 | A-01-R | ALD |
| 09/08/16 10:49 | 1 | PULSER 160-268678/1 | | 268678 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-18 | SU03-S-075-SS-P-00 | 268678 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268678 | | | |

Detector: AV200

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|----------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:15 | 140 | IC 160-223497/1 | | 223497 | | | PS |
| 11/01/15 14:26 | 60 | ICV 160-223615/1 | | 223615 | | | PS |
| 09/02/16 10:55 | 960 | ICB 160-268133/1 | | 268133 | | | PS |
| 09/06/16 12:41 | 60 | CCV 160-268342/1 | | 268342 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268491/1 | | 268491 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-4 | SU03-S-061-SS-P-00 | 268491 | 266565 | A-01-R | ALD |
| 09/08/16 10:49 | 1 | PULSER 160-268679/1 | | 268679 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-19 | SU03-S-074-SS-DUP-00 | 268679 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268679 | | | |

Detector: AV201

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|----------------------|-------------------|---------------|--------|---------------------|
| 10/17/15 18:23 | 140 | IC 160-223498/1 | | 223498 | | | PS |
| 11/01/15 14:26 | 60 | ICV 160-223616/1 | | 223616 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268064/1 | | 268064 | | | PS |
| 09/06/16 12:48 | 60 | CCV 160-268343/1 | | 268343 | | | PS |
| 09/08/16 10:49 | 1 | PULSER 160-268680/1 | | 268680 | | | ALD |
| 09/08/16 11:49 | 400 | 160-18567-20 | SU03-S-060-SS-DUP-00 | 268680 | 266566 | A-01-R | ALD |
| 09/08/16 20:54 | 400 | ZZZZZ | | 268680 | | | |

Detector: AV203

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/18/15 16:18 | 140 | IC 160-223500/1 | | 223500 | | | PS |
| 11/01/15 16:01 | 60 | ICV 160-223618/1 | | 223618 | | | |
| 11/01/15 18:11 | 60 | ICV 160-223618/2 | | 223618 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268066/1 | | 268066 | | | PS |
| 09/06/16 12:42 | 60 | CCV 160-268345/1 | | 268345 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268494/1 | | 268494 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-7 | SU03-S-064-SS-P-00 | 268494 | 266565 | A-01-R | ALD |

Detector: AV204

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/18/15 16:18 | 140 | IC 160-223501/1 | | 223501 | | | PS |
| 11/01/15 16:10 | 60 | ICV 160-223619/1 | | 223619 | | | PS |
| 09/02/16 10:55 | 960 | ICB 160-268134/1 | | 268134 | | | PS |
| 09/06/16 12:42 | 60 | CCV 160-268346/1 | | 268346 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268495/1 | | 268495 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-8 | SU03-S-065-SS-P-00 | 268495 | 266565 | A-01-R | ALD |

Alpha Spectroscopy Run Log

Detector: AV205

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/18/15 16:19 | 140 | IC 160-223502/1 | | 223502 | | | PS |
| 11/01/15 16:02 | 60 | ICV 160-223620/1 | | 223620 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268068/1 | | 268068 | | | PS |
| 09/06/16 12:49 | 60 | CCV 160-268347/1 | | 268347 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268496/1 | | 268496 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-9 | SU03-S-066-SS-P-00 | 268496 | 266565 | A-01-R | ALD |

Detector: AV208

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/18/15 16:19 | 140 | IC 160-223505/1 | | 223505 | | | PS |
| 11/01/15 16:11 | 60 | ICV 160-223623/1 | | 223623 | | | PS |
| 09/02/16 10:55 | 960 | ICB 160-268137/1 | | 268137 | | | PS |
| 09/06/16 11:23 | 60 | CCV 160-268350/1 | | 268350 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268499/1 | | 268499 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-12 | SU03-S-069-SS-P-00 | 268499 | 266565 | A-01-R | ALD |

Detector: AV209

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 10/18/15 16:11 | 140 | IC 160-223506/1 | | 223506 | | | PS |
| 11/01/15 16:11 | 60 | ICV 160-223624/1 | | 223624 | | | PS |
| 09/01/16 15:17 | 960 | ICB 160-268072/1 | | 268072 | | | PS |
| 09/06/16 11:23 | 60 | CCV 160-268351/1 | | 268351 | | | PS |
| 09/07/16 12:23 | 1 | PULSER 160-268500/1 | | 268500 | | | ALD |
| 09/07/16 14:38 | 400 | 160-18567-13 | SU03-S-070-SS-P-00 | 268500 | 266565 | A-01-R | ALD |

GAMMA SPECTROSCOPY

Method 901.1

Ra-226

Radium-226 & Other Gamma Emitters
(GS) by Method 901.1

Prep Batch: 265170

Fill Geometry, 21-Day In-Growth

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 265170

Lab ID: MB 160-265170/1-A Analyzed: 09/07/16 16:23 Ts: 30 Sigma: 2
 Client ID: Detector: GV15 Decay Corrected: No

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|-----------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | -0.05210 | 0.132 | 0.132 | U | pCi/g | 0.500 | 0.389 | 268245 |

Lab ID: LCS 160-265170/2-A Analyzed: 09/07/16 16:24 Ts: 30 Sigma: 2
 Client ID: Detector: GV16 Decay Corrected: No

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---------------|------------|-----------|-----------|-----------|-------|-----|--------|------------|
| Americium-241 | 96.96 | 1.55 | 10.2 | | pCi/g | | 1.12 | 268246 |
| Cesium-137 | 29.30 | 0.674 | 3.12 | | pCi/g | | 0.236 | 268246 |
| Cobalt-60 | 16.39 | 0.411 | 1.70 | | pCi/g | | 0.0748 | 268246 |

Lab ID: 160-18567-1 Analyzed: 09/07/16 15:22 Ts: 30 Sigma: 2
 Client ID: SU03-S-058-SS-P-00 Detector: GV15 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.03 | 0.215 | 0.241 | | pCi/g | 0.500 | 0.167 | 268245 |

Lab ID: 160-18567-1 DU Analyzed: 09/07/16 16:25 Ts: 30 Sigma: 2
 Client ID: SU03-S-058-SS-P-00 Detector: GV17 Decay Corrected: No

| Analyte | DU Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|-----------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.124 | 0.205 | 0.236 | | pCi/g | 0.500 | 0.152 | 268247 |

Lab ID: 160-18567-2 Analyzed: 09/07/16 16:27 Ts: 30 Sigma: 2
 Client ID: SU03-S-059-SS-P-00 Detector: GV9 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.23 | 0.207 | 0.243 | | pCi/g | 0.500 | 0.156 | 268241 |

Lab ID: 160-18567-3 Analyzed: 09/07/16 16:29 Ts: 30 Sigma: 2
 Client ID: SU03-S-060-SS-P-00 Detector: GV5 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.12 | 0.259 | 0.284 | | pCi/g | 0.500 | 0.204 | 268237 |

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 265170

Lab ID: 160-18567-4 Analyzed: 09/07/16 16:30 Ts: 30 Sigma: 2
Client ID: SU03-S-061-SS-P-00 Detector: GV8 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.07 | 0.208 | 0.236 | | pCi/g | 0.500 | 0.138 | 268239 |

Lab ID: 160-18567-5 Analyzed: 09/07/16 17:48 Ts: 30 Sigma: 2
Client ID: SU03-S-062-SS-P-00 Detector: GV17 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.34 | 0.255 | 0.291 | | pCi/g | 0.500 | 0.209 | 268247 |

Lab ID: 160-18567-6 Analyzed: 09/07/16 17:44 Ts: 30 Sigma: 2
Client ID: SU03-S-063-SS-P-00 Detector: GV16 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.30 | 0.233 | 0.270 | | pCi/g | 0.500 | 0.176 | 268246 |

Lab ID: 160-18567-7 Analyzed: 09/07/16 17:50 Ts: 30 Sigma: 2
Client ID: SU03-S-064-SS-P-00 Detector: GV15 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.17 | 0.294 | 0.318 | | pCi/g | 0.500 | 0.242 | 268245 |

Lab ID: 160-18567-8 Analyzed: 09/07/16 17:50 Ts: 30 Sigma: 2
Client ID: SU03-S-065-SS-P-00 Detector: GV9 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.13 | 0.194 | 0.227 | | pCi/g | 0.500 | 0.191 | 268241 |

Lab ID: 160-18567-9 Analyzed: 09/07/16 17:51 Ts: 30 Sigma: 2
Client ID: SU03-S-066-SS-P-00 Detector: GV8 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.32 | 0.292 | 0.322 | | pCi/g | 0.500 | 0.236 | 268239 |

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 265170

Lab ID: 160-18567-10 Analyzed: 09/07/16 17:52 Ts: 30 Sigma: 2
 Client ID: SU03-S-067-SS-P-00 Detector: GV7 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.32 | 0.206 | 0.248 | | pCi/g | 0.500 | 0.101 | 268238 |

Lab ID: 160-18567-11 Analyzed: 09/07/16 17:53 Ts: 30 Sigma: 2
 Client ID: SU03-S-068-SS-P-00 Detector: GV5 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.71 | 0.304 | 0.352 | | pCi/g | 0.500 | 0.188 | 268237 |

Lab ID: 160-18567-12 Analyzed: 09/07/16 18:30 Ts: 30 Sigma: 2
 Client ID: SU03-S-069-SS-P-00 Detector: GV3 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.57 | 0.270 | 0.315 | | pCi/g | 0.500 | 0.211 | 268236 |

Lab ID: 160-18567-13 Analyzed: 09/07/16 18:30 Ts: 30 Sigma: 2
 Client ID: SU03-S-070-SS-P-00 Detector: GV5 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.61 | 0.304 | 0.347 | | pCi/g | 0.500 | 0.228 | 268237 |

Lab ID: 160-18567-14 Analyzed: 09/07/16 18:31 Ts: 30 Sigma: 2
 Client ID: SU03-S-071-SS-P-00 Detector: GV7 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.78 | 0.280 | 0.336 | | pCi/g | 0.500 | 0.112 | 268238 |

Lab ID: 160-18567-15 Analyzed: 09/07/16 18:32 Ts: 30 Sigma: 2
 Client ID: SU03-S-072-SS-P-00 Detector: GV8 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.68 | 0.334 | 0.376 | | pCi/g | 0.500 | 0.237 | 268239 |

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 265170

Lab ID: 160-18567-16 Analyzed: 09/07/16 18:33 Ts: 30 Sigma: 2
Client ID: SU03-S-073-SS-P-00 Detector: GV9 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.30 | 0.217 | 0.256 | | pCi/g | 0.500 | 0.171 | 268241 |

Lab ID: 160-18567-17 Analyzed: 09/07/16 18:33 Ts: 30 Sigma: 2
Client ID: SU03-S-074-SS-P-00 Detector: GV15 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.16 | 0.291 | 0.315 | | pCi/g | 0.500 | 0.237 | 268245 |

Lab ID: 160-18567-18 Analyzed: 09/07/16 18:34 Ts: 30 Sigma: 2
Client ID: SU03-S-075-SS-P-00 Detector: GV16 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.41 | 0.271 | 0.309 | | pCi/g | 0.500 | 0.217 | 268246 |

Lab ID: 160-18567-19 Analyzed: 09/07/16 18:35 Ts: 30 Sigma: 2
Client ID: SU03-S-074-SS-DUP-00 Detector: GV17 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.39 | 0.242 | 0.281 | | pCi/g | 0.500 | 0.181 | 268247 |

Lab ID: 160-18567-20 Analyzed: 09/07/16 19:11 Ts: 30 Sigma: 2
Client ID: SU03-S-060-SS-DUP-00 Detector: GV3 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|------------|--------|-----------|-----------|-----------|-------|-------|-------|------------|
| Radium-226 | 1.27 | 0.231 | 0.266 | | pCi/g | 0.500 | 0.224 | 268236 |

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 265170

Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|------------------------|---------------|---------------|-------------|------------|-----------|-------|-------|--------------|-----|------|------|-----------|------------------|
| MB 160-265170/1-A | Radium-226 | | | -0.05210 | U | pCi/g | | | | | | | -.7881204 2 |
| Lab Control Sample ID: | Analyte | Parent Result | Spike Added | LCS Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
| LCS 160-265170/2-A | Americium-241 | | 97.1 | 96.96 | | pCi/g | 100 | 87 - 116 | | | | | -.0175250 174 |
| LCS 160-265170/2-A | Cesium-137 | | 29.5 | 29.30 | | pCi/g | 99 | 87 - 120 | | | | | -.0846682 385 |
| LCS 160-265170/2-A | Cobalt-60 | | 16.6 | 16.39 | | pCi/g | 99 | 87 - 115 | | | | | -.1674652 212 |
| Duplicate ID: | Analyte | Parent Result | Spike Added | DU Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
| 160-18567-1 | Radium-226 | 1.03 | | 1.124 | | pCi/g | | | 9 | 0.20 | 0.55 | 1 | |

Glossary:

Ts = Count Duration, Sample

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

Batch Number: 265170 Batch Start Date: 08/17/16 10:53 Batch Analyst: Sloan, Robert 1Batch Method: Fill_Geo-21 Batch End Date: 08/17/16 12:00

| Lab Sample ID | Client Sample ID | Method Chain | Basis | TareWeight | GrossWeight | InitialAmount | IngDecDate1 | IngDecDate3 | Geometry |
|-----------------------|--------------------|-----------------------|-------|------------|-------------|---------------|-------------|-------------|----------|
| MB 160-265170/1 | | Fill_Geo-21, 901.1 | | | | 291.18 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| LCS 160-265170/2 | | Fill_Geo-21, 901.1 | | | | 341.9 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-1-A | SU03-S-058-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.4 g | 375.6 g | 329.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-1-A DU | SU03-S-058-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.4 g | 375.6 g | 329.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-2-A | SU03-S-059-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.7 g | 341.2 g | 294.5 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-3-A | SU03-S-060-SS-P-00 | Fill_Geo-21, 901.1 | T | 47.0 g | 344.7 g | 297.7 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-4-A | SU03-S-061-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.0 g | 345.0 g | 299 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-5-A | SU03-S-062-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.1 g | 314.1 g | 268 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-6-A | SU03-S-063-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.6 g | 357.0 g | 310.4 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-7-A | SU03-S-064-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.4 g | 330.6 g | 284.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-8-A | SU03-S-065-SS-P-00 | Fill_Geo-21, 901.1 | T | 45.8 g | 340.7 g | 294.9 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-9-A | SU03-S-066-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.7 g | 341.3 g | 294.6 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-10-A | SU03-S-067-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.6 g | 355.8 g | 309.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-11-A | SU03-S-068-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.1 g | 327.3 g | 281.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-12-A | SU03-S-069-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.7 g | 363.4 g | 316.7 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-13-A | SU03-S-070-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.1 g | 351.0 g | 304.9 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-14-A | SU03-S-071-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.5 g | 246.4 g | 199.9 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-15-A | SU03-S-072-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.6 g | 331.8 g | 285.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-16-A | SU03-S-073-SS-P-00 | Fill_Geo-21, 901.1 | T | 45.6 g | 361.7 g | 316.1 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-17-A | SU03-S-074-SS-P-00 | Fill_Geo-21, 901.1 | T | 45.9 g | 306.1 g | 260.2 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-18-A | SU03-S-075-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.1 g | 328.9 g | 282.8 g | 8/17/2016 | 9/7/2016 | Tuna Can |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

901.1

Page 1 of 3

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

Batch Number: 265170 Batch Start Date: 08/17/16 10:53 Batch Analyst: Sloan, Robert 1

Batch Method: Fill_Geo-21 Batch End Date: 08/17/16 12:00

| Lab Sample ID | Client Sample ID | Method Chain | Basis | TareWeight | GrossWeight | InitialAmount | IngDecDate1 | IngDecDate3 | Geometry |
|------------------|--------------------------|-----------------------|-------|------------|-------------|---------------|-------------|-------------|----------|
| 160-18567-A-19-A | SU03-S-074-SS-DU P-00 | Fill_Geo-21, 901.1 | T | 45.9 g | 309.5 g | 263.6 g | 8/17/2016 | 9/7/2016 | Tuna Can |
| 160-18567-A-20-A | SU03-S-060-SS-DU P-00 | Fill_Geo-21, 901.1 | T | 46.4 g | 364.2 g | 317.8 g | 8/17/2016 | 9/7/2016 | Tuna Can |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Tuna Can LCS 00005 | | | | | |
|-----------------------|------------------------|-----------------------|-------|-----------------------|--|--|--|--|--|
| MB 160-265170/1 | | Fill_Geo-21, 901.1 | | | | | | | |
| LCS 160-265170/2 | | Fill_Geo-21, 901.1 | | # g | | | | | |
| 160-18567-A-1-A | SU03-S-058-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-1-A DU | SU03-S-058-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-2-A | SU03-S-059-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-3-A | SU03-S-060-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-4-A | SU03-S-061-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-5-A | SU03-S-062-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-6-A | SU03-S-063-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-7-A | SU03-S-064-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-8-A | SU03-S-065-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-9-A | SU03-S-066-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-10-A | SU03-S-067-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-11-A | SU03-S-068-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-12-A | SU03-S-069-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-13-A | SU03-S-070-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-14-A | SU03-S-071-SS-P- 00 | Fill_Geo-21, 901.1 | T | | | | | | |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

901.1

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-18567-1

SDG No.: _____

Batch Number: 265170 Batch Start Date: 08/17/16 10:53 Batch Analyst: Sloan, Robert 1Batch Method: Fill_Geo-21 Batch End Date: 08/17/16 12:00

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Tuna Can LCS 00005 | | | | | |
|------------------|--------------------------|-----------------------|-------|-----------------------|--|--|--|--|--|
| 160-18567-A-15-A | SU03-S-072-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-16-A | SU03-S-073-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-17-A | SU03-S-074-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-18-A | SU03-S-075-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-19-A | SU03-S-074-SS-DU P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-18567-A-20-A | SU03-S-060-SS-DU P-00 | Fill_Geo-21, 901.1 | T | | | | | | |

| Batch Notes | |
|-------------|-----------------------|
| Balance ID | 1121432711 |
| SOP Number | ST-RC-0003 ST-RC-0025 |

| Basis | Basis Description |
|-------|-------------------|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

901.1

Page 3 of 3

Run Logs

Gamma Spectroscopy Run Log

Detector: GV3

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|----------------------|-------------------|---------------|--------|---------------------|
| 03/27/12 18:49 | | IC 160-11762/1 | | 11762 | | | JLW |
| 03/27/12 22:50 | | ICV 160-11762/2 | | 11762 | | | JLW |
| 01/19/16 07:22 | | ACVTOP 160-238517/1 | | 238517 | | | JLW |
| 09/03/16 11:00 | | ICB 160-267969/1 | | 267969 | | | ALS |
| 09/07/16 00:39 | | CCV 160-268236/1 | | 268236 | | | |
| 09/07/16 01:03 | | CCV 160-268236/2 | | 268236 | | | ALS |
| 09/07/16 01:22 | | CCB 160-268236/3 | | 268236 | | | ALS |
| 09/07/16 02:13 | 30 | ZZZZZ | | 268236 | | | |
| 09/07/16 08:41 | 120 | ZZZZZ | | 268236 | | | |
| 09/07/16 11:28 | 120 | ZZZZZ | | 268236 | | | |
| 09/07/16 18:30 | 30 | 160-18567-12 | SU03-S-069-SS-P-00 | 268236 | 265170 | 901.1 | ALS |
| 09/07/16 19:11 | 30 | 160-18567-20 | SU03-S-060-SS-DUP-00 | 268236 | 265170 | 901.1 | ALS |

Detector: GV5

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 03/26/12 15:05 | | IC 160-12297/1 | | 12297 | | | JLW |
| 03/27/12 10:12 | | ICV 160-12297/2 | | 12297 | | | JLW |
| 01/28/16 10:21 | | ACVTOP 160-236240/1 | | 236240 | | | PS |
| 09/03/16 12:57 | | ICB 160-267970/1 | | 267970 | | | ALS |
| 09/07/16 00:36 | | CCB 160-268237/1 | | 268237 | | | |
| 09/07/16 01:20 | | CCV 160-268237/2 | | 268237 | | | |
| 09/07/16 01:42 | | CCV 160-268237/3 | | 268237 | | | |
| 09/07/16 02:13 | 30 | ZZZZZ | | 268237 | | | |
| 09/07/16 08:47 | 120 | ZZZZZ | | 268237 | | | |
| 09/07/16 11:07 | 60 | ZZZZZ | | 268237 | | | |
| 09/07/16 12:53 | 60 | ZZZZZ | | 268237 | | | |
| 09/07/16 15:07 | 60 | ZZZZZ | | 268237 | | | |
| 09/07/16 16:29 | 30 | 160-18567-3 | SU03-S-060-SS-P-00 | 268237 | 265170 | 901.1 | ALS |
| 09/07/16 17:53 | 30 | 160-18567-11 | SU03-S-068-SS-P-00 | 268237 | 265170 | 901.1 | ALS |
| 09/07/16 18:30 | 30 | 160-18567-13 | SU03-S-070-SS-P-00 | 268237 | 265170 | 901.1 | ALS |
| 09/07/16 19:14 | 30 | ZZZZZ | | 268237 | | | |
| 09/07/16 20:09 | 30 | ZZZZZ | | 268237 | | | |
| 09/07/16 21:32 | 60 | ZZZZZ | | 268237 | | | |

Detector: GV7

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 03/27/12 08:10 | | IC 160-12302/1 | | 12302 | | | JLW |
| 03/27/12 15:25 | | ICV 160-12302/2 | | 12302 | | | JLW |
| 01/23/16 19:25 | | ACVTOP 160-236241/1 | | 236241 | | | PS |
| 09/03/16 12:58 | | ICB 160-267971/1 | | 267971 | | | ALS |
| 09/07/16 00:38 | | CCB 160-268238/1 | | 268238 | | | ALS |
| 09/07/16 01:21 | | CCV 160-268238/2 | | 268238 | | | |
| 09/07/16 01:44 | | CCV 160-268238/3 | | 268238 | | | ALS |
| 09/07/16 02:14 | 30 | ZZZZZ | | 268238 | | | |
| 09/07/16 05:59 | 120 | ZZZZZ | | 268238 | | | |
| 09/07/16 08:29 | 120 | ZZZZZ | | 268238 | | | |
| 09/07/16 10:49 | 60 | ZZZZZ | | 268238 | | | |
| 09/07/16 12:44 | 120 | ZZZZZ | | 268238 | | | |
| 09/07/16 15:12 | 120 | ZZZZZ | | 268238 | | | |
| 09/07/16 17:52 | 30 | 160-18567-10 | SU03-S-067-SS-P-00 | 268238 | 265170 | 901.1 | ALS |
| 09/07/16 18:31 | 30 | 160-18567-14 | SU03-S-071-SS-P-00 | 268238 | 265170 | 901.1 | ALS |

Gamma Spectroscopy Run Log

Detector: GV7 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------|------------------|-------------------|---------------|--------|---------------------|
| 09/07/16 19:13 | 30 | ZZZZZ | | 268238 | | | |
| 09/07/16 19:58 | | ZZZZZ | | 268238 | | | |
| 09/07/16 22:06 | | ZZZZZ | | 268238 | | | |

Detector: GV8

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 03/27/12 10:58 | | IC 160-12311/1 | | 12311 | | | JLW |
| 03/29/12 01:58 | | ICV 160-12311/2 | | 12311 | | | JLW |
| 01/28/16 18:34 | | ACVTOP 160-236248/1 | | 236248 | | | PS |
| 09/03/16 13:00 | | ICB 160-267972/1 | | 267972 | | | ALS |
| 09/07/16 00:39 | | CCB 160-268239/1 | | 268239 | | | ALS |
| 09/07/16 01:23 | | CCV 160-268239/2 | | 268239 | | | |
| 09/07/16 01:45 | | CCV 160-268239/3 | | 268239 | | | ALS |
| 09/07/16 02:15 | 30 | ZZZZZ | | 268239 | | | |
| 09/07/16 08:48 | 60 | ZZZZZ | | 268239 | | | |
| 09/07/16 10:10 | 60 | ZZZZZ | | 268239 | | | |
| 09/07/16 11:27 | 60 | ZZZZZ | | 268239 | | | |
| 09/07/16 12:54 | 60 | ZZZZZ | | 268239 | | | |
| 09/07/16 15:08 | 60 | ZZZZZ | | 268239 | | | |
| 09/07/16 16:30 | 30 | 160-18567-4 | SU03-S-061-SS-P-00 | 268239 | 265170 | 901.1 | ALS |
| 09/07/16 17:51 | 30 | 160-18567-9 | SU03-S-066-SS-P-00 | 268239 | 265170 | 901.1 | ALS |
| 09/07/16 18:32 | 30 | 160-18567-15 | SU03-S-072-SS-P-00 | 268239 | 265170 | 901.1 | ALS |
| 09/07/16 19:16 | 30 | ZZZZZ | | 268239 | | | |
| 09/07/16 19:54 | 30 | ZZZZZ | | 268239 | | | |

Detector: GV9

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 05/03/12 13:37 | | IC 160-12326/1 | | 12326 | | | JLW |
| 06/14/12 10:54 | | ICV 160-12326/2 | | 12326 | | | JLW |
| 01/22/16 13:21 | | ACVTOP 160-235884/1 | | 235884 | | | PS |
| 09/05/16 18:04 | | ICB 160-268230/1 | | 268230 | | | ALS |
| 09/07/16 01:13 | | CCV 160-268241/1 | | 268241 | | | |
| 09/07/16 01:38 | | CCV 160-268241/2 | | 268241 | | | |
| 09/07/16 02:05 | | CCB 160-268241/3 | | 268241 | | | |
| 09/07/16 09:55 | 60 | ZZZZZ | | 268241 | | | |
| 09/07/16 11:27 | 60 | ZZZZZ | | 268241 | | | |
| 09/07/16 12:55 | 60 | ZZZZZ | | 268241 | | | |
| 09/07/16 14:58 | 60 | ZZZZZ | | 268241 | | | |
| 09/07/16 16:27 | 30 | 160-18567-2 | SU03-S-059-SS-P-00 | 268241 | 265170 | 901.1 | ALS |
| 09/07/16 17:50 | 30 | 160-18567-8 | SU03-S-065-SS-P-00 | 268241 | 265170 | 901.1 | ALS |
| 09/07/16 18:33 | 30 | 160-18567-16 | SU03-S-073-SS-P-00 | 268241 | 265170 | 901.1 | ALS |
| 09/07/16 19:19 | 30 | ZZZZZ | | 268241 | | | |
| 09/07/16 19:52 | 30 | ZZZZZ | | 268241 | | | |
| 09/07/16 22:52 | 30 | ZZZZZ | | 268241 | | | |
| 09/07/16 23:56 | 60 | ZZZZZ | | 268241 | | | |

Detector: GV15

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|-----------------|------------------|-------------------|---------------|--------|---------------------|
| 03/22/12 11:06 | | IC 160-12362/1 | | 12362 | | | JLW |
| 03/23/12 06:10 | | ICV 160-12362/2 | | 12362 | | | JLW |

Gamma Spectroscopy Run Log

Detector: GV15 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 05/04/16 18:46 | | ACVTOP 160-249629/1 | | 249629 | | | PS |
| 09/03/16 10:55 | | ICB 160-267977/1 | | 267977 | | | ALS |
| 09/07/16 01:15 | | CCB 160-268245/1 | | 268245 | | | |
| 09/07/16 02:04 | | CCV 160-268245/2 | | 268245 | | | |
| 09/07/16 02:27 | | CCV 160-268245/3 | | 268245 | | | |
| 09/07/16 05:55 | 120 | ZZZZZ | | 268245 | | | |
| 09/07/16 08:39 | 60 | ZZZZZ | | 268245 | | | |
| 09/07/16 09:54 | 60 | ZZZZZ | | 268245 | | | |
| 09/07/16 11:49 | 60 | ZZZZZ | | 268245 | | | |
| 09/07/16 13:00 | 120 | ZZZZZ | | 268245 | | | |
| 09/07/16 15:22 | 30 | 160-18567-1 | SU03-S-058-SS-P-00 | 268245 | 265170 | 901.1 | ALS |
| 09/07/16 16:23 | | ZZZZZ | | 268245 | | | |
| 09/07/16 16:23 | 30 | MB 160-265170/1-A | | 268245 | 265170 | 901.1 | ALS |
| 09/07/16 17:50 | 30 | 160-18567-7 | SU03-S-064-SS-P-00 | 268245 | 265170 | 901.1 | ALS |
| 09/07/16 18:33 | 30 | 160-18567-17 | SU03-S-074-SS-P-00 | 268245 | 265170 | 901.1 | ALS |
| 09/07/16 19:20 | 30 | ZZZZZ | | 268245 | | | |
| 09/07/16 19:54 | 30 | ZZZZZ | | 268245 | | | |

Detector: GV16

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|--------------------|-------------------|---------------|--------|---------------------|
| 07/10/12 10:35 | | IC 160-12382/1 | | 12382 | | | JLW |
| 07/17/12 11:27 | | ICV 160-12382/2 | | 12382 | | | JLW |
| 01/22/16 10:56 | | ACVTOP 160-235879/1 | | 235879 | | | PS |
| 09/03/16 10:57 | | ICB 160-267978/1 | | 267978 | | | ALS |
| 09/07/16 01:15 | | CCB 160-268246/1 | | 268246 | | | |
| 09/07/16 02:12 | | CCV 160-268246/2 | | 268246 | | | |
| 09/07/16 02:35 | | CCV 160-268246/3 | | 268246 | | | |
| 09/07/16 05:53 | 120 | ZZZZZ | | 268246 | | | |
| 09/07/16 08:40 | 60 | ZZZZZ | | 268246 | | | |
| 09/07/16 09:58 | 60 | ZZZZZ | | 268246 | | | |
| 09/07/16 11:52 | 60 | ZZZZZ | | 268246 | | | |
| 09/07/16 13:05 | 60 | ZZZZZ | | 268246 | | | |
| 09/07/16 14:55 | 60 | ZZZZZ | | 268246 | | | |
| 09/07/16 16:24 | 30 | LCS 160-265170/2-A | | 268246 | 265170 | 901.1 | ALS |
| 09/07/16 17:44 | 30 | 160-18567-6 | SU03-S-063-SS-P-00 | 268246 | 265170 | 901.1 | ALS |
| 09/07/16 18:34 | 30 | 160-18567-18 | SU03-S-075-SS-P-00 | 268246 | 265170 | 901.1 | ALS |
| 09/07/16 19:24 | 30 | ZZZZZ | | 268246 | | | |
| 09/07/16 20:03 | 30 | ZZZZZ | | 268246 | | | |
| 09/07/16 21:35 | | ZZZZZ | | 268246 | | | |

Detector: GV17

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|---------------------|------------------|-------------------|---------------|--------|---------------------|
| 03/26/12 06:29 | | IC 160-12390/1 | | 12390 | | | JLW |
| 03/26/12 09:29 | | ICV 160-12390/2 | | 12390 | | | JLW |
| 01/27/16 15:26 | | ACVTOP 160-235874/1 | | 235874 | | | PS |
| 09/03/16 10:58 | | ICB 160-267979/1 | | 267979 | | | ALS |
| 09/07/16 01:18 | | CCB 160-268247/1 | | 268247 | | | ALS |
| 09/07/16 02:05 | | CCV 160-268247/2 | | 268247 | | | |
| 09/07/16 02:29 | | CCV 160-268247/3 | | 268247 | | | ALS |
| 09/07/16 05:50 | 30 | ZZZZZ | | 268247 | | | |
| 09/07/16 08:42 | 60 | ZZZZZ | | 268247 | | | |

Gamma Spectroscopy Run Log

Detector: GV17 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|----------------|------------------|----------------|-----------------------|-------------------|---------------|--------|---------------------|
| 09/07/16 10:06 | 60 | ZZZZZ | | 268247 | | | |
| 09/07/16 11:54 | 60 | ZZZZZ | | 268247 | | | |
| 09/07/16 13:09 | 60 | ZZZZZ | | 268247 | | | |
| 09/07/16 14:57 | 60 | ZZZZZ | | 268247 | | | |
| 09/07/16 16:25 | 30 | 160-18567-1 DU | SU03-S-058-SS-P-00 DU | 268247 | 265170 | 901.1 | ALS |
| 09/07/16 17:48 | 30 | 160-18567-5 | SU03-S-062-SS-P-00 | 268247 | 265170 | 901.1 | ALS |
| 09/07/16 18:35 | 30 | 160-18567-19 | SU03-S-074-SS-DUP-00 | 268247 | 265170 | 901.1 | ALS |
| 09/07/16 19:29 | 30 | ZZZZZ | | 268247 | | | |
| 09/07/16 20:06 | 30 | ZZZZZ | | 268247 | | | |
| 09/07/16 23:35 | 60 | ZZZZZ | | 268247 | | | |

Shipping and Receiving Documents

Earth City, MO 63045
phone 314.298.8566 fax 314.298.8757

TECHNICAL LABORATORIES, INC.

| | | | | | | | |
|--|--|---|--|--|--|---|--|
| Client Contact Cabrera Services, Inc 3355 Myrtle Ave, Suite 210 North Highlands, CA 95660 (916) 334-3740 Phone (916) 334-4867 FAX Project Name: WR 111 - Little Mountain Test Annex Site: Hill Air Force Base, Utah PO #: 11460 | | Project Manager: Greg Bright Tel/Fax: 508-315-6246 Analysis Turnaround Time <input type="checkbox"/> CALENDAR DAYS <input checked="" type="checkbox"/> WORKING DAYS TAT if different from Below: <u>20</u> <input type="checkbox"/> 2 weeks <input type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day | | Site Contact: Bachir Badaoui Lab Contact: Jessica DeHerrera Date: 8/9/2016 Carrier: | | COC No: 001 1 of 2 COCs Sampler: For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.: | |
| Sample Identification | | Sample Date Time Type (C=Comp, G=Grab) Matrix # of Cont. | | Filtered Sample (Y / N) Perform MS / MSD (Y / N) Radium 226 - by Gamma spec Isotopic Thorium (Th-230, Th-232) | | | |
| SU03-S-058-SS-P-00 | | 8/9/2016 0945 G S 1 | | X | | | |
| SU03-S-059-SS-P-00 | | 8/9/2016 1000 G S 1 | | X | | | |
| SU03-S-060-SS-P-00 | | 8/9/2016 0931 G S 1 | | X | | | |
| SU03-S-061-SS-P-00 | | 8/9/2016 0936 G S 1 | | X | | | |
| SU03-S-062-SS-P-00 | | 8/9/2016 0940 G S 1 | | X | | | |
| SU03-S-063-SS-P-00 | | 8/9/2016 0924 G S 1 | | X | | | |
| SU03-S-064-SS-P-00 | | 8/9/2016 0944 G S 1 | | X | | | |
| SU03-S-065-SS-P-00 | | 8/9/2016 0927 G S 1 | | X | | | |
| SU03-S-066-SS-P-00 | | 8/9/2016 0910 G S 1 | | X | | | |
| SU03-S-067-SS-P-00 | | 8/9/2016 0830 G S 1 | | X | | | |
| SU03-S-068-SS-P-00 | | 8/9/2016 0840 G S 1 | | X | | | |
| SU03-S-069-SS-P-00 | | 8/9/2016 0845 G S 1 | | X | | | |
| Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4= HNO3; 5= NaOH; 6= Other | | | | | | | |
| Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample. | | | | | | | |
| <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown | | | | | | | |
| Special Instructions/QC Requirements & Comments: Gamma spec analysis for Ra-226 which includes 21 day ingrowth. Alpha Spec/ST-RD-0210 (Th-230 and Th-232). Gamma Spec/ST-RD-0102 for (Ra-226) | | | | | | | |
| Custody Seals Intact: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | Custody Seal No.: | | Cooler Temp. (°C): Obs'd: Corrd: Therm ID No.: | | | |
| Relinquished by: Bachir Badaoui | | Company: Cabrera Services | | Received by: <i>Jessica DeHerrera</i> Company: TASR Date/Time: 8-10-16 0920 | | | |
| Relinquished by: | | Company: | | Received by: Company: Date/Time: | | | |
| Relinquished by: | | Company: | | Received in Laboratory by: Company: Date/Time: | | | |

| | | | | | | | | | | | | | |
|---|--|--|--|--|--|----------------------------|--|----------------------------|--|--------------------|--|------------|--|
| Regulatory Program: <input type="checkbox"/> DW <input type="checkbox"/> NPDES <input type="checkbox"/> RCRA <input type="checkbox"/> Other: | | Project Manager: Greg Bright Tel/Fax: 508-315-6246 | | Site Contact: Bachir Badaoui Lab Contact: Jessica DeHerrera | | Date: 8/8/2016 Carrier: | | COC No: 001 2 of 2 COCs | | | | | |
| Client Contact Cabrera Services, Inc 3355 Myrtle Ave, Suite 210 North Highlands, CA 95660 (916) 334-3740 Phone (916) 334-4867 FAX Project Name: WR 111 - Little Mountain Test Annex Site: Hill Air Force Base, Utah PO #: 11460 | | Analysis Turnaround Time <input type="checkbox"/> CALENDAR DAYS <input checked="" type="checkbox"/> WORKING DAYS TAT if different from Below: 20 <input type="checkbox"/> 2 weeks <input type="checkbox"/> 1 week <input type="checkbox"/> 2 days <input type="checkbox"/> 1 day | | Sample Type (C-Comp, G-Grab) | | Sample Date | | Sample Time | | Matrix | | # of Cont. | |
| Sample Identification | | SU03-S-070-SS-P-00 | | 8/9/2016 | | 1010 | | G | | S | | 1 | |
| SU03-S-071-SS-P-00 | | 8/9/2016 | | 0949 | | G | | S | | S | | 1 | |
| SU03-S-072-SS-P-00 | | 8/9/2016 | | 1012 | | G | | S | | S | | 1 | |
| SU03-S-073-SS-P-00 | | 8/9/2016 | | 0953 | | G | | S | | S | | 1 | |
| SU03-S-074-SS-P-00 | | 8/9/2016 | | 0855 | | G | | S | | S | | 1 | |
| SU03-S-075-SS-P-00 | | 8/9/2016 | | 0900 | | G | | S | | S | | 1 | |
| SU03-S-074-SS-DUP-00 | | 8/9/2016 | | 0855 | | G | | S | | S | | 1 | |
| SU03-S-060-SS-DUP-00 | | 8/9/2016 | | 0931 | | G | | S | | S | | 1 | |
| Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4= HNO3, 5= NaOH, 6= Other | | | | | | | | | | | | | |
| Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample. | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown | | | | | | | | | | | | | |
| Special Instructions/QC Requirements & Comments: Gamma spec analysis for Ra-226 which includes 21 day ingrowth. Alpha Spec/ST-RD-0210 (Th-230 and Th-232). Gamma Spec/ST-RD-0102 for (Ra-226) | | | | | | | | | | | | | |
| Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No | | Custody Seal No.: | | Cooler Temp. (°C): | | Obs'd: | | Cor'd: | | Therm ID No.: | | | |
| Relinquished by: Bachir Badaoui | | Company: Cabrera Services | | Date/Time: 8/9/2016 1300 | | Received by: Jil Clarke | | Company: TH SR | | Date/Time: 8.10.16 | | 0820 | |
| Relinquished by: | | Company: | | Date/Time: | | Received by: | | Company: | | Date/Time: | | | |
| Relinquished by: | | Company: | | Date/Time: | | Received in Laboratory by: | | Company: | | Date/Time: | | | |

Login Sample Receipt Checklist

Client: EA Engineering, Science, and Technology

Job Number: 160-18567-1

Login Number: 18567

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

| Question | Answer | Comment |
|--|--------|---------|
| Radioactivity wasn't checked or is \leq background as measured by a survey meter. | True | |
| The cooler's custody seal, if present, is intact. | N/A | |
| Sample custody seals, if present, are intact. | N/A | |
| 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? | False | |
| There are no discrepancies between the containers received and the COC. | True | |
| Samples are received within Holding Time (excluding tests with immediate HTs) | True | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | |
| Appropriate sample containers are used. | True | |
| Sample bottles are completely filled. | True | |
| Sample Preservation Verified. | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | True | |
| Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4"). | N/A | |
| Multiphasic samples are not present. | True | |
| Samples do not require splitting or compositing. | True | |
| Residual Chlorine Checked. | False | |