Lindsay Light Field Report Gamma Survey and Sample Collection U.S. EPA Region 5 Emergency Response

| Site Name: | 161 E Grand Ave |
|-----------------------------|------------------------------------|
| Operable Unit: | Lindsay Light II Site OU17 |
| Date of Field Work: | June 14, 2021 |
| EPA/START Personnel: | Adam Peterca (START / Tetra Tech) |
| | Kirsten Myles (START / Tetra Tech) |
| | Verneta Simon (USEPA) |
| | Eugene Jablonowski (USEPA) |

Summary of Environmental Conditions

- During historical construction/excavation activities at the 161 E Grand Ave property radioactive contamination in soil/fill has been identified. Current utility installation plans required excavation of soil/fill in areas where radioactive contamination was suspected to be present, but had not been remediated during previous clean-up efforts. Due to the history of contaminated material in the vicinity of the utility excavation and the relatively small size of the excavation EPA and START were present during all excavation activities.
- Excavation was conducted by Electric Conduit Construction (ECC). Radiation monitoring during excavation was conducted by Stan A. Huber Consultants, Inc. (SAHCI).
- Elevated levels of gamma radiation were observed by SAHCI within the excavation. Material with elevated levels of gamma radiation was segregated from other material and placed in designated containers for future disposal.
- Excavation activities terminated at the planned excavation extent based on the requirements for utility installation. When excavation was completed, an area of material with elevated gamma radiation remained in place along the northern wall of the excavated trench.

Description of EPA/START Activities

- Verneta Simon (USEPA), Adam Peterca (START / Tetra Tech), and Kirsten Myles (START / Tetra Tech) arrived at the excavation site at approximately 08:35 on June 14, 2021. Kirsten Myles left the site at approximately 09:40 to respond to an unrelated emergency response. Gene Jablonowski (USEPA) arrived at the excavation site at approximately 10:00.
- The instrument used by Tetra Tech for gamma surveying was a Ludlum Model 2221 scaler/ratemeter (Serial Number 106678) with a Ludlum 44-10 sodium iodide detector (Serial Number PR292700) with a 6-inch lead shield, calibrated on April 21, 2021 with a 7.1 picocurie per gram (pCi/g) cutoff of 5,828 counts per minute (cpm).

- Tetra Tech completed a post-excavation walkover gamma survey of the excavated area at approximately 12:00. The excavated area was considered one survey unit.
 - Gamma readings of the floor of the survey unit ranged from 2,009 to 5,256 cpm. Gamma readings of the walls of the survey unit ranged from 1,612 to 12,000 cpm. The area of the excavation wall with elevated gamma readings above the instrument-specific cutoff level was a known area of contamination that was intentionally left in place. A soil sample was collected from this portion of the excavation wall to document the gamma radiation levels left in place.
- Tetra Tech collected the following samples from the excavation:
 - A 5-point composite soil sample from the floor of the survey unit for gamma spectroscopy analysis (sample field ID LL-210614-F) and a corresponding soil sample for dry weight moisture analysis.
 - A 5-point composite soil sample from the area of the excavation wall that exceeded the instrument-specific cutoff level for gamma spectroscopy analysis (sample field ID LL-210614-W) and a corresponding soil sample for dry weight moisture analysis.

Summary of Sample Results

Samples were sent to ALS Environmental (ALS) in Fort Collins, Colorado for gamma spectroscopy analysis. The results are summarized in the table below.

| Sample Field ID | Sample Lab ID | Sample Ra-228 (pCi/g) | Sample Ra-226 (pCi/g) | Ra-228 plus Ra- 226 (pCi/g) |
|-----------------|---------------|--------------------------|--------------------------|--------------------------------|
| LL-210614-F | 2106442-1 | 0.950 | 0.518 | 1.468 |
| | | | | |
| LL-210614-W | 2106442-2 | 21.000 | 2.240 | 23.240 |

Table 1: Verification Sampling Analytical Results

Notes: DUP – Duplicate ID – Identification pCi/g – Picocuries per gram

Ra – Radium

Attachments

1. ALS report of gamma spectroscopy results for the samples collected by EPA.

Prepared by:

Name:

Adam Peterca, START / Tetra Tech

Signature:

Atem f. Peterion

Date:

February 3, 2022

Reviewed by:

 Name:
 Eugene Jablonowski, Health Physicist, U.S. EPA Region 5

 Signature:
 EUGENE JABLONOWSKI JABLONOWSKI

 Date:
 2022.02.24 08:39:57 -0600

Date: February 24, 2022



Gamma Spectroscopy Case Narrative

Tetra Tech, Inc.

Lindsay Light - 161 E Grand Alley

Work Order Number: 2106442

- 1. This report consists of analytical results and supporting documentation for two solid samples received by ALS on 06/16/2021.
- 2. These samples were prepared according to the current revision of SOP 739. The samples were sealed in steel cans on 06/19/2029 and stored for at least 21 days to allow ²²²Rn to approach secular equilibrium with its parent, ²²⁶Ra. The degree of ingrowth achieved prior to analysis on 07/11/2021 is at least 97.8%. Conservatively assuming a radon emanation efficiency of approximately 50%, the effective radon progeny ingrowth for these samples would be greater than 98.9%.
- 3. The samples were analyzed for the presence of gamma emitting radionuclides according to the current revision of SOP 713. The analyses were completed on 07/11/2021.
- 4. The results for these samples are reported on a "Dry Weight" basis in units of pCi/gram.
- 5. Sample volumes were insufficient to allow preparation of a duplicate. A duplicate analysis of sample 2106442-1 was performed in lieu of a prepared duplicate.
- 6. Activity concentrations above the calculated MDC are reported in some instances where minimum nuclide identification criteria are not met. Such tentative identifications result when the software attempts to calculate net activity concentrations for analytes where either one or both of the following criteria are not satisfied: the 'diagnostic' peak for a nuclide must be identified above the critical level, or the minimum library peak abundance must be attained. Nuclides not meeting these requirements have been flagged with a "TI" qualifier.



- 7. In cases where there are no peaks found in the peak search routine, the software performs a net quantification. This indicates that nuclides are not detected or supported at any level above the reported MDC. Consequently, these nuclides are flagged with an "NQ" qualifier on the final reports. Please refer to the Technical Bulletin Addendum in section 5 of this report.
- 8. The volume of these samples was not within 0.5 cm of the associated calibration volume as required per the current revision of SOP 739. Therefore, any reported results for these samples are identified with a "J" qualifier, indicating the activity values to be an estimated value. Results are reported without further qualification.
- 9. Technical considerations made in the creation of the gamma spectroscopy library used in this analysis are detailed in the document "Technical Comments Regarding Gamma Spectroscopy Libraries" found in Section 5.
- 10. ALS uses the following convention for reporting significant digits in the TPU and MDC results. The TPU value is rounded to two significant digits. The MDC value is rounded to the same decimal place as the TPU value. In practice, this could result in an MDC reported value of zero for samples with significant activity, including the batch laboratory control sample.
- 11. No further problems were encountered with either the client's samples or the associated quality control samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

J@an Anderson Radiochemistry Primary Data Reviewer

Radiochemistry Final Data Reviewer

<u>7/15/21</u> Date

7/22/21 Date

0

Section 1

CHAIN OF CUSTODY

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2106442 Client Name: Tetra Tech, Inc. Client Project Name: Lindsay Light - 161 E Grand Alley Client Project Number: Client PO Number:

| Client Sample Number | Lab Sample Number | COC Number | Matrix | Date Collected | Time Collected |
|-------------------------|----------------------|------------|--------|-------------------|-------------------|
| LL-210614-F | 2106442-1 | | SOLID | 14-Jun-21 | 12:03 |
| LL-210614-W | 2106442-2 | | SOLID | 14-Jun-21 | 12:14 |

| 2106447 REGION 5 Chicago, Illinois 60604 | | | | | | | | | Ship To: ALS FART COLLENS 225 COMMERCE DREWE | | ATTN: Airbill Number | Chain of Custody Seal Numbers | 5+823 5-63733 |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------|---------------|-----|--|--|------|--|-------------------------------------------------|------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------|
| CHAIN OF CUSTODY RECORD | | ALESS A | | | | | | | 57260 12/11/9 | | Date / Time | aboratory File | |
| CHAIN OF CU | CON-CON-CON-CON-CON-CON-CON-CON-CON-CON- | STATION LOCATION | | 4-W | | | | | ime Received by: (Signature) | Received by: (Signature) | Received for Laboratory by: (Signature) | Distribution: White - Accompanies Shipment: Pick - Coordinator Flad Files: Vallow - Laboratory File | 1 |
| ENVIRONMENTAL PROTECTION AGENCY Office of Enforcement | PROJECT NAME LENDSAY LEGHT - 161 E, GRAND It Name and Sign) IECA / ALL A. F. F. F. | A COMP. GRAB | | | | | | | Date / 1 6/i4/21 | gnature) Date / Time | gnature) Date / Time | on: White - Accompanies Shinment | Printed on Recycled Paper/Printed with Soy-Based Ink |
| ENVIRONMENTAL P Office of E | PROJ. NO. PROJECT NAME LENDSAY LT SAMPLERS: (Print Name and Sign) Abam Reverce Att A | STA. NO. DATE | (/14/21 203 | | | | | | Relinquished by: (Signature) | Relinquished by: (Signature) | Relinquished by: (<i>Signature)</i> | Dif 17 | Brinted on Recyc |



ALS Environmental - Fort Collins CONDITION OF SAMPLE UPON RECEIPT FORM

| Client: | TETRA TECH | Worko | rder No: | 2 | 106442 | | |
|------------------------------------------|--------------------------------------------------------------|---------------------------|----------------|-----------|-----------|-----------|----|
| – Project Manager: | JME | Initials: | | Date: | 06/2 | 16/2021 | |
| - | | | | | N/A | YES | NO |
| ^{1.} Are airbills / shipping | documents present and/or | removable? | | | , | _ | - |
| Tracking number: 2 | • | | | | | Х | |
| | shipping containers intact? | | | | Х | | |
| ^{3.} Are custody seals on | sample containers intact? | | | | Х | | |
| ^{4.} Is there a COC (chain | -of-custody) present? | | | | | Х | |
| 5. | ent with samples received? equested analyses, etc.) | (IDs, dates, times, # c | of samples, | # of | | х | |
| 6. Are short-hold sampl | es present? | | | | | | Х |
| 7. Are all samples withi | n holding times for the requ | ested analyses? | | | | Х | |
| ^{8.} Were all sample cont | ainers received intact? (not | broken or leaking) | | | | Х | |
| ^{9.} Is there sufficient sar | mple for the requested analy | vses? | | | | Х | |
| 10. Are samples in prope Guidelines) | er containers for requested a | nalyses? (form 250, S | ample Handl | ing | | х | |
| ^{11.} Are all aqueous samp | oles preserved correctly, if re | equired? (excluding | volatiles) | | Х | | |
| 17 | ring no headspace (VOC, GR ameter? (i.e. size of green pe | |) free of bu | ıbbles | х | | |
| ^{13.} Were the samples sh | ipped on ice? | | | | | | Х |
| ^{14.} Were cooler temperatu | ires measured at 0.1-6.0°C? | IR gun used*: #5 | | | RAD ONLY | | х |
| Cooler #: | 1 | | | | | | |
| Temperature (°C): | AMB | | | | | | |
| # of custody seals on cooler: | 0 | | | | | | |
| External µR/hr reading: | 11 | | | | | | |
| Background µR/hr reading: | 12 | | | | | | |
| Were external µR/hr reading | s ≤ two times background and within D | OT acceptance criteria? | ES | | | | |
| * Please provide details her | re for NO responses to boxes abo | ove - for 2 thru 5 & 7 th | hru 12, notif | y PM & | continue | w/ login. | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Were unpreserved bo | ottles pH checked? NA | All client bottle | ID's vs ALS la | ab ID's c | double-ch | ecked by | JE |
| | ontacted? YES / NO / NA Contact: | | | | Date/1 | - | 1 |
| Project Manager Signatur | | nii E | lline | _ | | | |
| | | | | | | | |

*IR Gun #5, VWR SN 192272629

Section 2



SAMPLE RESULTS SUMMARY

Due to the nature of gamma spectroscopy data, a summary report is not provided.

Please refer to the individual sample results in Section 4.

Section 3

QC RESULTS SUMMARY

Gamma Spectroscopy Results PAI 713 Rev 15 Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442 Client Name: Tetra Tech, Inc.

Library: NATURAL(SUB

ClientProject ID: Lindsay Light - 161 E Grand Alley

Lab ID: GS210619-1MB

Sample Matrix: SOLID Prep SOP: PAI 739 Rev 13 Date Collected: 19-Jun-21

Date Prepared: 19-Jun-21

Date Analyzed: 11-Jul-21

Prep Batch: GS210619-1 QCBatchID: GS210619-1-1 Run ID: GS210619-1A Count Time: 1000 minutes

Abbreviations:

TPU - Total Propagated Uncertainty

BDL - Below Detection Limit

MDC - Sample specific Minimum Detectable Concentration

Final Aliquot: 500 g Result Units: pCi/g File Name: 210799d01

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|-------------|----------------|--------------------|-------|------------------|----|------------------|
| 14331-83-0 | Ac-228 | 0.009 +/- 0.052 | 0.087 | 1 | NA | U |
| 14913-49-6 | Bi-212 | 0.130 +/- 0.094 | 0.149 | 1 | NA | U |
| 14733-03-0 | Bi-214 | 0.004 +/- 0.035 | 0.058 | 1 | NA | U |
| 13966-00-2 | K-40 | 0.05 +/- 0.27 | 0.45 | 2 | NA | U |
| 378783-76-7 | Pa-234m | 0.9 +/- 1.2 | 1.9 | 35 | NA | U |
| 15092-94-1 | Pb-212 | 0.011 +/- 0.019 | 0.032 | 1 | NA | U |
| 15067-28-4 | Pb-214 | 0.013 +/- 0.022 | 0.037 | 1 | NA | U |
| 15262-20-1 | Ra-228 | 0.009 +/- 0.052 | 0.087 | 1 | NA | U |
| 14274-82-9 | Th-228 | 0.009 +/- 0.052 | 0.087 | 1 | NA | U |
| 15065-10-8 | Th-234 | 0.03 +/- 0.23 | 0.38 | 2 | NA | U |
| 14913-50-9 | TI-208 | 0.006 +/- 0.018 | 0.030 | 1 | NA | U |

Comments:

Qualifiers/Flags:

- ${\sf U}_{\rm c}$ Result is less than the sample specific MDC or less than the associated TP
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- SQ Spectral quality prevents accurate quantitation.
- SI Nuclide identification and/or quantitation is tentative.
- TI Nuclide identification is tentative.
- R Nuclide has exceeded 8 halflives.
- M Requested MDC not met.
- B Analyte concentration greater than MDC.
- B3 Analyte concentration greater than MDC but less than Requested MDC.
- DL Decision Level

Gamma Spectroscopy Results PAI 713 Rev 15 Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442 Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| Lab ID: GS210619-1M |
|---------------------|
|---------------------|

Library: RA226.LIB

Sample Matrix: SOLID Prep SOP: PAI 739 Rev 13 Date Collected: 19-Jun-21 Date Prepared: 19-Jun-21 Date Analyzed: 11-Jul-21 Prep Batch: GS210619-1 QCBatchID: GS210619-1-1 Run ID: GS210619-1A Count Time: 1000 minutes Final Aliquot: 500 g Result Units: pCi/g File Name: 210799d01A

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|--------------------|-------|------------------|----|------------------|
| 13982-63-3 | Ra-226 | 0.031 +/- 0.014 | 0.022 | 1 | NA | NQ |

Comments:

Qualifiers/Flags:

- ${\sf U}~$ Result is less than the sample specific MDC or less than the associated TP
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- SQ Spectral quality prevents accurate quantitation.
- SI Nuclide identification and/or quantitation is tentative.
- TI Nuclide identification is tentative.
- R Nuclide has exceeded 8 halflives.
- M Requested MDC not met.
- B Analyte concentration greater than MDC.
- B3 Analyte concentration greater than MDC but less than Requested MDC.
- DL Decision Level

Data Package ID: GSS2106442-1

Abbreviations:

TPU - Total Propagated Uncertainty

- MDC Sample specific Minimum Detectable Concentration
- BDL Below Detection Limit

PAI 713 Rev 15

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc.

Library: ANALYTICAL.LI

ClientProject ID: Lindsay Light - 161 E Grand Alley

Lab ID: GS210619-1LCS

Sample Matrix: SOLID Prep SOP: PAI 739 Rev 13 Date Collected: 19-Jun-21 Date Prepared: 19-Jun-21 Date Analyzed: 11-Jul-21 Prep Batch: GS210619-1 QCBatchID: GS210619-1-1 Run ID: GS210619-1A Count Time: 30 minutes Final Aliquot: 500 g Result Units: pCi/g File Name: 210798d01

| CASNO | Target Nuclide | Results +/- 2s TPU | MDC | Spike Added | % Rec | Contro I Limits | Lab Qualifier |
|------------|-------------------|--------------------|-----|-------------|-------|--------------------|------------------|
| 14596-10-2 | Am-241 | 204 +/- 25 | 8 | 200.2 | 102 | 85 - 115 | Р |
| 10198-40-0 | Co-60 | 86 +/- 10 | 0 | 85.67 | 101 | 85 - 115 | Р |
| 10045-97-3 | Cs-137 | 78.6 +/- 9.3 | 0.6 | 76.29 | 103 | 85 - 115 | Р |

Comments:

Qualifiers/Flags:

Data Package ID: GSS2106442-1

activity is greater than the reported MDC.

Abbreviations:

PAI 713 Rev 15 Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc. ClientProject ID: Lindsay Light - 161 E Grand Alley

| Field ID: LL-210614-F Lab ID: 2106442-1DUP Library: NATURAL(SUB | | Sample Matrix: SOLID Prep SOP: PAI 73 Date Collected: 14-Jun Date Prepared: 19-Jun Date Analyzed: 11-Jul- | 9 Rev 13 -21 -21 | QCBate Ru Count T | atch: GS210619-1 chID: GS210619-1-1 n ID: GS210619-1A 'ime: 1000 minutes asis: Dry Weight | Final Alique Prep Bas Moisture(% Result Unit File Nam | | | |
|---------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------|--------|------------|
| | | Sample Result +/- 2 s TPU | e MDC | Flags | Dupli Result +/- 2 s TPU | cate MDC | Flags | DER | DER Lim |
| 14331-83-0 | Ac-228 | 0.95 +/- 0.13 | 0.12 | J | 1.01 +/- 0.13 | 0.08 | J | 0.315 | 2.13 |
| 14913-49-6 | Bi-212 | 1.02 +/- 0.24 | 0.30 | J | 1.09 +/- 0.19 | 0.18 | J | 0.205 | 2.13 |
| 14733-03-0 | Bi-214 | 0.507 +/- 0.078 | 0.082 | J | 0.50 +/- 0.10 | 0.14 | J | 0.0854 | 2.13 |
| 13966-00-2 | K-40 | 6.75 +/- 0.91 | 0.61 | J | 7.21 +/- 0.89 | 0.29 | J | 0.362 | 2.13 |
| 378783-76-7 | Pa-234m | 1.6 +/- 1.8 | 3.0 | U,J | 2.9 +/- 1.8 | 2.8 | J | 0.516 | 2.13 |
| 15092-94-1 | Pb-212 | 0.97 +/- 0.12 | 0.05 | J | 1.08 +/- 0.13 | 0.04 | J | 0.613 | 2.13 |
| 15067-28-4 | Pb-214 | 0.523 +/- 0.070 | 0.053 | J | 0.574 +/- 0.074 | 0.053 | J | 0.497 | 2.13 |
| 15262-20-1 | Ra-228 | 0.95 +/- 0.13 | 0.12 | J | 1.01 +/- 0.13 | 0.08 | J | 0.315 | 2.13 |
| 14274-82-9 | Th-228 | 0.95 +/- 0.13 | 0.12 | J | 1.01 +/- 0.13 | 0.08 | J | 0.315 | 2.13 |
| 15065-10-8 | Th-234 | 1.36 +/- 0.43 | 0.63 | J,TI | 1.31 +/- 0.30 | 0.41 | J,TI | 0.0919 | 2.13 |
| 14913-50-9 | TI-208 | 0.322 +/- 0.045 | 0.037 | J | 0.319 +/- 0.041 | 0.022 | J | 0.049 | 2.13 |

Comments:

| Duplicate Qualifiers/Flags: | | Abbreviations: |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------|
| U - Result is less than the sample specific MDC. | | TPU - Total Propagated Uncertainty |
| Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed. | | DER - Duplicate Error Ratio |
| Y2 - Chemical Yield outside default limits. | | BDL - Below Detection Limit |
| W - DER is greater than Warning Limit of 1.42 | | NR - Not Reported |
| D - DER is greater than Control Limit of 2.13 | | |
| LT - Result is less than Request MDC, greater than sample specific MDC | | |
| M - Requested MDC not met. | 20. Constral quality provide accurate quantitation | |
| M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC. | SQ - Spectral quality prevents accurate quantitation. | |
| L - LCS Recovery below lower control limit. | SI - Nuclide identification and/or quantitation is tentative. | |
| H - LCS Recovery above upper control limit. | TI - Nuclide identification is tentative. | |
| P - LCS, Matrix Spike Recovery within control limits. | R - Nuclide has exceeded 8 halflives. | |
| N - Matrix Spike Recovery outside control limits | G - Sample density differs by more than 15% of LCS density. | |

PAI 713 Rev 15 Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442 Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| Field ID:LL-210614-FLab ID:2106442-1DUPLibrary:RA226.LIB | | Sample Matrix: SOLID Prep SOP: PAI 739 Date Collected: 14-Jun- Date Prepared: 19-Jun- Date Analyzed: 11-Jul-2 | 21 21 | QCBa R Count | Batch: GS210619-1 tchID: GS210619-1-1 un ID: GS210619-1A Time: 1000 minutes Basis: Dry Weight | Final Aliquo Prep Basi Moisture(% Result Unit File Nam | | | |
|----------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------|-------|------------|
| CASNO | Analyte | Sample Result +/- 2 s TPU | Sample Result +/- 2 s TPU MDC | | Dupl Result +/- 2 s TPU | licate MDC | Flags | DER | DER Lim |
| 13982-63-3 | Ra-226 | 0.518 +/- 0.067 0.053 | | | 0.566 +/- 0.070 | 0.053 | J | 0.492 | 2.13 |

Comments:

| Duplicate Qualifiers/Flags: | | Abbreviations: |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------|
| U - Result is less than the sample specific MDC. | | TPU - Total Propagated Uncertainty |
| Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed | l. | DER - Duplicate Error Ratio |
| Y2 - Chemical Yield outside default limits. | | BDL - Below Detection Limit |
| W - DER is greater than Warning Limit of 1.42 | | NR - Not Reported |
| D - DER is greater than Control Limit of 2.13 | | NR - Not Reported |
| LT - Result is less than Request MDC, greater than sample specific MDC | | |
| M - Requested MDC not met. | CO. Spectral quality proverts accurate quantitation | |
| M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC. | SQ - Spectral quality prevents accurate quantitation. | |
| L - LCS Recovery below lower control limit. | SI - Nuclide identification and/or quantitation is tentative. | |
| H - LCS Recovery above upper control limit. | TI - Nuclide identification is tentative. | |
| P - LCS, Matrix Spike Recovery within control limits. | R - Nuclide has exceeded 8 halflives. | |
| N - Matrix Spike Recovery outside control limits | G - Sample density differs by more than 15% of LCS density. | |

Section 4

INDIVIDUAL SAMPLE RESULTS



Gamma Spectroscopy Results PAI 713 Rev 15 **Sample Results**

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| Field ID:LL-210614-FLab ID:2106442-1Library:NATURAL(SUB | | 2-1 Prep SOP: PAI 739 Rev 13 QCBatchID: GS210619-1-1 Date Collected: 14-Jun-21 Run ID: GS210619-1A NATURAL(SUB Date Prepared: 19-Jun-21 Count Time: 1000 minutes Date Analyzed: 10-Jul-21 Report Basis: Dry Weight | | Moisture(%): 11.293 Result Units: pCi/g File Name: 210796d01 | | |
|---------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------|----|------------------|
| CASNO | Target Nuclide | Result +/- 2 s | s TPU MDC | Requested MDC | DL | Lab Qualifier |
| 14331-83-0 | Ac-228 | 0.95 +/- 0.13 | 3 0.12 | 1 | NA | J |
| 14913-49-6 | Bi-212 | 1.02 +/- 0.24 | 4 0.30 | 1 | NA | J |
| 14733-03-0 | Bi-214 | 0.507 +/- 0.07 | 78 0.082 | 1 | NA | J |
| 13966-00-2 | K-40 | 6.75 +/- 0.91 | 1 0.61 | 2 | NA | J |
| 378783-76-7 | Pa-234m | 1.6 +/- 1.8 | 3.0 | 35 | NA | U,J |
| 15092-94-1 | Pb-212 | 0.97 +/- 0.12 | 2 0.05 | 1 | NA | J |
| 15067-28-4 | Pb-214 | 0.523 +/- 0.07 | 70 0.053 | 1 | NA | J |
| 15262-20-1 | Ra-228 | 0.95 +/- 0.13 | 3 0.12 | 1 | NA | J |
| 14274-82-9 | Th-228 | 0.95 +/- 0.13 | 3 0.12 | 1 | NA | J |
| 15065-10-8 | Th-234 | 1.36 +/- 0.43 | 3 0.63 | 2 | NA | J,TI |

0.322 +/- 0.045

0.037

SQ - Spectral quality prevents accurate quantitation.

TI - Nuclide identification is tentative R - Nuclide has exceeded 8 halflives.

SI - Nuclide identification and/or quantitation is tentative.

G - Sample density differs by more than 15% of LCS density.

1

NA

J

Comments:

14913-50-9

Qualifiers/Flags:

- U Result is less than the sample specific MDC or less than the associated TP
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 Chemical Yield outside default limits.
- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.

TI-208

M - The requested MDC was not met.

Abbreviations:

- TPU Total Propagated Uncertainty
- MDC Sample specific Minimum Detectable Concentration
- **BDL** Below Detection Limit
- DL Decision Level

Gamma Spectroscopy Results PAI 713 Rev 15 Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc. ClientProject ID: Lindsay Light - 161 E Grand Alley

| Field ID: LL-210614-F | Sample Matrix: SOLID | Prep Batch: GS210619-1 | Final Aliquot: 426 g | |
|-----------------------|---------------------------|--------------------------|-------------------------|--|
| | Prep SOP: PAI 739 Rev 13 | QCBatchID: GS210619-1-1 | Prep Basis: As Received | |
| Lab ID: 2106442-1 | Date Collected: 14-Jun-21 | Run ID: GS210619-1A | Moisture(%): 11.293 | |
| Library: RA226.LIB | Date Prepared: 19-Jun-21 | Count Time: 1000 minutes | Result Units: pCi/g | |
| | Date Analyzed: 10-Jul-21 | Report Basis: Dry Weight | File Name: 210796d01A | |

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|--------------------|-------|------------------|----|------------------|
| 13982-63-3 | Ra-226 | 0.518 +/- 0.067 | 0.053 | 1 | NA | J |

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

- TPU Total Propagated Uncertainty
- MDC Sample specific Minimum Detectable Concentration
- BDL Below Detection Limit
- DL Decision Level

- SQ Spectral quality prevents accurate quantitation.
- SI Nuclide identification and/or quantitation is tentative.
- TI Nuclide identification is tentative.
- R Nuclide has exceeded 8 halflives.
- G Sample density differs by more than 15% of LCS density.

PAI 713 Rev 15

Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| Field ID: LL-210614-F Lab ID: 2106442-1DUP Library: NATURAL(SUB | | Sample Matrix: SOLID Prep SOP: PAI 739 Rev 13 Date Collected: 14-Jun-21 Date Prepared: 19-Jun-21 Date Analyzed: 11-Jul-21 | Prep Batch: GS210 QCBatchID: GS210 Run ID: GS210 Count Time: 1000 m Report Basis: Dry We | 619-1-1 619-1A M inutes Re | nal Aliquot: 426 Prep Basis: As oisture(%): 11.: esult Units: pCi File Name: 210 | Received 293 /g |
|---------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------|-----------------------|
| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
| 14331-83-0 | Ac-228 | 1.01 +/- 0.13 | 0.08 | 1 | NA | J |
| 14913-49-6 | Bi-212 | 1.09 +/- 0.19 | 0.18 | 1 | NA | J |
| 14733-03-0 | Bi-214 | 0.50 +/- 0.10 | 0.14 | 1 | NA | J |
| 13966-00-2 | K-40 | 7.21 +/- 0.89 | 0.29 | 2 | NA | J |
| 378783-76-7 | Pa-234m | 2.9 +/- 1.8 | 2.8 | 35 | NA | J |
| 15092-94-1 | Pb-212 | 1.08 +/- 0.13 | 0.04 | 1 | NA | J |
| 15067-28-4 | Pb-214 | 0.574 +/- 0.074 | 0.053 | 1 | NA | J |
| 15262-20-1 | Ra-228 | 1.01 +/- 0.13 | 0.08 | 1 | NA | J |
| 14274-82-9 | Th-228 | 1.01 +/- 0.13 | 0.08 | 1 | NA | J |
| 15065-10-8 | Th-234 | 1.31 +/- 0.30 | 0.41 | 2 | NA | J,TI |
| | 1 | | | 1 | 1 | |

0.319 +/- 0.041

Comments:

14913-50-9

Qualifiers/Flags:

- ${\sf U}~$ Result is less than the sample specific MDC or less than the associated TPU.
- Y1 Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 Chemical Yield outside default limits.

TI-208

M - The requested MDC was not met.

 $\ensuremath{\mathsf{M3}}$ - The requested MDC was not met, but thereported activity is greater than the reported MDC.

 $\mathsf{W}\,$ - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: GSS2106442-1

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

1

NA

J

TI - Nuclide identification is tentative.

0.022

- R Nuclide has exceeded 8 halflives.
- G Sample density differs by more than 15% of LCS density.

Page 1 of 2

PAI 713 Rev 15

Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| CASNO | Target Nuclide | Rosult 1/- 2 s TPU | I | MDC | Poqueste | | Lah |
|----------------|---------------------|-----------------------------------------------------------------------|----------------------------|--------------------------|----------|---------------------|----------|
| | | Date Analyzed: 11-Jul-21 Report Basis: Dry Weight | | Report Basis: Dry Weight | | File Name: 210 |)805d02A |
| Librar | y: RA226.LIB | Date Prepared: 19-Jun-21 | Count Time: 1000 minutes | | | Result Units: pCi/g | |
| Lab ID: 2106 | 442-1DUP | Date Collected: 14-Jun-21 | Run ID: GS210619-1A | | • | | |
| | | Prep SOP: PAI 739 Rev 13 QCBatchID: GS210619-1-1 Prep Basis: As Recei | | | | Received | |
| Field ID: LL-2 | 10614-F | Sample Matrix: SOLID | Pre | p Batch: GS210 | 619-1 | Final Aliquot: 426 | δg |

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|------------|----------------|--------------------|-------|------------------|----|------------------|
| 13982-63-3 | Ra-226 | 0.566 +/- 0.070 | 0.053 | 1 | NA | J |

Comments:

Qualifiers/Flags:

- ${\sf U}~$ Result is less than the sample specific MDC or less than the associated TPU.
- Y1 Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 Chemical Yield outside default limits.
- M The requested MDC was not met.
- $\ensuremath{\mathsf{M3}}$ The requested MDC was not met, but thereported activity is greater than the reported MDC.
- W DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

- TPU Total Propagated Uncertainty
- MDC Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

- SQ Spectral quality prevents accurate quantitation.
- SI Nuclide identification and/or quantitation is tentative.
- TI Nuclide identification is tentative.
- R Nuclide has exceeded 8 halflives.
- G Sample density differs by more than 15% of LCS density.

Gamma Spectroscopy Results PAI 713 Rev 15 Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| Field ID: LL-210614-W Lab ID: 2106442-2 Library: NATURAL(SUB | | Sample Matrix: SOLID Prep SOP: PAI 739 Rev 13 Date Collected: 14-Jun-21 Date Prepared: 19-Jun-21 Date Analyzed: 10-Jul-21 | Prep Batch: GS210619-1 QCBatchID: GS210619-1 Run ID: GS210619-1 Count Time: 1000 minutes Report Basis: Dry Weight | -1 Prep Ba A Moisture s Result Ur | Moisture(%): 8.752 Result Units: pCi/g File Name: 210802d02 | | |
|------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------|------------------|--|
| CASNO | Target Nuclide | Result +/- 2 s | STPU MDC | Requested MDC | DL | Lab Qualifier | |
| 14331-83-0 | Ac-228 | 21.0 +/- 2.5 | 0.1 | 1 | NA | J | |
| 14913-49-6 | Bi-212 | 21.9 +/- 2.6 | 0.5 | 1 | NA | J | |
| 14733-03-0 | Bi-214 | 2.28 +/- 0.27 | 0.08 | 1 | NA | J | |
| 13966-00-2 | K-40 | 11.9 +/- 1.4 | 0.3 | 2 | NA | J | |
| 378783-76-7 | Pa-234m | 2.4 +/- 1.7 | 2.7 | 35 | NA | U,J | |
| 15092-94-1 | Pb-212 | 21.7 +/- 2.5 | 0.1 | 1 | NA | J | |
| 15067-28-4 | Pb-214 | 2.20 +/- 0.27 | 0.13 | 1 | NA | J | |
| 15262-20-1 | Ra-228 | 21.0 +/- 2.5 | 0.1 | 1 | NA | J | |
| 14274-82-9 | Th-228 | 21.0 +/- 2.5 | 0.1 | 1 | NA | J | |
| 15065-10-8 | Th-234 | 12.8 +/- 1.6 | 0.8 | 2 | NA | J | |

6.71 +/- 0.79

0.04

SQ - Spectral quality prevents accurate quantitation.

TI - Nuclide identification is tentative. R - Nuclide has exceeded 8 halflives.

SI - Nuclide identification and/or quantitation is tentative.

G - Sample density differs by more than 15% of LCS density.

1

NA

J

Comments:

14913-50-9

Qualifiers/Flags:

- U Result is less than the sample specific MDC or less than the associated TP
- Y1 Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

TI-208

M - The requested MDC was not met.

Abbreviations:

- TPU Total Propagated Uncertainty
- MDC Sample specific Minimum Detectable Concentration
- BDL Below Detection Limit
- DL Decision Level

Gamma Spectroscopy Results PAI 713 Rev 15 Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2106442

Client Name: Tetra Tech, Inc.

ClientProject ID: Lindsay Light - 161 E Grand Alley

| L | .ibrary: RA226.LIB | Date Prepared: 19-Jun-21 Date Analyzed: 10-Jul-21 | Count Time: 1000 minutes Report Basis: Dry Weight | Result Units: pCi/g File Name: 210802d02A |
|---|--------------------|------------------------------------------------------|------------------------------------------------------|-------------------------------------------------|
| | 2106442-2 | Date Collected: 14-Jun-21 | Run ID: GS210619-1A | Moisture(%): 8.752 |
| | LL-210614-W | Sample Matrix: SOLID Prep SOP: PAI 739 Rev 13 | Prep Batch: GS210619-1 QCBatchID: GS210619-1-1 | Final Aliquot: 444 g Prep Basis: As Received |

| CASNO | Target Nuclide | Result +/- 2 s TPU | MDC | Requested MDC | DL | Lab Qualifier |
|-------------------|----------------|--------------------|------|------------------|----|------------------|
| 13982-63-3 Ra-226 | | 2.24 +/- 0.27 | 0.08 | 1 | NA | J |

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

- M3 The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M The requested MDC was not met.

Abbreviations:

- TPU Total Propagated Uncertainty
- MDC Sample specific Minimum Detectable Concentration
- BDL Below Detection Limit
- DL Decision Level

Data Package ID: GSS2106442-1

SQ - Spectral quality prevents accurate quantitation.

TI - Nuclide identification is tentative. R - Nuclide has exceeded 8 halflives.

SI - Nuclide identification and/or quantitation is tentative.

G - Sample density differs by more than 15% of LCS density.

Section 5

RAW DATA



| 210796D01.SPC Analyzed by JH ************************************ | **** | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--|--|--|--|--|--|--|--|--|
| SEEKER GAMMA ANALYSIS RESULTS PS Version 1 ALS Laboratory Group - Fort Collins | **** | | | | | | | | | |
| ALS Laboratory Group - Fort Collins | | | | | | | | | | |
| | .8.4 | | | | | | | | | |
| | | | | | | | | | | |
| GammaScan | | | | | | | | | | |
| *************************************** | **** | | | | | | | | | |
| | | | | | | | | | | |
| Geo 13 / Solid | | | | | | | | | | |
| | | | | | | | | | | |
| Sample ID: 2106442-1 GS210619-1 | | | | | | | | | | |
| | | | | | | | | | | |
| Sampling Start: 06/14/2021 12:00:00 Counting Start: 07/10/2021 14:0 | 00:48 | | | | | | | | | |
| Sampling Stop: 06/14/2021 12:00:00 Decay Time 6.26E+002 | 2 Hrs | | | | | | | | | |
| Buildup Time 0.00E+000 Hrs Live Time 6000 |) Sec | | | | | | | | | |
| Sample Size | 4 Sec | | | | | | | | | |
| Collection Efficiency 1.0000 Spc. File | L.SPC | | | | | | | | | |
| | | | | | | | | | | |
| Detector $#: 1$ (Detector 1) | | | | | | | | | | |
| Energy (keV) = $-2.02 + 0.501$ *Ch + $0.00E+00$ *Ch ² + $0.00E+00$ *Ch ³ 07/10/2021 | | | | | | | | | | |
| $FWHM(keV) = 0.74 + 0.020*En + 4.70E - 04*En^2 + 0.00E + 00*En^3 08/22/2020$ | | | | | | | | | | |
| Where En = Sqrt(Energy in keV) | | | | | | | | | | |
| Search Sensitivity: 1.00 Sigma Multiplier: 2.00 Search Start/End: 80/4 | 4000 | | | | | | | | | |
| Search Sensicivicy: 1.00 Signa Mulcipiter: 2.00 Search Start/End: 60/4 | | | | | | | | | | |
| | | | | | | | | | | |
| PEAK SEARCH RESULTS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| PK. ENERGY ADDRESS NET/MDA UN- C.L. BKG FWHM | | | | | | | | | | |
| PK. ENERGY ADDRESS NET/MDA UN- C.L. BKG FWHM # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG | | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG | 3 | | | | | | | | | |
| # (keV) COUNTS COUNTS COUNTS COUNTS FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET | 3 < CL | | | | | | | | | |
| # (keV) COUNTS COUNTS COUNTS COUNTS FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET Wide | 3 | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.85 b | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.83 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b 8 89.80 183.25 458 129 100 1864 0.98 c | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b 8 89.80 183.25 458 129 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.83 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b 8 89.80 183.25 458 129 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d 10< | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAC 1 63.46 130.67 66 110 90 1618 0.83 a NET-WID 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b 8 89.80 183.25 458 129 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d <td< td=""><td>3 < CL</td></td<> | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS COUNTS (keV) FLAC 1 63.46 130.67 66 110 90 1618 0.83 a NET-wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d 10 99.30 202.21 143 136 110 2080 1.10 a | 3 < CL | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAC 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d 10 | G < CL e Pk | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.83 a NET 2 66.55 136.85 215 113 90 1618 0.83 b 3 3 70.97 145.66 423 293 239 5502 2.80 c 4 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d | G < CL e Pk | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.85 b Net-Wide 2 66.55 136.85 215 113 90 1618 0.85 c 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 | G < CL e Pk | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d 10 99.30 202.21 143 136 110 2080 1.10 a < | G < CL e Pk | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.83 a NET-Wide 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.99 b 8 89.80 183.25 458 129 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d 10 99.30 202.21 143 136 110 2080 1.10 a | G < CL e Pk | | | | | | | | | |
| # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS COUNTS (keV) FLAG 1 63.46 130.67 66 110 90 1618 0.83 a NET-Wide 2 66.55 136.85 215 113 90 1618 0.85 b 3 70.97 145.66 423 293 239 5502 2.80 c 4 74.80 153.32 1117 155 115 2266 1.13 d 5 77.03 157.75 1523 147 103 1942 1.04 e 6 84.32 172.30 338 157 125 2485 1.36 a 7 87.26 178.17 743 134 100 1864 0.98 c 9 92.96 189.55 949 178 138 2796 1.40 d 10 99.30 202.21 143 136 110 2080 1.10 a < | G < CL e Pk | | | | | | | | | |

PEAK SEARCH RESULTS

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|----------|---------|---------|------------|-----------|--------|-------------|--------|------------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| 21 | 241.50 | 485.98 | 1198 | 177 | 134 | 2330 | 1.83 | |
| 22 | 257.03 | 516.98 | 75 | 80 | 64 | 2330 944 | 0.83 | |
| 23 | 270.24 | 543.33 | 409 | 105 | 80 | 1258 | 1.14 | |
| 24 | 277.60 | 558.02 | 176 | 121 | 97 | 1631 | 1.42 | |
| 25 | 283.49 | 569.78 | 53 | 78 | 63 | 906 | | b Net< Cl |
| 26 | 295.26 | 593.27 | 1382 | 125 | 83 | 1276 | 1.24 | |
| 27 | 300.15 | 603.03 | 410 | 100 | 75 | 1117 | 1.18 | b |
| 28 | 328.13 | 658.87 | 294 | 104 | 81 | 1207 | 1.25 | a |
| 29 | 338.39 | 679.35 | 1267 | 120 | 79 | 1161 | 1.25 | a |
| 30 | 351.92 | 706.34 | 2385 | 131 | 72 | 957 | 1.32 | A |
| 31 | 409.55 | 821.36 | 133 | 80 | 63 | 781 | 1.23 | A |
| 32 | 463.07 | 928.15 | 341 | 78 | 57 | 636 | 1.22 | A |
| 33 | 511.09 | 1023.98 | 1801 | 145 | 97 | 1265 | 2.23 | a Wide Pk |
| 34 | 558.46 | 1118.51 | 95 | 66 | 52 | 529 | 1.15 a | a |
| 35 | 570.47 | 1142.48 | 51 | 65 | 52 | 531 | 1.20 a | a NET< CL |
| 36 | 583.28 | 1168.05 | 2098 | 121 | 65 | 685 | 1.61 a | a |
| 37 | 609.43 | 1220.23 | 1761 | 115 | 64 | 766 | 1.64 | A |
| 38 | 666.15 | 1333.43 | 94 | 66 | 52 | 518 | 1.41 | A |
| 39 | 727.44 | 1455.74 | 410 | 82 | 59 | 605 | 1.72 a | A |
| 40 | 768.90 | 1538.47 | 94 | 56 | 43 | 399 | 1.15 | a . |
| 41 | 785.96 | 1572.53 | 49 | 44 | 34 | 273 | 1.05 a | |
| 42 | 795.14 | 1590.84 | 217 | 70 | 53 | 487 | 1.80 | |
| 43 | 803.80 | 1608.12 | 124 | 72 | 56 | 532 | 1.89 | |
| 44 | 835.90 | 1672.18 | 56 | 61 | 48 | 457 | 1.44 | |
| 45 | 860.60 | 1721.48 | 237 | 74 | 55 | 494 | 2.15 | |
| 46 | 911.52 | 1823.09 | 1251 | 91 | 48 | 399 | 1.84 | |
| 47 | 934.41 | 1868.77 | 87 | 56 | 43 | 346 | 1.65 | |
| 48 | 964.96 | 1929.74 | 281 | 83 | 63 | 558 | 2.58 | |
| 49 | 969.16 | 1938.13 | 771 | 77 | 43 | 349 | 1.68 1 | |
| 50 | 1000.70 | 2001.06 | 44 | 50 | 40 | 293 | 1.61 | |
| 51 | 1014.80 | 2029.20 | 36 | 62 | 50 | 409 | | a NET< CL |
| 52 | 1120.62 | 2240.39 | 367 | 67 | 45 | 381 | 1.93 | |
| 53 | 1238.28 | 2475.20 | 136 | 56 | 42 | 344 | 1.85 | |
| 54 55 | 1378.14 | 2754.29 | 80 | 47 | 36 | 212 | 2.48 | |
| 55 56 | 1408.81 | 2815.51 | 46 2165 | 39 | 30 | 178 | 1.86 | |
| | 1461.25 | 2920.16 | 3165 | 120 | 34 | 184 | | A HiResid |
| 57 59 | 1589.24 | 3175.57 | 104 | 31 | 20 | 85 | 1.32 | |
| 58 50 | 1592.63 | 3182.35 | 104 | 53 | 41 | 222 | 3.36 1 | |
| 59 60 | 1622.24 | 3241.44 | 57 | 32 | 23 | 101 | 1.74 | |
| 60 61 | 1631.13 | 3259.17 | 28 | 31 | 24 | 110 | 2.00 1 | |
| 61 62 | 1730.07 | 3456.62 | 53 | 27 | 18 | 68 | 1.64 | |
| 62 63 | 1764.97 | 3526.28 | 338 | 51 | 29 | 129 | 2.82 | |
| 63 | 1848.96 | 3693.88 | 23 | 21 | 15 | 56 | 1.23 a | 1 |

> ALS Laboratory Group - Fort Collins GammaScan

Background File: DET010707.BKG (210707-1 LONGBKGCAL)

Bkg.File Detector #: 1

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | |
|-----|---------|---------|-----------|----------|---------|-----------|----------|-----------------------|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL | FLAG |
| | | | | | | | | |
| 2 | 66.55 | 215 | 113 | 90 | 80 | 164 | 134 | NET <cl< td=""></cl<> |
| 4 | 74.80 | 1117 | 155 | 115 | 994 | 209 | 164 | |
| 5 | 77.03 | 1523 | 147 | 103 | 1478 | 232 | 180 | |
| 9 | 92.96 | 949 | 178 | 138 | 802 | 232 | 185 | |
| 14 | 139.91 | 139 | 110 | 88 | 58 | 153 | 126 | NET <cl< td=""></cl<> |
| 16 | 154.21 | 153 | 109 | 88 | 111 | 149 | 121 | NET <cl< td=""></cl<> |
| 17 | 185.96 | 788 | 142 | 107 | 691 | 218 | 174 | |
| 18 | 198.70 | 194 | 133 | 107 | 21 | 211 | 173 | NET <cl< td=""></cl<> |
| 20 | 238.66 | 6180 | 194 | 93 | 6087 | 237 | 147 | |
| 26 | 295.26 | 1382 | 125 | 83 | 1338 | 194 | 148 | |
| 30 | 351.92 | 2385 | 131 | 72 | 2283 | 163 | 108 | |
| 33 | 511.09 | 1801 | 145 | 97 | 809 | 268 | 216 | |
| 34 | 558.46 | 95 | 66 | 52 | -88 | 135 | 112 | NET <cl< td=""></cl<> |
| 36 | 583.28 | 2098 | 121 | 65 | 2017 | 164 | 113 | |
| 37 | 609.43 | 1761 | 115 | 64 | 1636 | 180 | 132 | |
| 43 | 803.80 | 124 | 72 | 56 | 6 | 109 | 90 | NET <cl< td=""></cl<> |
| 46 | 911.52 | 1251 | 91 | 48 | 1182 | 121 | 81 | |
| 49 | 969.16 | 771 | 77 | 43 | 729 | 122 | 90 | |
| 52 | 1120.62 | 367 | 67 | 45 | 340 | 87 | 65 | |
| 53 | 1238.28 | 136 | 56 | 42 | 97 | 97 | 78 | |
| 56 | 1461.25 | 3165 | 120 | 34 | 2519 | 169 | 112 | |
| 62 | 1764.97 | 338 | 51 | 29 | 273 | 91 | 70 | |

| 210/9 | 6D01.SPC Analyzed by | , | | | | | | | | |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------|-----------------------------------------|--|--|--|--|--|--|
| SEEKER | FINAL ACTI | | | | | | | | | |
| | ALS Laboratory Group - Fort Collins GammaScan | | | | | | | | | |
| ****** | ****** | ******* | ***** | ****** | | | | | | |
| | Geo 13 / Solid | | | | | | | | | |
| Sample ID: 21064 | 42-1 GS210619-1 | | | | | | | | | |
| Sampling Stop: Buildup Time Sample Size Collection Effici | 06/14/2021 12:00:0 06/14/2021 12:00:0 0.00e+000 H 3.78e+002 ency 1.000 nce Interval: 95 | 00 Decay Ti s Live Tim g Real Tim 00 Spectrum | me e e | 60000 Sec 60274 Sec 210796D01.SPC | | | | | | |
| Eff=10^[-1.10E+0 | Detector # (D01)(Sh13).EFF (Geo 2 +1.44E+02*L +-6.30 1 + -8.38E-01 * En | E+01*L^2 +9. | 33E+00*L^3] | | | | | | | |
| - | URAL(SUB RA228).LI | (Natural.LIB | - | | | | | | | |
| | | MDA CONCENTR | | | | | | | | |
| | N E Concentration T (pCi/g |) MDA | Critical Level | | | | | | | |
| 115.18 238.63 | | -02 -01 1.43E+00 -02 4.71E-02 | 7.02E-01 2.33E-02 | 1.27E+14 1.27E+14 1.27E+14 | | | | | | |
| 300.09 U-235 143.76 185.72 | 9.80E-01 +- 2.39E N 6.47E-02 +- 6.90E I.D | -02 1.13E-01 | 5.59E-02 | 6.17E+12 | | | | | | |
| | x 3.22E-01 +- 2.53E 1.86E-01 +- 1.28E 3.26E-01 +- 2.65E | -02 -01 2.08E-01 -02 3.69E-02 | 1.03E-01 1.82E-02 | 1.27E+14 1.27E+14 | | | | | | |
| | x 5.23E-01 +- 3.36E 4.48E-01 +- 6.51E 5.50E-01 +- 3.92E | -02 -02 1.00E-01 | 4.96E-02 | 1.40E+07 1.40E+07 | | | | | | |
| Ra-228 Average: 338.40 911.07 968.90 | x 9.53E-01 +- 6.10E 9.81E-01 +- 9.28E 9.17E-01 +- 9.35E 9.73E-01 +- 1.63E | -02 1.25E-01 -02 1.28E-01 | 6.32E-02 | 5.04E+04 5.04E+04 | | | | | | |
| Bi-214 Average: | x 5.07E-01 +- 5.12E 5.03E-01 +- 5.53E 5.31E-01 +- 1.36E | -02 -02 8.21E-02 | 4.06E-02 | 1.40E+07 1.40E+07 | | | | | | |

| 210796D01.SPC Analyzed by | | | | | | | | | | | |
|---------------------------------------|------------------|----------------|----------------------------|-------------|------------|----------|---------|----------|--|--|--|
| | | | | | | | | | | | |
| MEASURED or MDA CONCENTRATIONS | | | | | | | | | | | |
| ▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋▋ | | | | | | | | | | | |
| | TRA | N Edgy R | Concentra | | | 0 | | | | | |
| Nucl | | ERGY E | Concentr | | | Critical | | 8 | | | |
| NUCL | 1 de (| keV) T | (pCi/g |) | MDA | Level | (hrs) | | | | |
| Bi-2 | 12 72 | 7 17 | 1.02E+00 +- | | | | | | | | |
| Pa-2 | | | 1.62E+00 +- | | | | | | | | |
| Fa-2 K-40 | | | | | | | | - | | | |
| | | | 6.75E+00 +- | | | | 1.12E+1 | - | | | |
| | | | 8.73E-01 +- 1.08E-01 +- | | | | 1.95E+0 | | | | |
| Cs-1 | | | | | | | | - | | | |
| CR-T | .37 00 | 1.02 N | 2.86E-03 +- | 1.216-02 | 2.03E-02B | 9.92E-03 | 2.64E+0 | 5 | | | |
| МБ | ית השמווס מי | OTAT | 1.51E+01 +- | 1 7150.01 . | | | | | | | |
| | | | | - | | | | | | | |
| ~~~~ | | | | OWN,SUM or | | | | | | | |
| | | | ================== | - | | | | | | | |
| | | | | | | | | | | | |
| PK. | ENERGY | ADDRES | s net | UN- | C.L. | BKG | THATLER | | | | |
| # | (keV) | CHANNE | | CERTAINTY | COUNTS | COUNTS | FWHM | | | | |
| | (| | | | | COUNTS | (keV) | FLAG | | | |
| 1 | 63.46 | 130.6 | 7 66 | 110 | 90 | 1618 | 0.83 | Deleted | | | |
| 2 | 66.55 | | | 164 | 134 | 1618 | 0.85 | Deleted | | | |
| 3 | 70.97 | | | 293 | 239 | 5502 | 2.80 | Unknown | | | |
| 4 | 74.80 | | | 209 | 164 | 2266 | 2.80 | | | | |
| - 5 | 77.03 | | | 232 | 180 | | | Unknown | | | |
| 6 | 84.32 | | | 157 | 125 | 1942 | 1.04 | Unknown | | | |
| 7 | 87.26 | | | 137 | 125 | 2485 | 1.36 | Unknown | | | |
| 8 | 89.80 | | | 134 | | 1864 | 0.99 | Unknown | | | |
| 10 | 99.30 | | | 136 | 100 110 | 1864 | 0.98 | Unknown | | | |
| 11 | 105.40 | | | 130 | | 2080 | 1.10 | 1121DEsc | | | |
| 13 | 129.18 | | | | 139 | 2862 | 1.53 | Unknown | | | |
| 14 | 139.91 | 281.8 | | 114 | 89 | 1606 | 0.75 | Unknown | | | |
| 15 | 143.84 | 203.2 | | 153 124 | 126 | 1572 | 0.79 | Deleted | | | |
| 16 | 154.21 | 311.7 | | 149 | 101 | 1886 | 0.95 | Deleted | | | |
| 18 | 198.70 | 400.5 | | | 121 | 1547 | 0.74 | Deleted | | | |
| 19 | 209.21 | 421.5 | | 211 | 173 | 1955 | 1.15 | Deleted | | | |
| 21 | 241.50 | 485.9 | | 122 | 92 | 1574 | 0.94 | Unknown | | | |
| 22 | 241.50 | 485.9 516.9 | | 177 | 134 | 2330 | 1.83 | Unknown | | | |
| 23 | 257.03 | 543.3 | | 80 105 | 64 | 944 | 0.83 | Unknown | | | |
| 25 25 | 270.24 | 543.3 | | 105 | 80 | 1258 | 1.14 | Unknown | | | |
| 25 28 | 328.13 | 658.8 | | 78 | 63 81 | 906 | 0.76 | Deleted | | | |
| 31 | 409.55 | 821.3 | | 104 | 81 | 1207 | 1.25 | Unknown | | | |
| 32 | 463.07 | 928.1 | | 80 | 63 | 781 | 1.23 | Unknown | | | |
| 33 | 403.07 511.09 | | | 78 | 57 | 636 | 1.22 | Unknown | | | |
| | | | | 268 | 216 | 1265 | 2.23 | Unknown | | | |
| 34 | | 1118.5 | | 135 | 112 | 529 | 1.15 | Deleted | | | |
| 35 | | 1142.4 | | 65 | 52 | 531 | 1.20 | Deleted | | | |
| 38 | | 1333.4 | | 66 | 52 | 518 | 1.41 | Unknown | | | |
| 40 | | 1538.4 | | 56 | 43 | 399 | 1.15 | Unknown | | | |
| 41 | | 1572.5 | | 44 | 34 | 273 | 1.05 | Unknown | | | |
| 42 | | 1590.8 | | 70 | 53 | 487 | 1.80 | Unknown | | | |
| 43 | 803.80 | 1608.1 | | 109 | 90 | 532 | 1.89 | Deleted | | | |
| | | Page 0 | 05 | | | | | | | | |

Page 005

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|---------|
| 44 | 835.90 | 1672.18 | 56 | 61 | 48 | 457 | 1.44 | Unknown |
| 47 | 934.41 | 1868.77 | 87 | 56 | 43 | 346 | 1.65 | Unknown |
| 48 | 964.96 | 1929.74 | 281 | 83 | 63 | 558 | 2.58 | Unknown |
| 51 | 1014.80 | 2029.20 | 36 | 62 | 50 | 409 | 2.51 | Deleted |
| 53 | 1238.28 | 2475.20 | 97 | 97 | 78 | 344 | 1.85 | Unknown |
| 54 | 1378.14 | 2754.29 | 80 | 47 | 36 | 213 | 2.48 | Unknown |
| 55 | 1408.81 | 2815.51 | 46 | 39 | 30 | 178 | 1.86 | Unknown |
| 57 | 1589.24 | 3175.57 | 104 | 31 | 20 | 85 | 1.32 | Unknown |
| 58 | 1592.63 | 3182.35 | 104 | 53 | 41 | 222 | 3.36 | Unknown |
| 59 | 1622.24 | 3241.44 | 57 | 32 | 23 | 101 | 1.74 | Unknown |
| 60 | 1631.13 | 3259.17 | 28 | 32 | 24 | 110 | 2.00 | Unknown |
| 61 | 1730.07 | 3456.62 | 53 | 27 | 18 | 68 | 1.64 | Unknown |
| 62 | 1764.97 | 3526.28 | 273 | 91 | 70 | 129 | 2.82 | Unknown |
| 63 | 1848.96 | 3693.88 | 23 | 21 | 15 | 56 | 1.23 | Unknown |

c:\SEEKER\BIN\210796d01.res Analysis Results Saved.

| * * * * | | 210796D01. | SPC Analyz | HC 20 De | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| | | | | LYSIS | | ******* | G Vora | ********** | |
| 022 | | GAAA | | | KESU. | | S Vers | 1011 1.0.4 | |
| | | i | ALS Laborat | tory Group GammaSca | | lins | | | |
| **** | ******* | ****** | ****** | ****** | ***** | ****** | ***** | ******* | |
| | Geo 13 / Solid | | | | | | | | |
| Comm | 1. TD. 31 | L06442-1 G | 9210610 1 | | | | | | |
| sanp | Te ID: 71 | LU6442-1 Gi | 8210019-1 | | | | | | |
| | | | | | | | | | |
| Samp Buil | ling Stop dup Time. | 06/ : | 14/2021 12 . 0.00E+00 | :00:00 Co :00:00 D e 00 Hrs Li | cay Time. ve Time . | • • • • • | . 6.2 | 26E+002 Hrs 60000 Sec | |
| | | | | +002 g Re | | | | | |
| | | | | 1.0000 Sp | | | | | |
| | | | | or #: 1 (D | | | | | |
| Ener | av(keV)= | -2.02 + | | 0.00E+00*C | | ጅ∔ዐዐጵሮኬላ3 | 07/10 | /2021 | |
| | | | | 4.70E-04*E | | | | | |
| | | | | En = Sgrt(E | | | | | |
| | | | | | | | | | |
| Sear | ch Sensit | vity: 1.0 | 00 Sigma | Multiplier | : 2.00 S | earch Sta | rt/End | : 80/4000 | |
| | | | | | | | | | |
| | | | =========== | | | | ====== | | |
| PEAK SEARCH RESULTS | | | | | | | | | |
| ==== | | | | | | | | | |
| | ******** | | | | | | | | |
| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | | |
| PK. | ENERGY | ADDRESS | NET/MDA | | C.L. | BKG | FWHM | | |
| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS (| UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG | |
| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM (keV) | FLAG a NET< CL | |
| РК. # 1 | ENERGY (keV) 63.46 | ADDRESS CHANNEL 130.67 | NET/MDA COUNTS (66 | UN- CERTAINTY 110 | C.L. COUNTS 90 | BKG COUNTS 1618 | FWHM (keV) 0.83 | FLAG a NET< CL Wide Pk | |
| PK. # 1 2 | ENERGY (keV) 63.46 66.55 | ADDRESS CHANNEL 130.67 136.85 | NET/MDA COUNTS (66 215 | UN- CERTAINTY 110 113 | C.L. COUNTS 90 90 | BKG COUNTS 1618 1618 | FWHM (keV) 0.83 0.85 | FLAG a NET< CL Wide Pk b | |
| РК. # 1 | ENERGY (keV) 63.46 66.55 70.97 | ADDRESS CHANNEL 130.67 136.85 145.66 | NET/MDA COUNTS (66 215 423 | UN- CERTAINTY 110 113 293 | C.L. COUNTS 90 90 239 | BKG COUNTS 1618 1618 5502 | FWHM (keV) 0.83 0.85 2.80 | FLAG a NET< CL Wide Pk b c | |
| PK. # 1 2 3 4 | ENERGY (keV) 63.46 66.55 70.97 74.80 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 | NET/MDA COUNTS (66 215 423 1117 | UN- CERTAINTY 110 113 293 155 | C.L. COUNTS 90 239 115 | BKG COUNTS 1618 1618 5502 2266 | FWHM (keV) 0.83 0.85 2.80 1.13 | FLAG a NET< CL Wide Pk b c d | |
| PK. # 1 2 3 | ENERGY (keV) 63.46 66.55 70.97 | ADDRESS CHANNEL 130.67 136.85 145.66 | NET/MDA COUNTS (66 215 423 1117 1523 | UN- CERTAINTY 110 113 293 155 147 | C.L. COUNTS 90 239 115 103 | BKG COUNTS 1618 1618 5502 2266 1942 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 | FLAG a NET< CL Wide Pk b c d e | |
| PK. # 1 2 3 4 5 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 | NET/MDA COUNTS (66 215 423 1117 1523 338 | UN- CERTAINTY 110 113 293 155 147 157 | C.L. COUNTS 90 90 239 115 103 125 | BKG COUNTS 1618 1618 5502 2266 1942 2485 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 | FLAG a NET< CL Wide Pk b c d e a | |
| PK. # 1 2 3 4 5 6 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 | NET/MDA COUNTS (66 215 423 1117 1523 338 743 | UN- CERTAINTY 110 113 293 155 147 157 134 | C.L. COUNTS 90 239 115 103 125 100 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 | FLAG a NET < CL Wide Pk b c d e a b | |
| PK. # 1 2 3 4 5 6 7 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 | NET/MDA COUNTS (66 215 423 1117 1523 338 | UN- CERTAINTY 110 113 293 155 147 157 | C.L. COUNTS 90 239 115 103 125 100 100 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 | FLAG a NET < CL Wide Pk b c d e a b c | |
| PK. # 1 2 3 4 5 6 7 8 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 | NET/MDA COUNTS (66 215 423 1117 1523 338 743 458 | UN- CERTAINTY 110 113 293 155 147 157 134 129 | C.L. COUNTS 90 239 115 103 125 100 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 | FLAG a NET < CL Wide Pk b c d e a b c d | |
| PK. # 1 2 3 4 5 6 7 8 9 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 | NET/MDA COUNTS (66 215 423 1117 1523 338 743 458 949 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 | C.L. COUNTS 90 90 239 115 103 125 100 100 138 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 | FLAG a NET < CL Wide Pk b c d e a b c d a b c d a | |
| PK. # 1 2 3 4 5 6 7 8 9 10 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 | C.L. COUNTS 90 90 239 115 103 125 100 100 138 110 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 | FLAG a NET < CL Wide Pk b c d e a b c d a a a | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 | NET/MDA COUNTS (66 215 423 1117 1523 338 743 458 949 143 158 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 | C.L. COUNTS 90 239 115 103 125 100 100 138 110 139 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 | FLAG a NET < CL Wide Pk b c d e a b c d a a a a a | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 114.93 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 | NET/MDA COUNTS (66 215 423 1117 1523 338 743 458 949 143 158 67 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 | C.L. COUNTS 90 239 115 103 125 100 100 138 110 139 62 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 | FLAG a NET < CL Wide Pk b c d e a b c d d a a a a a a | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 114.93 129.18 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 158 67 288 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 | C.L. COUNTS 90 239 115 103 125 100 100 138 110 139 62 89 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 | FLAG a NET < CL Wide Pk b c d e a b c d d a a a a a a | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 114.93 129.18 139.91 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 283.25 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 158 67 288 139 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 110 | C.L. COUNTS 90 239 115 103 125 100 100 138 110 139 62 89 88 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 1572 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 | FLAG a NET < CL Wide Pk b c d e a b c d a a a a a a b NET < CL | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 114.93 129.18 139.91 143.84 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 283.25 291.09 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 158 67 288 139 100 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 110 124 | C.L. COUNTS 90 90 239 115 103 125 100 100 138 110 139 62 89 88 101 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 1572 1886 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 0.95 0.74 | FLAG a NET < CL Wide Pk b c d e a b c d a a a a a b NET < CL a | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 114.93 129.18 139.91 143.84 154.21 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 283.25 291.09 311.77 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 158 67 288 139 100 153 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 110 124 109 142 | C.L. COUNTS 90 90 239 115 103 125 100 100 138 110 139 62 89 88 101 88 101 88 107 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 1572 1886 1547 1966 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 0.95 0.74 1.18 | FLAG a NET < CL Wide Pk b c d e a b c d a a a a a a b b c c d b c c d b c c d b c c d b c c d b c c d b c c d b c c d b c c d b c c d b c c d b c c d b c c c c | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 | ENERGY (keV) | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 283.25 291.09 311.77 375.15 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 158 67 288 139 100 153 788 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 110 124 109 | C.L. COUNTS 90 90 239 115 103 125 100 100 138 110 139 62 89 88 101 88 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 1572 1886 1547 1966 1955 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 0.95 0.74 1.18 1.15 | FLAG a NET < CL Wide Pk b c d e a b c d a a a a a a a a a a a a a a a a a a | |
| PK. # 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 | ENERGY (keV) 63.46 66.55 70.97 74.80 77.03 84.32 87.26 89.80 92.96 99.30 105.40 114.93 129.18 139.91 143.84 154.21 185.96 198.70 | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 283.25 291.09 311.77 375.15 400.56 | NET/MDA COUNTS (66 215 423 1117 1523 338 743 458 949 143 158 67 288 139 100 153 788 194 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 110 124 109 142 133 | C.L. COUNTS 90 239 115 103 125 100 100 138 110 139 62 89 88 101 88 101 88 107 107 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 1572 1886 1547 1966 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 0.95 0.74 1.18 | FLAG a NET < CL Wide Pk b c d e a b c d a a a b b c d a a b b c d a a a a a a a a a a a a a a a a a a | |
| PK. # 2 3 4 5 6 7 8 9 10 11 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | ENERGY (keV) | ADDRESS CHANNEL 130.67 136.85 145.66 153.32 157.75 172.30 178.17 183.25 189.55 202.21 214.38 233.40 261.84 283.25 291.09 311.77 375.15 400.56 421.54 | NET/MDA COUNTS 0 66 215 423 1117 1523 338 743 458 949 143 158 67 288 139 100 153 788 194 574 | UN- CERTAINTY 110 113 293 155 147 157 134 129 178 136 171 77 114 110 124 109 142 133 122 | C.L. COUNTS 90 90 239 115 103 125 100 100 138 110 139 62 89 88 101 88 101 88 107 107 92 | BKG COUNTS 1618 1618 5502 2266 1942 2485 1864 1864 2796 2080 2862 939 1606 1572 1886 1547 1966 1955 1574 | FWHM (keV) 0.83 0.85 2.80 1.13 1.04 1.36 0.99 0.98 1.40 1.10 1.53 0.50 0.75 0.79 0.95 0.74 1.18 1.15 0.94 | FLAG a NET < CL Wide Pk b c d e a b c d a a a b b c d a a b b c d a a a a a a a a a a a a a a a a a a | |

PEAK SEARCH RESULTS

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|-----|---------|---------|----------|-----------|-----------|--------------|--------|--------------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| 21 | 241.50 | 485.98 | 1198 | 177 | | | | |
| 22 | 257.03 | 516.98 | 75 | 80 | 134 64 | 2330 | 1.83 1 | |
| 23 | 270.24 | 543.33 | 409 | 105 | 80 | 944 1259 | 0.83 | |
| 24 | 277.60 | 558.02 | 176 | 105 | 97 | 1258 1631 | 1.14 | |
| 25 | 283.49 | 569.78 | 53 | 78 | 63 | 906 | 1.42 8 | D NET< CL |
| 26 | 295.26 | 593.27 | 1382 | 125 | 83 | 1276 | 1.24 | |
| 27 | 300.15 | 603.03 | 410 | 100 | 75 | 1117 | 1.18 | |
| 28 | 328.13 | 658.87 | 294 | 104 | 81 | 1207 | 1.25 a | |
| 29 | 338.39 | 679.35 | 1267 | 120 | 79 | 1161 | 1.25 4 | |
| 30 | 351.92 | 706.34 | 2385 | 131 | 72 | 957 | 1.32 4 | |
| 31 | 409.55 | 821.36 | 133 | 80 | 63 | 781 | 1.23 a | |
| 32 | 463.07 | 928.15 | 341 | 78 | 57 | 636 | 1.22 4 | |
| 33 | 511.09 | 1023.98 | 1801 | 145 | 97 | 1265 | | - Wide Pk |
| 34 | 558.46 | 1118.51 | 95 | 66 | 52 | 529 | 1.15 a | |
| 35 | 570.47 | 1142.48 | 51 | 65 | 52 | 531 | | A NET< CL |
| 36 | 583.28 | 1168.05 | 2098 | 121 | 65 | 685 | 1.61 4 | |
| 37 | 609.43 | 1220.23 | 1761 | 115 | 64 | 766 | 1.64 8 | |
| 38 | 666.15 | 1333.43 | 94 | 66 | 52 | 518 | 1.41 a | |
| 39 | 727.44 | 1455.74 | 410 | 82 | 59 | 605 | 1.72 a | |
| 40 | 768.90 | 1538.47 | 94 | 56 | 43 | 399 | 1.15 a | |
| 41 | 785.96 | 1572.53 | 49 | 44 | 34 | 273 | 1.05 a | 1 |
| 42 | 795.14 | 1590.84 | 217 | 70 | 53 | 487 | 1.80 a | 1 |
| 43 | 803.80 | 1608.12 | 124 | 72 | 56 | 532 | 1.89 1 | > |
| 44 | 835.90 | 1672.18 | 56 | 61 | 48 | 457 | 1.44 a | L |
| 45 | 860.60 | 1721.48 | 237 | 74 | 55 | 494 | 2.15 a | L |
| 46 | 911.52 | 1823.09 | 1251 | 91 | 48 | 399 | 1.84 a | L |
| 47 | 934.41 | 1868.77 | 87 | 56 | 43 | 346 | 1.65 a | L |
| 48 | 964.96 | 1929.74 | 281 | 83 | 63 | 558 | 2.58 a | L |
| 49 | 969.16 | 1938.13 | 771 | 77 | 43 | 349 | 1.68 h |) |
| 50 | 1000.70 | 2001.06 | 44 | 50 | 40 | 293 | 1.61 a | L |
| 51 | 1014.80 | 2029.20 | 36 | 62 | 50 | 409 | 2.51 a | NET< CL |
| 52 | 1120.62 | 2240.39 | 367 | 67 | 45 | 381 | 1.93 a | L |
| 53 | 1238.28 | 2475.20 | 136 | 56 | 42 | 344 | 1.85 a | |
| 54 | 1378.14 | 2754.29 | 80 | 47 | 36 | 212 | 2.48 a | L |
| 55 | 1408.81 | 2815.51 | 46 | 39 | 30 | 178 | 1.86 a | L |
| 56 | 1461.25 | 2920.16 | 3165 | 120 | 34 | 184 | 2.65 a | HiResid |
| 57 | 1589.24 | 3175.57 | 104 | 31 | 20 | 85 | 1.32 e | |
| 58 | 1592.63 | 3182.35 | 104 | 53 | 41 | 222 | 3.36 ł | |
| 59 | 1622.24 | 3241.44 | 57 | 32 | 23 | 101 | 1.74 s | |
| 60 | 1631.13 | 3259.17 | 28 | 31 | 24 | 110 | 2.00 1 | |
| 61 | 1730.07 | 3456.62 | 53 | 27 | 18 | 68 | 1.64 a | L |
| 62 | 1764.97 | 3526.28 | 338 | 51 | 29 | 129 | 2.82 a | |
| 63 | 1848.96 | 3693.88 | 23 | 21 | 15 | 56 | 1.23 a | L |

SEEKER BACKGROUND SUBTRACT RESULTS Vers. 2.2.1

ALS Laboratory Group - Fort Collins GammaScan

Background File:. DET010707.BKG (210707-1 LONGBKGCAL)

Bkg.File Detector #: 1

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | |
|-----|---------|---------|-----------|----------|---------|-----------|------------------------------------|--|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL FLAG | |
| | | | | | | | | |
| | | 215 | | 90 | | | 134 NET <cl< td=""><td></td></cl<> | |
| 4 | 74.80 | | 155 | 115 | 994 | 209 | 164 | |
| 5 | 77.03 | | | 103 | 1478 | 232 | 180 | |
| 9 | 92.96 | 949 | 178 | 138 | 802 | 232 | 185 | |
| 14 | 139.91 | 139 | 110 | 88 | 58 | 153 | 126 NET <cl< td=""><td></td></cl<> | |
| 16 | 154.21 | 153 | 109 | 88 | 111 | 149 | 121 NET <cl< td=""><td></td></cl<> | |
| 17 | 185.96 | 788 | 142 | 107 | 691 | 218 | 174 | |
| 18 | 198.70 | 194 | 133 | 107 | 21 | 211 | 173 NET <cl< td=""><td></td></cl<> | |
| 20 | 238.66 | 6180 | 194 | 93 | 6087 | 237 | 147 | |
| 26 | 295.26 | 1382 | 125 | 83 | 1338 | 194 | 148 | |
| 30 | 351.92 | 2385 | 131 | 72 | 2283 | 163 | 108 | |
| 33 | 511.09 | 1801 | 145 | 97 | 809 | 268 | 216 | |
| 34 | 558.46 | 95 | 66 | 52 | -88 | 135 | | |
| 36 | 583.28 | 2098 | 121 | 65 | 2017 | 164 | 113 | |
| 37 | 609.43 | 1761 | 115 | 64 | 1636 | 180 | | |
| 43 | 803.80 | 124 | 72 | 56 | 6 | 109 | 90 NET <cl< td=""><td></td></cl<> | |
| 46 | 911.52 | 1251 | 91 | 48 | 1182 | | | |
| 49 | 969.16 | 771 | 77 | 43 | 729 | 122 | | |
| 52 | 1120.62 | 367 | 67 | 45 | 340 | 87 | | |
| 53 | 1238.28 | 136 | 56 | 42 | | 97 | | |
| 56 | 1461.25 | 3165 | | | | | | |
| 62 | 1764.97 | | 51 | 29 | | 91 | | |

| **** | 210796D01.SPC Analyzed by | | | | | | | | |
|--------------------------------------------|---------------------------------|-------------------|-----------|-------------------------|-------------------------|-------------|----------|-------------------|--|
| SEEKER FINAL ACTIVITY REPORT Version 2.2.1 | | | | | | | | | |
| | | | | | | | | | |
| | | | ALS Labor | ratory Gro | up - Fort (| Collins | | | |
| | | | | Gamma | | | | | |
| **** | ****** | ****** | ******* | ******** | ******** | ****** | ***** | ***** | |
| | | | | 0 12 | (| | | | |
| | | | | Geo 13 | / Solia | | | | |
| Samp | Sample ID: 2106442-1 GS210619-1 | | | | | | | | |
| | | | | | | | | | |
| Samp | ling Sta | rt: 06/ | /14/2021 | 12:00:00 | Counting a | Start: | 07/10/20 | 21 14:00:48 | |
| _ | - | p: 06/ | | • | • | | | 26e+002 Hrs | |
| | | | | | | | | 60000 Sec | |
| | | | | | | | | 6027 4 Sec | |
| | | | | | | | | 0796D01.SPC | |
| | | | | • | | | | val: 95 % | |
| | | | | | | | | | |
| rff: | aiona- T | ile. (D01) | | Ctor #: 1 FF (Geo 13 | (Detector | L) | | | |
| | - | | | • | Err Car) 1*L^2 +9.33 | 38+00*1.431 | 06/25/2 | 0.21 | |
| | | | | | 00E+00 * E1 | | | | |
| Libr | ary File | ••••• | RA22 | 6.LIB (Ra | -226 (215g | steel can) |)) | | |
| | | | | | | | - | | |
| | | | MEASU | RED or MDA | CONCENTRAT | rions | | | |
| | | | | | | | | | |
| | | N | - | | | | | | |
| N | | | | ation | | Critical | | 9 | |
| NUCL | .1 de (| keV) T (<u>r</u> | pc1/g |) | MDA | Level | (hrs) | | |
| Ra-2 | 26 Ave | rage:x 5.1 | 8E-01 +- | 2.81E-02 | | • • • • | 1.40E+0 | 7 | |
| | | - | | | 1.00E-01 | | | | |
| | | 1.92 5.5 | | | 5.29E-02 | | | | |
| | 60 | 9.31 5.0 |)3E-01 +- | 5.53E-02 | 8.21E-02 | 4.06E-02 | | | |
| | 112 | 0.29 5.3 | 31E-01 +- | 1.36E-01 | 2.06E-01 | 1.01E-01 | 1.40E+0 | 7 | |
| | | | | | | | | | |
| | | | | 2.81E-02] | | | | | |
| | ******* | | | | | | | | |
| | | | | - | ESCAPE PE | | | | |
| | | | | | | | | | |
| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | | |
| # | (keV) | CHANNEL | | CERTAINTY | | COUNTS | (keV) | FLAG | |
| | | | | | | | | | |
| 1 | 70.97 | 145.66 | 423 | 293 | 239 | 5502 | 2.80 | Unknown | |
| 2 | 74.80 | 153.32 | 994 | 209 | 164 | 2266 | | Unknown | |
| 3 | 77.03 | 157.75 | 1478 | 232 | 180 | 1942 | | Unknown | |
| 4 | 84.32 | 172.30 | 338 | 157 | 125 | 2485 | 1.36 | Unknown | |
| 5 | 87.26 | | 743 | 134 | 100 | 1864 | 0.99 | Unknown | |
| 6 | 89.80 | | 458 | 129 | 100 | 1864 | 0.98 | Unknown | |
| 7 | 92.96 | | 802 | 232 | 185 | 2796 | 1.40 | Unknown | |
| | | Page 004 | | | | | | | |
| | | | | | | | | | |

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UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. Counts | BKG COUNTS | FWHM | |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|-------|----------|
| | | | | | | COUNTS | (keV) | FLAG |
| 8 | 99.30 | 202.21 | 143 | 136 | 110 | 2080 | 1.10 | 1121DEsc |
| 9 | 105.40 | 214.38 | 158 | 171 | 139 | 2862 | 1.53 | Unknown |
| 10 | 114.93 | 233.40 | 67 | 77 | 62 | 939 | 0.50 | Unknown |
| 11 | 129.18 | 261.84 | 288 | 114 | 89 | 1606 | 0.75 | Unknown |
| 12 | 185.96 | 375.15 | 691 | 218 | 174 | 1966 | 1.18 | Unknown |
| 13 | 209.21 | 421.54 | 574 | 122 | 92 | 1574 | 0.94 | Unknown |
| 14 | 238.66 | 480.31 | 6087 | 237 | 147 | 1483 | 1.12 | Unknown |
| 15 | 241.50 | 485.98 | 1198 | 177 | 134 | 2330 | 1.83 | Unknown |
| 16 | 257.03 | 516.98 | 75 | 80 | 64 | 944 | 0.83 | Unknown |
| 17 | 270.24 | 543.33 | 409 | 105 | 80 | 1258 | 1.14 | Unknown |
| 18 | 277.60 | 558.02 | 176 | 121 | 97 | 1631 | 1.42 | Unknown |
| 20 | 300.15 | 603.03 | 410 | 100 | 75 | 1117 | 1.18 | Unknown |
| 21 | 328.13 | 658.87 | 294 | 104 | 81 | 1207 | 1.25 | Unknown |
| 22 | 338.39 | 679.35 | 1267 | 120 | 79 | 1161 | 1.25 | Unknown |
| 24 | 409.55 | 821.36 | 133 | 80 | 63 | 781 | 1.23 | Unknown |
| 25 | 463.07 | 928.15 | 341 | 78 | 57 | 636 | 1.22 | Unknown |
| 26 | 511.09 | 1023.98 | 809 | 268 | 216 | 1265 | 2.23 | Unknown |
| 27 | 583.28 | 1168.05 | 2017 | 164 | 113 | 685 | 1.61 | Unknown |
| 29 | 666.15 | 1333.43 | 94 | 66 | 52 | 518 | 1.41 | Unknown |
| 30 | 727.44 | 1455.74 | 410 | 82 | 59 | 605 | 1.72 | Unknown |
| 31 | 768.90 | 1538.47 | 94 | 56 | 43 | 399 | 1.15 | Unknown |
| 32 | 785.96 | 1572.53 | 49 | 44 | 34 | 273 | 1.05 | Unknown |
| 33 | 795.14 | 1590.84 | 217 | 70 | 53 | 487 | 1.80 | Unknown |
| 34 | 835.90 | 1672.18 | 56 | 61 | 48 | 457 | 1.44 | Unknown |
| 35 | 860.60 | 1721.48 | 237 | 74 | 55 | 494 | 2.15 | Unknown |
| 36 | 911.52 | 1823.09 | 1182 | 121 | 81 | 399 | 1.84 | Unknown |
| 37 | 934.41 | 1868.77 | 87 | 56 | 43 | 346 | 1.65 | Unknown |
| 38 | 964.96 | 1929.74 | 281 | 83 | 63 | 558 | 2.58 | Unknown |
| 39 | 969.16 | 1938.13 | 729 | 122 | 90 | 349 | 1.68 | Unknown |
| 40 | 1000.70 | 2001.06 | 44 | 50 | 40 | 293 | 1.61 | Unknown |
| 42 | 1238.28 | 2475.20 | 97 | 97 | 78 | 344 | 1.85 | Unknown |
| 43 | 1378.14 | 2754.29 | 80 | 47 | 36 | 213 | 2.48 | Unknown |
| 44 | 1408.81 | 2815.51 | 46 | 39 | 30 | 178 | 1.86 | Unknown |
| 45 | 1461.25 | 2920.16 | 2519 | 169 | 112 | 184 | 2.65 | Unknown |
| 46 | 1589.24 | 3175.57 | 104 | 31 | 20 | 85 | 1.32 | Unknown |
| 47 | 1592.63 | 3182.35 | 104 | 53 | 41 | 222 | 3.36 | Unknown |
| 48 | 1622.24 | 3241.44 | 57 | 32 | 23 | 101 | 1.74 | Unknown |
| 49 | 1631.13 | 3259.17 | 28 | 32 | 24 | 110 | 2.00 | Unknown |
| 50 | 1730.07 | 3456.62 | 53 | 27 | 18 | 68 | 1.64 | Unknown |
| 51 | 1764.97 | 3526.28 | 273 | 91 | 70 | 129 | 2.82 | Unknown |
| 52 | 1848.96 | 3693.88 | 23 | 21 | 15 | 56 | 1.23 | Unknown |
| | | | | | | | • | |

c:\SEEKER\BIN\210796d01A.res Analysis Results Saved.

| | | | | A | | | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| 210805D02.SPC Analyzed by JI | | | | | | | | | | | | |
| **** | ******* | G A M M | ********* | ******************* | ********* | ******** | ******* | ******** | | | | |
| SEEI | KER | GAMM | A ANAI | LISIS | RESUI | JTS P | S Versi | on 1.8.4 | | | | |
| | ALS Laboratory Group - Fort Collins | | | | | | | | | | | |
| | | | | GammaSca | | | | | | | | |
| **** | ****** | ******* | ******* | ****** | ******* | ****** | ****** | ******** | | | | |
| | | | (| Geo 13 / S | oliđ | | | | | | | |
| Gome | le TD: 21 | 06442-1D G | 0010610 1 | | | | | | | | | |
| Saup. | Le ID: 21 | .00442-1D G | 5210619-1 | | | | | | | | | |
| | | | | | | | | | | | | |
| - | - | | 4/2021 12:0 | | - | | | | | | | |
| - | | | 4/2021 12:0 | | - | | | | | | | |
| | - | | 0.00E+00 | • | | | | 60000 Sec 60110 Sec | | | | |
| - | | | . 3.78E+(| | | | | | | | | |
| | | | ••••± | | | • • • • • • | | | | | | |
| | | | Detector | r#: 2 (D | etector 2) | | | | | | | |
| | | | .501*Ch + (| | | | | | | | | |
| FWHM | (keV) = | 0.59 + 0 | .019*En + 4 | | | | 07/29/ | 2020 | | | | |
| | | | Where E | n = Sqrt(E | nergy in ko | ev) | | | | | | |
| Searc | ch Sensit | ivity: 1.0 | 0 Sigma 1 | Multiplier | : 2.00 S | arch Sta | rt/End: | 80/4000 | | | | |
| | | | | | | | | | | | | |
| ====: | | | | | | | ======= | | | | | |
| | | | | | | | | | | | | |
| | | | PEA | K SEARCH R | ESULTS | | | | | | | |
| ====: | | | PEA | | | | | ============ | | | | |
| | | | | | | | | | | | | |
| ====: PK. # | ENERGY (keV) | | | UN- | | BKG COUNTS | FWHM | FLAG | | | | |
| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | | | | | | |
| PK. # 1 | ENERGY (keV) 46.34 | ADDRESS CHANNEL 95.44 | NET/MDA COUNTS CI | UN- ERTAINTY 100 | C.L. COUNTS 80 | BKG COUNTS 1423 | FWHM (keV) 0.59 | FLAG a | | | | |
| PK. # 1 2 | ENERGY (keV) 46.34 53.39 | ADDRESS CHANNEL 95.44 109.50 | NET/MDA COUNTS CI 138 101 | UN- ERTAINTY 100 63 | C.L. COUNTS 80 49 | BKG COUNTS 1423 677 | FWHM (keV) 0.59 0.41 | FLAG a a | | | | |
| PK. # 1 2 3 | ENERGY (keV) 46.34 53.39 63.28 | ADDRESS CHANNEL 95.44 109.50 129.26 | NET/MDA COUNTS CI 138 101 351 | UN- ERTAINTY 100 63 110 | C.L. COUNTS 80 49 85 | BKG COUNTS 1423 677 1613 | FWHM (keV) 0.59 0.41 0.66 | FLAG a a a | | | | |
| PK. # 1 2 3 4 | ENERGY (keV) 46.34 53.39 63.28 66.23 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 | NET/MDA COUNTS C 138 101 351 252 | UN- ERTAINTY 100 63 110 143 | C.L. COUNTS 80 49 85 114 | BKG COUNTS 1423 677 1613 2419 | FWHM (keV) 0.59 0.41 0.66 0.97 | FLAG a a a b | | | | |
| PK. # 1 2 3 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 | NET/MDA COUNTS CI 138 101 351 252 210 | UN- ERTAINTY 100 63 110 143 94 | C.L. COUNTS 80 49 85 114 74 | BKG COUNTS 1423 677 1613 2419 1335 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 | FLAG a a a b a | | | | |
| PK. # 1 2 3 4 5 | ENERGY (keV) 46.34 53.39 63.28 66.23 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 | NET/MDA COUNTS C 138 101 351 252 | UN- ERTAINTY 100 63 110 143 | C.L. COUNTS 80 49 85 114 | BKG COUNTS 1423 677 1613 2419 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 | FLAG a a a b a b | | | | |
| PK. # 1 2 3 4 5 6 7 8 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 | NET/MDA COUNTS C 138 101 351 252 210 1743 | UN- ERTAINTY 100 63 110 143 94 153 | C.L. COUNTS 80 49 85 114 74 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 | FLAG a a a b a b c | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 | NET/MDA COUNTS C 138 101 351 252 210 1743 2671 503 1308 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 | FLAG a a a b b a b c a b b c a b b | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 | NET/MDA COUNTS C: 138 101 351 252 210 1743 2671 503 1308 817 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 | FLAG a a a b b c a b c a b c | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 | NET/MDA COUNTS C 138 101 351 252 210 1743 2671 503 1308 817 1702 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 | FLAG a a a b a b c a b c a d | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 | NET/MDA COUNTS CI 138 101 351 252 210 1743 2671 503 1308 817 1702 228 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 2721 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 | FLAG a a a b b c a b c d a | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 | NET/MDA COUNTS C 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 221 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 | FLAG a a a b b c a b c d a a a | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 | NET/MDA COUNTS C: 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 | FLAG a a a b b c a b c d a a b b c d b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c c c | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 | NET/MDA COUNTS C 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 221 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 | FLAG a a a b b c d d a a b b c d d a a a b NET < CL a NET < CL | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 | NET/MDA COUNTS CI 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 | FLAG a a a b b c d d a a b b c d d a a a b NET < CL a NET < CL | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 | NET/MDA COUNTS CI 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 104 115 191 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 | FLAG a a a b b c d d d a a b b c c d d a a b b c c d a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b b c c a a b b b c c a a b b b c c a a b b b c c b b b c c c a b b b c c b b b c c c a a b b b c c a a b b b c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c a a b b b c c c c | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 154.09 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 310.58 | NET/MDA COUNTS CI 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 130 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 104 115 191 81 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 64 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 996 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 0.45 | FLAG a a a b b c d d d a a b b c d d a a b b c c d a a b b c c d a a b b c c d a a b b c c d a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c c a b b c c c a b b c c c c | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 154.09 185.95 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 310.58 374.19 | NET/MDA COUNTS C: 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 130 1164 | UN- ERTAINTY 100 63 110 143 94 153 164 155 162 145 162 131 129 80 104 115 191 81 140 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 64 101 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 221 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 0.45 1.04 | FLAG a a a b b c a b c a b b c a b b c a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a a b b c c a a a b b c c c a a a b b c c a a a a | | | | |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 154.09 185.95 198.40 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 310.58 374.19 | NET/MDA COUNTS CI 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 130 | UN- ERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 104 115 191 81 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 64 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 996 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 0.45 | FLAG a a a b b c a b c a b b c a b b c a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a a b b c c a a a b b c c c a a a b b c c a a a a | | | | |

PEAK SEARCH RESULTS

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|-----|---------|------------------|---------|-----------|------------|--------------|------------------|---------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| 22 | 209.19 | 420.59 | 733 | 115 | 83 | 1404 | | |
| 23 | 238.60 | 479.33 | 8709 | 216 | 83 | 1404 1479 | 0.90 a | HiResid |
| 24 | 241.44 | 484.99 | 1259 | 141 | 101 | 14/9 | | HiResid |
| 25 | 248.91 | 499.91 | 47 | 76 | 62 | 844 | | NET< CL |
| 26 | 270.30 | 542.62 | 652 | 133 | 101 | 1603 | 1.26 a | |
| 27 | 277.40 | 556.79 | 251 | 88 | 68 | 928 | 0.74 a | |
| 28 | 295.25 | 592.43 | 1936 | 127 | 76 | 1054 | 0.74 a | |
| 29 | 300.11 | 602.13 | 573 | 104 | 76 | 1054 | 1.05 b | |
| 30 | 328.04 | 657.90 | 359 | 87 | 65 | 841 | | HiResid |
| 31 | 338.31 | 678.41 | 1574 | 118 | 72 | 966 | | HiResid |
| 32 | 351.86 | 705.46 | 3410 | 148 | 75 | 949 | 1.09 a | |
| 33 | 409.51 | 820.57 | 248 | 81 | 62 | 706 | 1.03 a | |
| 34 | 427.93 | 857.34 | 78 | 81 | 65 | 700 | 1.03 a | |
| 35 | 462.98 | 927.34 | 558 | 96 | 68 | 812 | 1.54 a | |
| 36 | 510.98 | 1023.18 | 2894 | 156 | 93 | 1220 | | Wide Pk |
| 37 | 558.51 | 1118.07 | 205 | 130 67 | 50 | 519 | 2.20 a 0.94 a | |
| | 562.50 | 1126.04 | 205 | 56 | | | | |
| 38 | | | | | 44 | 433 | 0.88 b | |
| 39 | 569.95 | 1140.92 | 87 | 57 | 44 | 448 | 0.81 a | |
| 40 | 583.22 | 1167.42 | 2891 | 129 | 59 | 647 | 1.29 a | |
| 41 | 597.64 | 1196.21 | 89 | 137 | 112 | 1540 | 2.57 a | NET< CL |
| | <i></i> | 1010 55 | | | 6 0 | | | Wide Pk |
| 42 | 609.34 | 1219.57 | 2774 | 130 | 63 | 738 | 1.29 a | |
| 43 | 665.33 | 1331.36 | 70 | 62 | 49 | 478 | 1.12 a | |
| 44 | 692.24 | 1385.10 | 34 | 44 | 35 | 302 | 0.70 a | NET< CL |
| | | | | | • • | | | Wide Pk |
| 45 | 694.96 | 1390.52 | 176 | 117 | 94 | 1131 | 2.51 b | |
| 46 | 705.45 | 1411.47 | 31 | 47 | 37 | 344 | | NET< CL |
| 47 | 727.35 | 1455.20 | 628 | 80 | 52 | 494 | 1.37 a | |
| 48 | 755.51 | 1511.42 | 114 | 78 | 62 | 598 | 1.75 a | |
| 49 | 768.46 | 1537.29 | 200 | 62 | 45 | 400 | 1.08 a | |
| 50 | 772.48 | 1545.32 | 84 | 52 | 40 | 343 | 0.94 b | |
| 51 | 782.10 | 1564.51 | 71 | 53 | 41 | 339 | 1.15 a | |
| 52 | 785.73 | 1571.76 | 177 | 71 | 54 | 484 | 1.69 b | |
| 53 | 795.00 | 1590.27 | 346 | 76 | 54 | 483 | 1.57 a | |
| 54 | 803.19 | 1606.62 | 127 | 59 | 45 | 396 | 1.08 a | |
| 55 | 830.94 | 1662.04 | 17 | 45 | 37 | 303 | 0.87 a | NET< CL |
| 56 | 835.66 | 1671.46 | 86 | 65 | 51 | 485 | 1.26 b |) |
| 57 | 860.58 | 1721.22 | 365 | 66 | 45 | 389 | 1.51 a | L |
| 58 | 904.78 | 1809.48 | 45 | 47 | 37 | 297 | 1.21 a | L |
| 59 | 911.37 | 1822.63 | 2064 | 105 | 43 | 356 | 1.50 a | L |
| 60 | 934.07 | 1867.96 | 128 | 74 | 58 | 511 | 2.36 a | L |
| 61 | 964.85 | 1929.41 | 392 | 62 | 39 | 310 | 1.36 a | L |
| 62 | 969.05 | 1937.79 | 1217 | 89 | 46 | 387 | 1.56 b | • |
| 63 | 1001.10 | 2001.79 | 120 | 71 | 55 | 470 | 2.31 a | L |
| 64 | 1014.08 | 2027.72 | 59 | 62 | 49 | 409 | 1.92 a | L |
| 65 | 1120.43 | 2240.05 | 522 | 70 | 44 | 356 | 1.60 a | 6 |
| | | Page 002 | | | | | | |
| | | - · · · - | | | | | | |

PEAK SEARCH RESULTS

| РК. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (kev) | FLAG |
|----------|-----------------|--------------------|-------------------|------------------|----------------|---------------|---------------|-----------|
| | | | | | | | | |
| 66 | 1238.15 | 2475.10 | 203 | 56 | 40 | 305 | 1.51 | 1 |
| 67 | 1303.51 | 2605.61 | 54 | 36 | 27 | 158 | 1.13 | 1 |
| 68 | 1327.27 | 2653.05 | 34 | 38 | 30 | 179 | 1.27 | 1 |
| 69 | 1377.69 | 2753.71 | 138 | 49 | 35 | 228 | 1.94 | 1 |
| 70 | 1401.41 | 2801.09 | 48 | 44 | 35 | 224 | 2.02 | 1 |
| 71 | 1408.28 | 2814.79 | 81 | 36 | 26 | 149 | 1.37 | b |
| 72 | 1460.96 | 2919.98 | 4416 | 138 | 31 | 179 | 1.95 | a HiResid |
| 73 | 1510.12 | 3018.14 | 78 | 46 | 35 | 203 | 2.43 | 9 |
| 74 | 1588.21 | 3174.06 | 164 | 45 | 31 | 180 | 1.74 | a |
| 75 | 1592.23 | 3182.09 | 90 | 44 | 33 | 196 | 1.89 | b |
| 76 | 1620.96 | 3239.45 | 57 | 32 | 23 | 115 | 1.47 | A |
| 77 | 1630.69 | 3258.89 | 54 | 34 | 25 | 129 | 1.60 | A |
| 78 | 1729.80 | 3456.78 | 87 | 31 | 20 | 86 | 1.46 | A |
| 79 | 1764.58 | 3526.22 | 475 | 55 | 27 | 129 | 2.17 | A |
| 80 | 1847.91 | 3692.61 | 56 | 33 | 24 | 106 | 1.92 | a |

SEEKER BACKGROUND SUBTRACT RESULTS Vers. 2.2.1

ALS Laboratory Group - Fort Collins

GammaScan

Background File: DET020707.BKG (210707-2 LONGBKGCAL)

Bkg.File Detector #: 2

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | |
|-----|---------|---------|-----------|----------|---------|-----------|------------|---------------------|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL I | LAG |
| | | | | | | | | |
| 1 | 46.34 | | | 80 | | | | |
| 3 | 63.28 | 351 | | 85 | | 214 | | - |
| 4 | 66.23 | | 143 | | | | | C <cl< td=""></cl<> |
| 6 | | 1743 | 153 | | 1620 | | | |
| 7 | | 2671 | | | 2546 | | | |
| 8 | 84.13 | 503 | 156 | | | 227 | | |
| 9 | 87.12 | 1308 | 152 | 110 | 1270 | 208 | 160 | |
| 11 | 92.87 | 1702 | 186 | 137 | 1282 | 254 | 200 | |
| 12 | 99.52 | 228 | 162 | 131 | 189 | 252 | 206 NE | L <cl< td=""></cl<> |
| 17 | 139.87 | 251 | 115 | 91 | 70 | 186 | 153 NE: | L_>1 |
| 18 | 143.07 | 229 | 191 | 155 | 174 | 216 | 176 NE: | L <cl< td=""></cl<> |
| 20 | 185.95 | 1164 | 140 | 101 | 892 | 204 | 160 | |
| 21 | 198.40 | 251 | 153 | 123 | -66 | 212 | 175 NE: | L <cl< td=""></cl<> |
| 23 | 238.60 | 8709 | 216 | 89 | 8456 | 249 | 138 | |
| 24 | 241.44 | 1259 | 141 | 101 | 1162 | 181 | 138 | |
| 28 | 295.25 | 1936 | 127 | 76 | 1872 | 176 | 126 | |
| 32 | 351.86 | 3410 | 148 | 75 | 3215 | 208 | 143 | |
| 36 | 510.98 | 2894 | 156 | 93 | 789 | 316 | 256 | |
| 37 | 558.51 | 205 | 67 | 50 | -115 | 135 | 113 NE | L <cl< td=""></cl<> |
| 39 | 569.95 | 87 | 57 | 44 | 13 | 105 | 86 NE | L-CL |
| 40 | 583.22 | 2891 | 129 | 59 | 2790 | 157 | 95 | |
| 41 | 597.64 | 89 | 137 | 112 | -39 | 206 | 170 NE: | L2>J |
| 42 | 609.34 | 2774 | 130 | 63 | 2606 | 192 | 133 | |
| 54 | 803.19 | 127 | 59 | 45 | -36 | 125 | 103 NE | L <cl< td=""></cl<> |
| 59 | 911.37 | 2064 | 105 | 43 | 1977 | 152 | 101 | |
| 65 | 1120.43 | 522 | 70 | 44 | 480 | 90 | 65 | |
| 69 | | 138 | 49 | 35 | | 74 | | |
| 72 | 1460.96 | | 138 | | | | 81 | |
| 79 | | 475 | 55 | 27 | 426 | 78 | 55 | |

| ****** | | | nalyzed by | ***** | ***** | ***** | ***** | | | | |
|---------------|-------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|--------|--|--|--|--|
| SEEKER | SEEKER FINAL ACTIVITY REPORT Version 2.2.1 | | | | | | | | | | |
| | | | | | | | | | | | |
| | ALS Laboratory Group - Fort Collins | | | | | | | | | | |
| | | | Gamma | | | | | | | | |
| ****** | ***** | ******* | ******** | ****** | ****** | ****** | ****** | | | | |
| | | | | | | | | | | | |
| | | | Geo 13 | / Solid | | | | | | | |
| Sample I | D: 210644 | 2-1D GS21(| 0619-1 | | | | | | | | |
| | | | | | | | | | | | |
| | | | 21 12:00:00 | - | | 07/11/2021 1: | | | | | |
| | - | | 21 12:00:00 | - | | 6.49e+ | | | | | |
| - | | | | | | 60 | | | | | |
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| | - | | 2*L +-4.58E+0 | | 7E+00*L^3] | 10/10/2020 | | | | | |
| Eff.= EX | P[-2.35E-0 | 1 + -5.841 | E-01 * En + - | 1.09E-02 * | En^2] Abo | ve 300.00 | ceV | | | | |
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| | | | ASURED or MDA | | | | | | | | |
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| | | | ntration | | Critical | Halflife | | | | | |
| Nuclide | (keV) T | | | MDA | | | | | | | |
| | | | | | | | | | | | |
| Pb-210 | 46.50 N | | +- 3.47E+00 | | 2.84E+00 | | | | | | |
| Th-234 | 92.50 | | +- 2.60E-01 | | | 3.92E+13 | | | | | |
| U-235 | | | +- 8.74E-02 | 1.44E-01 | 7.13E-02 | | | | | | |
| | 185.72 | I.D. | • • • • | • • • • | • • • • | | | | | | |
| Pb-212 | - | | +- 3.13E-02 | • • • • | • • • • | | | | | | |
| | | | +- 3.17E-02 | | | | | | | | |
| | | | +- 1.91E-01 | 2.83E-01 | 1.39E-01 | 1.27E+14 | | | | | |
| T1-208 | - | | +- 1.70E-02 | | • • • • | | | | | | |
| | | | +- 7.96E-02 | | | | | | | | |
| | | | +- 1.80E-02 | | | | | | | | |
| | 860.47 | | +- 6.88E-02 | | 4.63E-02 | | | | | | |
| Pb-214 | - | | +- 3.05E-02 | | • • • • | | | | | | |
| | | | | 7.52E-02 | 3.72E-02 | | | | | | |
| | 351.99 | | | 5.26E-02 | | | | | | | |
| Ra-228 | AVerage:X | I.01E+00 | +- 4.38E-02 | • • • • | | 5.04E+04 | | | | | |
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| | 338.40 | 9.25E-01 | +- 6.96E-02 | | 4.25E-02 | 5.04E+04 | | | | | |
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| D: 010 | 338.40 911.07 968.90 | 9.25E-01 1.04E+00 1.09E+00 | +- 6.96E-02 +- 7.97E-02 +- 8.00E-02 | 1.08E-01 8.45E-02 | 4.25E-02 5.32E-02 4.10E-02 | 5.04E+04 5.04E+04 5.04E+04 | | | | | |
| Bi-212 | 338.40 911.07 968.90 727.17 | 9.25E-01 1.04E+00 1.09E+00 1.09E+00 | +- 6.96E-02 +- 7.97E-02 +- 8.00E-02 +- 1.39E-01 | 1.08E-01 8.45E-02 1.83E-01 | 4.25E-02 5.32E-02 4.10E-02 8.94E-02 | 5.04E+04 5.04E+04 5.04E+04 1.27E+14 | | | | | |
| Pa-234m | 338.40 911.07 968.90 727.17 1001.03 | 9.25E-01 1.04E+00 1.09E+00 1.09E+00 2.93E+00 | +- 6.96E-02 +- 7.97E-02 +- 8.00E-02 +- 1.39E-01 +- 1.72E+00 | 1.08E-01 8.45E-02 1.83E-01 2.76E+00 | 4.25E-02 5.32E-02 4.10E-02 8.94E-02 1.35E+00 | 5.04E+04 5.04E+04 5.04E+04 1.27E+14 3.92E+13 | | | | | |
| | 338.40 911.07 968.90 727.17 1001.03 | 9.25E-01 1.04E+00 1.09E+00 1.09E+00 2.93E+00 4.96E-01 | +- 6.96E-02 +- 7.97E-02 +- 8.00E-02 +- 1.39E-01 | 1.08E-01 8.45E-02 1.83E-01 2.76E+00 | 4.25E-02 5.32E-02 4.10E-02 8.94E-02 | 5.04E+04 5.04E+04 5.04E+04 1.27E+14 | | | | | |

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|--------------------------------|-----------------|------------|------------|------------|-----------|----------------------|---------|---------|--|--|--|--|
| MEASURED or MDA CONCENTRATIONS | | | | | | | | | | | | |
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| | | N | - . | | | | | | | | | |
| | - | | Concentra | | | Critical | Halflif | e | | | | |
| Nucl | . 1de () | keV) T | (pCi/g |) | MDA | Level | (hrs) | | | | | |
| | 110 | 0 20 A | | | 1 377 01 | | | | | | | |
| | | | | | | 6.73E-02 1.72E-01 | | | | | | |
| K-40 | | | | | | 1.40E-01 | | | | | | |
| | | | | | | 1.11E+00 | | | | | | |
| Cs-1 | | | | | | 6.63E-03 | | | | | | |
| C9-1 | .57 00 | | ./32-03 +- | 0.136-03 | 1.306-025 | 0.036-03 | 4.04670 | 5 | | | | |
| ME | ASURED T | OTAL: 1 | .74E+01 +- | 7.528+00 1 | oCi/a | | | | | | | |
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| | | | | OWN,SUM or | | | | | | | | |
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| | | | | | | | | | | | | |
| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | | | | | |
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | | (keV) | FLAG | | | | |
| | | | | | | | | | | | | |
| 2 | 53.39 | 109.50 | 101 | 63 | 49 | 677 | 0.41 | Unknown | | | | |
| 3 | 63.28 | 129.26 | 172 | 214 | 175 | 1613 | 0.66 | Deleted | | | | |
| 4 | 66.23 | 135.16 | -10 | 236 | 194 | 2419 | 0.97 | Deleted | | | | |
| 5 | 72.89 | 148.45 | 210 | 94 | 74 | 1335 | 0.50 | Unknown | | | | |
| 6 | 74.77 | 152.20 | 1620 | 207 | 157 | 2225 | 0.88 | Unknown | | | | |
| 7 | 77.03 | 156.72 | . 2546 | 231 | 171 | 2225 | 0.80 | Unknown | | | | |
| 8 | 84.13 | 170.90 | 411 | 227 | 184 | 2588 | 1.15 | Unknown | | | | |
| 9 | 87.12 | 176.86 | 1270 | 208 | 160 | 2218 | 1.03 | Unknown | | | | |
| 10 | 89.92 | 182.45 | 817 | 145 | 110 | 2218 | 0.92 | Unknown | | | | |
| 12 | 99.52 | 201.62 | 189 | 252 | 206 | 2721 | 1.37 | Deleted | | | | |
| 13 | 105.58 | 213.72 | 193 | 131 | 105 | 2033 | 0.99 | Unknown | | | | |
| 14 | 108.71 | 219.96 | 86 | 129 | 105 | 2033 | 0.97 | Deleted | | | | |
| 15 | 115.41 | 233.34 | 59 | 80 | 64 | 1018 | 0.42 | Deleted | | | | |
| 16 | 129.15 | | 443 | 104 | 78 | 1354 | 0.71 | Unknown | | | | |
| 17 | 139.87 | | 70 | 186 | 153 | 1674 | 0.79 | Deleted | | | | |
| 19 | 154.09 | | 130 | 81 | 64 | 996 | 0.45 | Unknown | | | | |
| 21 | 198.40 | | -66 | 212 | 175 | 2388 | 1.25 | Deleted | | | | |
| 22 | 209.19 | | 733 | 115 | 83 | 1404 | 0.90 | Unknown | | | | |
| 24 | 241.44 | 484.99 | 1162 | 181 | 138 | 1726 | 1.22 | Unknown | | | | |
| 25 | 248.91 | | 47 | 76 | 62 | 844 | 0.74 | Deleted | | | | |
| 26 | 270.30 | | 652 | 133 | 101 | 1603 | 1.26 | Unknown | | | | |
| 30 | 328.04 | | 359 | 87 | 65 | 841 | 0.78 | Unknown | | | | |
| 33 | 409.51 | | 248 | 81 | 62 | 706 | 1.03 | Unknown | | | | |
| 34 | 427.93 | | 78 | 81 | 65 | 729 | 1.17 | Unknown | | | | |
| 35 | 462.98 | | 558 | 96 | 68 | 812 | 1.54 | Unknown | | | | |
| 36 | | 1023.18 | 789 | 316 | 256 | 1220 | 2.20 | Unknown | | | | |
| 37 | | 1118.07 | -115 | 135 | 113 | 519 | 0.94 | Deleted | | | | |
| 38 | | 1126.04 | 81 | 56 | 44 | 433 | 0.88 | Unknown | | | | |
| 39 | | 1140.92 | 13 | 105 | 86 | 448 | 0.81 | Deleted | | | | |
| 41 | | 1196.21 | -39 | 206 | 170 | 1540 | 2.57 | Deleted | | | | |
| 42 | | 1219.57 | 2606 | 192 | 133 | 738 | 1.29 | SPLIT | | | | |
| 43 | 665.33 | 1331.36 | 70 | 62 | 49 | 478 | 1.12 | Unknown | | | | |
| | | Page 000 | D | | | | | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. Counts | BKG COUNTS | FWHM (keV) | FLAG |
|--------------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|----------|
| 44 | 692.24 | 1385.10 | 34 | 44 | 35 | 302 | 0.70 | Deleted |
| 45 | 694.96 | 1390.52 | 176 | 117 | 94 | 1131 | 2.51 | Unknown |
| 46 | 705.45 | 1411.47 | 31 | 47 | 37 | 344 | 0.70 | Deleted |
| 48 | 755.51 | 1511.42 | 114 | 78 | 62 | 598 | 1.75 | Unknown |
| 49 | 768.46 | 1537.29 | 200 | 62 | 45 | 400 | 1.08 | Unknown |
| 50 | 772.48 | 1545.32 | 84 | 52 | 40 | 343 | 0.94 | Unknown |
| 51 | 782.10 | 1564.51 | 71 | 53 | 41 | 339 | 1.15 | Unknown |
| 52 | 785.73 | 1571.76 | 177 | 71 | 54 | 484 | 1.69 | Unknown |
| 53 | 795.00 | 1590.27 | 346 | 76 | 54 | 483 | 1.57 | Unknown |
| 54 | 803.19 | 1606.62 | -36 | 125 | 103 | 396 | 1.08 | Deleted |
| 55 | 830.94 | 1662.04 | 17 | 45 | 37 | 303 | 0.87 | Deleted |
| 56 | 835.66 | 1671.46 | 86 | 65 | 51 | 485 | 1.26 | Unknown |
| 58 | 904.78 | 1809.48 | 45 | 47 | 37 | 297 | 1.21 | Unknown |
| 60 | 934.07 | 1867.96 | 128 | 74 | 58 | 511 | 2.36 | Unknown |
| 61 | 964.85 | 1929.41 | 392 | 62 | 39 | 310 | 1.36 | Unknown |
| 64 | 1014.08 | 2027.72 | 59 | 62 | 49 | 409 | 1.92 | Unknown |
| 66 | 1238.15 | 2475.10 | 203 | 56 | 40 | 305 | 1.51 | Unknown |
| 67 | 1303.51 | 2605.61 | 54 | 36 | 27 | 158 | 1.13 | Unknown |
| 68 | 1327.27 | 2653.05 | 34 | 38 | 30 | 179 | 1.27 | Unknown |
| 69 | 1377.69 | 2753.71 | 108 | 74 | 58 | 228 | 1.94 | Unknown |
| 70 | 1401.41 | 2801.09 | 48 | 45 | 35 | 224 | 2.02 | Unknown |
| 71 | 1408.28 | 2814.79 | 81 | 36 | 26 | 149 | 1.37 | Unknown |
| 73 | 1510.12 | 3018.14 | 78 | 46 | 35 | 203 | 2.43 | Unknown |
| 74 | 1588.21 | 3174.06 | 164 | 45 | 31 | 180 | 1.74 | Unknown |
| 75 | 1592.23 | 3182.09 | 90 | 44 | 33 | 196 | 1.89 | Unknown |
| 76 | 1620.96 | 3239.45 | 57 | 32 | 23 | 115 | 1.47 | Unknown |
| 77 | 1630.69 | 3258.89 | 54 | 34 | 25 | 129 | 1.60 | Unknown |
| 78 | 1729.80 | 3456.78 | 87 | 31 | 20 | 86 | 1.46 | Unknown |
| 79 | 1764.58 | 3526.22 | 426 | 78 | 55 | 129 | 2.17 | Unknown |
| 80 | 1847.91 | 3692.61 | 56 | 33 | 24 | 106 | 1.92 | Unknown |
| 82 | 609.34 | 1219.57 | 322 | 2071 | 133 | 738 | 1.29 | 1120SEsc |

c:\SEEKER\BIN\210805d02.res Analysis Results Saved.

| **** | | 10805D02.8 | SPC Analyze | ed by JU | ****** | ***** | ***** | ***** |
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| SEEI | KER | GAMM | A ANA | LYSIS | RESUI | LTS P | S Versi | on 1.8.4 |
| | | 1 | LS Laborat | tory Group | | lins | | |
| **** | ****** | ****** | ******* | GammaSca: *********** | | ****** | ***** | ****** |
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| | | | | Geo 13 / S | oliđ | | | |
| Sampl | le ID: 21 | .06442-1D (| 3 S210619-1 | | | | | |
| Samp Build Samp Colle | ling Stop lup Time. le Size . action Ef | ficiency | L4/2021 12 0.00E+00 . 3.78E | :00:00 Co :00:00 De 00 Hrs Li +002 g Re 1.0000 Sp | cay Time. ve Time . al Time . c. File . | · · · · · · | . 6.4 210 | 9E+002 Hrs 60000 Sec 60110 Sec 805D02.SPC |
| Energ | Jy(keV)= | -1.46 + (| Detecto .501*Ch + .019*En + | or #: 2 (D 0.00E+00*C 4.08E-04*E En = Sgrt(E | etector 2) h^2 + 0.001 n^2 + 0.001 | E+00*Ch^3 E+00*En^3 | 07/11/ | 2021 |
| Searc | | ivitv: 1.(| 00 Sicma | Multiplier | • 2.00 S | earch Sta | | 80/4000 |
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| | | | PE | AK SEARCH R | ESULTS | | | |
| = = = = = : | | | PE | | ESULTS | | | |
| PK. | ENERGY | ADDRESS | PE. | AK SEARCH R UN- | ESULTS C.L. | BKG | FWHM | |
| PK. | ENERGY | ADDRESS | PE. | ak search r | ESULTS C.L. | BKG | FWHM | |
| PK. # | ENERGY (keV) | ADDRESS CHANNEL | PE NET/MDA COUNTS | AK SEARCH R UN- CERTAINTY | ESULTS C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
| PK. | ENERGY | ADDRESS CHANNEL 95.44 | PE. | AK SEARCH R UN- | ESULTS C.L. | BKG | FWHM (keV) 0.59 | FLAG |
| PK. # 1 | ENERGY (keV) 46.34 | ADDRESS CHANNEL 95.44 | PE NET/MDA COUNTS 138 | AK SEARCH R UN- CERTAINTY 100 | C.L. COUNTS | BKG COUNTS 1423 | FWHM (keV) 0.59 | FLAG a |
| PK. # 1 2 3 4 | ENERGY (keV) 46.34 53.39 63.28 66.23 | ADDRESS CHANNEL 95.44 109.50 | PE NET/MDA COUNTS 138 101 351 252 | AK SEARCH R UN- CERTAINTY 100 63 110 143 | C.L. COUNTS 80 49 85 114 | BKG COUNTS 1423 677 1613 2419 | FWHM (keV) 0.59 0.41 0.66 0.97 | FLAG a a b |
| PK. # 1 2 3 4 5 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 | PE NET/MDA COUNTS 138 101 351 252 210 | AK SEARCH R UN- CERTAINTY 100 63 110 143 94 | ESULTS C.L. COUNTS 80 49 85 114 74 | BKG COUNTS 1423 677 1613 2419 1335 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 | FLAG a a b a |
| PK. # 1 2 3 4 5 6 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 | PE NET/MDA COUNTS 138 101 351 252 210 1743 | AK SEARCH R UN- CERTAINTY 100 63 110 143 94 153 | ESULTS C.L. COUNTS 80 49 85 114 74 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 | FLAG a a b a b |
| PK. # 1 2 3 4 5 6 7 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 | UN- CERTAINTY 100 63 110 143 94 153 164 | ESULTS C.L. COUNTS 80 49 85 114 74 105 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 | FLAG a a b a b c |
| PK. # 1 2 3 4 5 6 7 8 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 | AK SEARCH R UN- CERTAINTY 100 63 110 143 94 153 164 156 | ESULTS C.L. COUNTS 80 49 85 114 74 105 105 123 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 | FLAG a a b a b c a |
| PK. # 1 2 3 4 5 6 7 8 9 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 | AK SEARCH R UN- CERTAINTY 100 63 110 143 94 153 164 156 152 | ESULTS C.L. COUNTS 80 49 85 114 74 105 105 123 110 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 | FLAG a a b a b c a b |
| PK. # 1 2 3 4 5 6 7 8 9 10 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 | ESULTS C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 | FLAG a a b b c a b c a b c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 | ESULTS C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 | FLAG a a b b c a b c d |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 | ESULTS C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2957 2721 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 | FLAG a a b b c a b c d a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2218 2957 2721 2033 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 | FLAG a a b b c a b c d a a a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 | FLAG a a b b c a b c d a a b c d b c c d b c c d b c c d b c c d b c c d b c c d b c c c c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2957 2721 2033 2033 1018 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 | FLAG a a a b b c a b c d a a b b c c d a a b b c c d a a b c c d a a b b c c a a b b c c a a b b c c a a a b b c c a a b b c c c c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 104 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 1354 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 | FLAG a a a b b c d a b c d a a b b c c d a a b b c c d a a b b c c d a a b b c c a a b c c a a a b c c a a a b b c c a a a b c c c c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 | UN- CERTAINTY 100 63 110 143 94 153 164 155 152 145 185 162 131 129 80 104 115 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 105 64 78 91 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 | FLAG a a a b c a b c d a a b NET < CL a NET < CL a a wide Pk |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 | UN- CERTAINTY 100 63 110 143 94 153 164 155 164 152 145 185 162 131 129 80 104 115 191 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 | FLAG a a b b c a b c d a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a a b b c c a a b b c a a b b c a a b b c a a b b c c a a b b c c a a b b c c a a b b c c a b b c c a b b b c c a b b b c c a b b b c c a b b b c c a b b b c c a b b b c c a b b b c c b b b c c c a b b b c c c a b b b c c c b b c c c b b c c c b b c c c a b b c c c b b c c c c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 154.09 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 310.58 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 130 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 104 115 191 81 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 64 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 996 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 0.45 | FLAG a a b b c d a b b c d a b b c c d a a b b c c a b b c c a b b c c a b b c c a b b c c a a b b c c a a b b c c a a b b c a a b b c a a b b c a a b b c c a a b b c c a a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c a b b c c c a b b c c c a b b c c c a b b c c c c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 154.09 185.95 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 310.58 374.19 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 130 1164 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 162 131 129 80 104 115 191 81 140 | C.L. COUNTS 80 49 85 114 74 105 123 110 110 110 137 131 105 105 64 78 91 155 64 101 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 996 1885 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 0.45 1.04 | FLAG a a a b c d a b c d a b b c d a a b b c c d a a b b c c d a a b b c c d a a b b c c d a a b b c d a a b b c d a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c c a a b b c c c a a b b c c c b b c c c a a b b c c c a a b b c c c c |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | ENERGY (keV) 46.34 53.39 63.28 66.23 72.89 74.77 77.03 84.13 87.12 89.92 92.87 99.52 105.58 108.71 115.41 129.15 139.87 143.07 154.09 | ADDRESS CHANNEL 95.44 109.50 129.26 135.16 148.45 152.20 156.72 170.90 176.86 182.45 188.35 201.62 213.72 219.96 233.34 260.77 282.19 288.58 310.58 | PE NET/MDA COUNTS 138 101 351 252 210 1743 2671 503 1308 817 1702 228 193 86 59 443 251 229 130 | UN- CERTAINTY 100 63 110 143 94 153 164 156 152 145 185 162 131 129 80 104 115 191 81 | C.L. COUNTS 80 49 85 114 74 105 105 123 110 110 137 131 105 105 64 78 91 155 64 | BKG COUNTS 1423 677 1613 2419 1335 2225 2225 2588 2218 2218 2218 2957 2721 2033 2033 1018 1354 1674 3348 996 | FWHM (keV) 0.59 0.41 0.66 0.97 0.50 0.88 0.80 1.15 1.03 0.92 1.33 1.37 0.99 0.97 0.42 0.71 0.79 1.69 0.45 | FLAG a a a b c d a b c d a b b c d a a b b c c d a a b b c c d a a b b c c d a a b b c c d a a b b c d a a b b c d a a b b c a a b b c a a b b c a a b b c a a b b c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c a a b b c c c a a b b c c c a a b b c c c b b c c c a a b b c c c a a b b c c c c |

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| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|-----|----------------|----------|---------|-----------|-----------|---------------------|---------|--------------------|
| # | (ke V) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| 22 | 209.19 | 420.59 | 733 | 115 | 83 | | | |
| 22 | 238.60 | 479.33 | 8709 | 216 | 89 | 1404 | 0.90 a | |
| 24 | 241.44 | 484.99 | 1259 | 141 | | 1479 | | HiResid HiResid |
| 25 | 248.91 | 499.91 | 47 | 76 | 101 62 | 1726 8 44 | | NET< CL |
| 26 | 270.30 | 542.62 | 652 | 133 | 101 | 1603 | 1.26 a | |
| 27 | 277.40 | 556.79 | 251 | 88 | 68 | 928 | 0.74 a | |
| 28 | 295.25 | 592.43 | 1936 | 127 | 76 | 1054 | 0.98 a | |
| 29 | 300.11 | 602.13 | 573 | 104 | 76 | 1054 | 1.05 b | |
| 30 | 328.04 | 657.90 | 359 | 87 | 65 | 841 | | HiResid |
| 31 | 338.31 | 678.41 | 1574 | 118 | 72 | 966 | | HiResid |
| 32 | 351.86 | 705.46 | 3410 | 148 | 72 | 949 | 1.09 a | |
| 33 | 409.51 | 820.57 | 248 | 81 | 62 | 706 | 1.03 a | |
| 34 | 427.93 | 857.34 | 78 | 81 | 65 | 700 | 1.03 a | |
| 35 | 462.98 | 927.34 | 558 | 96 | 68 | 812 | 1.54 a | |
| 36 | 510.98 | 1023.18 | 2894 | 156 | 93 | 1220 | | Wide Pk |
| 37 | 558.51 | 1118.07 | 205 | 67 | 50 | 519 | 0.94 a | |
| 38 | 562.50 | 1126.04 | 81 | 56 | 44 | 433 | 0.88 b | |
| 39 | 569.95 | 1140.92 | 87 | 57 | 44 | 448 | 0.81 a | |
| 40 | 583.22 | 1167.42 | 2891 | 129 | 59 | 647 | 1.29 a | |
| 41 | 597.64 | 1196.21 | 89 | 137 | 112 | 1540 | | NET< CL |
| ••• | | | 05 | 207 | | 1340 | 2.J/ a | Wide Pk |
| 42 | 609.34 | 1219.57 | 2774 | 130 | 63 | 738 | 1.29 a | |
| 43 | 665.33 | | 70 | 62 | 49 | 478 | 1.12 a | |
| 44 | 692.24 | 1385.10 | 34 | 44 | 35 | 302 | | NET< CL |
| | | | | | 55 | 502 | 0.70 a | Wide Pk |
| 45 | 694.96 | 1390.52 | 176 | 117 | 94 | 1131 | 2.51 b | |
| 46 | 705.45 | 1411.47 | 31 | 47 | 37 | 344 | | NET< CL |
| 47 | 727.35 | 1455.20 | 628 | 80 | 52 | 494 | 1.37 a | - |
| 48 | 755.51 | 1511.42 | 114 | 78 | 62 | 598 | 1.75 a | |
| 49 | 768.46 | 1537.29 | 200 | 62 | 45 | 400 | 1.08 a | |
| 50 | 772.48 | 1545.32 | 84 | 52 | 40 | 343 | 0.94 b | |
| 51 | 782.10 | 1564.51 | 71 | 53 | 41 | 339 | 1.15 a | |
| 52 | 785.73 | 1571.76 | 177 | 71 | 54 | 484 | 1.69 b | |
| 53 | 795.00 | 1590.27 | 346 | 76 | 54 | 483 | 1.57 a | |
| 54 | 803.19 | 1606.62 | 127 | 59 | 45 | 396 | 1.08 a | |
| 55 | 830.94 | 1662.04 | 17 | 45 | 37 | 303 | | NET< CL |
| 56 | 835.66 | 1671.46 | 86 | 65 | 51 | 485 | 1.26 b | |
| 57 | 860.58 | 1721.22 | 365 | 66 | 45 | 389 | 1.51 a | |
| 58 | 904.78 | 1809.48 | 45 | 47 | 37 | 297 | 1.21 a | |
| 59 | 911.37 | 1822.63 | 2064 | 105 | 43 | 356 | 1.50 a | |
| 60 | 934.07 | 1867.96 | 128 | 74 | 58 | 511 | 2.36 a | |
| 61 | 964.85 | 1929.41 | 392 | 62 | 39 | 310 | 1.36 a | |
| 62 | 969.05 | 1937.79 | 1217 | 89 | 46 | 387 | 1.50 a | |
| 63 | 1001.10 | 2001.79 | 120 | 71 | 55 | 470 | 2.31 a | |
| 64 | 1014.08 | 2027.72 | 59 | 62 | 49 | 409 | 1.92 a | |
| 65 | 1120.43 | 2240.05 | 522 | 70 | 44 | 356 | 1.60 a | |
| | | Page 002 | | ,,, | | 550 | 2. VV Q | |
| | | | | | | | | |

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|-----|---------|---------|---------|-----------|--------|--------|--------|-----------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| 66 | 1238.15 | 2475.10 | 203 | 56 | 40 | 305 | 1.51 4 | a |
| 67 | 1303.51 | 2605.61 | 54 | 36 | 27 | 158 | 1.13 a | a |
| 68 | 1327.27 | 2653.05 | 34 | 38 | 30 | 179 | 1.27 a | a |
| 69 | 1377.69 | 2753.71 | 138 | 49 | 35 | 228 | 1.94 a | a |
| 70 | 1401.41 | 2801.09 | 48 | 44 | 35 | 224 | 2.02 | A |
| 71 | 1408.28 | 2814.79 | 81 | 36 | 26 | 149 | 1.37 1 | b |
| 72 | 1460.96 | 2919.98 | 4416 | 138 | 31 | 179 | 1.95 a | a HiResid |
| 73 | 1510.12 | 3018.14 | 78 | 46 | 35 | 203 | 2.43 | A |
| 74 | 1588.21 | 3174.06 | 164 | 45 | 31 | 180 | 1.74 | A |
| 75 | 1592.23 | 3182.09 | 90 | 44 | 33 | 196 | 1.89 1 | b |
| 76 | 1620.96 | 3239.45 | 57 | 32 | 23 | 115 | 1.47 | A |
| 77 | 1630.69 | 3258.89 | 54 | 34 | 25 | 129 | 1.60 a | A |
| 78 | 1729.80 | 3456.78 | 87 | 31 | 20 | 86 | 1.46 | a |
| 79 | 1764.58 | 3526.22 | 475 | 55 | 27 | 129 | 2.17 | 8. |
| 80 | 1847.91 | 3692.61 | 56 | 33 | 24 | 106 | 1.92 | a |

SEEKER BACKGROUND SUBTRACT RESULTS Vers. 2.2.1

ALS Laboratory Group - Fort Collins GammaScan

Background File: DET020707.BKG (210707-2 LONGBKGCAL)

Bkg.File Detector #: 2

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | |
|-----|---------|---------|-----------|----------|---------|-----------|--------------------------------------------|----------|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL FLAC | 3 |
| | | | | | | | | - |
| | | | 100 | | | | | |
| 3 | | 351 | | 85 | | | | Ĺ. |
| 4 | 66.23 | | 143 | | | | 194 NET <ci< td=""><td>L</td></ci<> | L |
| 6 | 74.77 | 1743 | 153 | 105 | 1620 | 207 | 157 | |
| 7 | 77.03 | 2671 | 164 | 105 | 2546 | 231 | 171 | |
| 8 | 84.13 | 503 | 156 | 123 | 411 | 227 | 184 | |
| 9 | 87.12 | 1308 | 152 | 110 | 1270 | 208 | 160 | |
| 11 | 92.87 | 1702 | 186 | 137 | 1282 | 254 | 200 | |
| 12 | 99.52 | 228 | 162 | 131 | 189 | 252 | 206 NET <ci< td=""><td>L</td></ci<> | L |
| 17 | 139.87 | 251 | 115 | 91 | 70 | 186 | 153 NET <ci< td=""><td>ما</td></ci<> | ما |
| 18 | 143.07 | 229 | 191 | 155 | 174 | 216 | 176 NET <ci< td=""><td>L.</td></ci<> | L. |
| 20 | 185.95 | 1164 | 140 | 101 | 892 | 204 | 160 | |
| 21 | 198.40 | 251 | 153 | 123 | -66 | 212 | 175 NET <ci< td=""><td>L.</td></ci<> | L. |
| 23 | 238.60 | 8709 | 216 | 89 | 8456 | 249 | 138 | |
| 24 | 241.44 | 1259 | 141 | 101 | 1162 | 181 | 138 | |
| 28 | 295.25 | 1936 | 127 | 76 | 1872 | 176 | 126 | |
| 32 | 351.86 | 3410 | 148 | 75 | 3215 | 208 | 143 | |
| 36 | 510.98 | 2894 | 156 | 93 | 789 | 316 | 256 | |
| 37 | 558.51 | 205 | 67 | 50 | -115 | 135 | 113 NET <ci< td=""><td>يا</td></ci<> | يا |
| 39 | 569.95 | 87 | 57 | 44 | 13 | 105 | 86 NET <ci< td=""><td>L.</td></ci<> | L. |
| 40 | 583.22 | 2891 | 129 | 59 | 2790 | 157 | 95 | |
| 41 | 597.64 | 89 | 137 | 112 | -39 | 206 | 170 NET <ci< td=""><td>ما</td></ci<> | ما |
| 42 | 609.34 | 2774 | 130 | 63 | 2606 | 192 | 133 | |
| 54 | 803.19 | 127 | 59 | 45 | -36 | 125 | 103 NET <ci< td=""><td>ما</td></ci<> | ما |
| 59 | 911.37 | 2064 | 105 | 43 | 1977 | 152 | 101 | |
| 65 | 1120.43 | 522 | 70 | 44 | 480 | 90 | 65 | |
| 69 | 1377.69 | 138 | 49 | 35 | | 74 | | |
| 72 | 1460.96 | 4416 | 138 | 31 | 4174 | 163 | 81 | |
| 79 | 1764.58 | 475 | 55 | 27 | 426 | 78 | 55 | |

| | 210805D02.SPC Analyzed by | | | | | | | | | | | | |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--|--|--|--|--|
| SEEK | | | | | | | | ion 2.2.1 | | | | | |
| | | | | | | | | | | | | | |
| ALS Laboratory Group - Fort Collins | | | | | | | | | | | | | |
| | | | | Gamma | | | | | | | | | |
| **** | *************************************** | | | | | | | | | | | | |
| | Geo 13 / Solid | | | | | | | | | | | | |
| Sample TD: $2106442 - 1D$ GS210619-1 | | | | | | | | | | | | | |
| Sample ID: 2106442-1D GS210619-1 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Samp | ling Sta | rt: 06/ | 14/2021 | L2:00:00 | Counting 8 | Start: | 07/11/20 | 21 13:16:20 | | | | | |
| - | - | | | L2:00:00 | - | | | 49e+002 Hrs | | | | | |
| - | - | - | | • | - | | | 60000 Sec | | | | | |
| Samp | le Size | | 3.7 | Be+002 g | Real Time | • • • • • | • • • | 60110 Sec | | | | | |
| Coll | ection E | fficiency | • • • • | 1.0000 | Spectrum 1 | File | 21 | 0805D02.SPC | | | | | |
| Cr. | Level Co | nfidence] | Interval: | 95 % | Det. Limit | t Confiden | ce Inter | val: 95 % | | | | | |
| | | | | | | | | | | | | | |
| | | • • • • | | | (Detector | 2) | | | | | | | |
| | _ | | | FF (Geo 13 | • | | | | | | | | |
| | - | | | | 1*L^2 +6.6 | • | | | | | | | |
| EII. | = EXP[-2] | .35E-01 + | -5.84E-0. | L * En + -: | 1.09E-02 * | En^2] Aboy | ve 300 | .00 keV | | | | | |
| Libr | arv File | • | RA22 | 5 T.TR (Re. | -226 (215g | steel can | \ | | | | | | |
| | _ | | | | | | | | | | | | |
| | | | | | CONCENTRA | | | | | | | | |
| ==== | | | | | | | | ============ | | | | | |
| | | N | | | | | | | | | | | |
| | | | Concentra | ation | N ENERGY E Concentration Critical Halflife | | | | | | | | |
| Nucl | ide (| 1 | | | | | | 8 | | | | | |
| Nuclide (keV) T (pCi/g) MDA Level (hrs) | | | | | | | | | | | | | |
| Ra-226 Average:x 5.66E-01 +- 2.38E-02 1.40E+07 | | | | | | | (hrs) | | | | | | |
| Ra-2 | | rage:x 5.6 | 56E-01 +- |) 2.38E-02 | MDA • • • • • | Level | (hrs) 1.40E+0 | 7 | | | | | |
| Ra-2 | 29 | rage:x 5.6 5.21 5.5 | 56E-01 +- 52E-01 +- |) 2.38E-02 5.19E-02 | MDA 7.52E-02 | Level | (hrs) 1.40E+0 1.40E+0 | 7 7 | | | | | |
| Ra-2 | 29 35 | rage:x 5.6 5.21 5.5 1.92 5.8 | 56E-01 +- 52E-01 +- 85E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 | MDA 7.52E-02 5.25E-02 | Level 3.72E-02 2.60E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 | | | | | |
| Ra-2 | 29 35 60 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 | 56E-01 +- 52E-01 +- 55E-01 +- 56E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 | MDA 7.52E-02 5.25E-02 5.85E-02 | Level 3.72E-02 2.60E-02 2.90E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 | | | | | |
| Ra-2 | 29 35 60 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 | 56E-01 +- 52E-01 +- 55E-01 +- 56E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 | MDA 7.52E-02 5.25E-02 | Level 3.72E-02 2.60E-02 2.90E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 | | | | | |
| | 29 35 60 112 | rage:x 5.6 5.21 5.5 1.92 5.8 9.31 5.6 0.29 4.9 | 56E-01 +- 52E-01 +- 55E-01 +- 56E-01 +- 96E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 | Level 3.72E-02 2.60E-02 2.90E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 | | | | | |
| ME | 29 35 60 112 ASURED T | rage:x 5.6 5.21 5.5 1.92 5.8 9.31 5.6 0.29 4.9 OTAL: 5.6 | 56E-01 +- 52E-01 +- 55E-01 +- 56E-01 +- 56E-01 +- 56E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 pCi/g | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 | | | | | |
| ME | 29 35 60 112 ASURED T | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 52E-01 +- 56E-01 +- 66E-01 +- 56E-01 +- 56E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PE | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 7 | | | | | |
| ME | 29 35 60 112 ASURED T | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 52E-01 +- 56E-01 +- 66E-01 +- 56E-01 +- 56E-01 +- |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PE | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 7 7 | | | | | |
| ME ==== | 29 35 60 112 ASURED T ======= | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- UNKN(|) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 DWN,SUM or | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 pCi/g ESCAPE PE | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 7 | | | | | |
| ME ==== ==== PK. | 29 35 60 112 ASURED T ======= ENERGY | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 ADDRESS | 6E-01 +- 52E-01 +- 55E-01 +- 66E-01 +- 66E-01 +- 56E-01 +- UNKN(|) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 WN,SUM or | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PEA C.L. | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | | | | | | |
| ME ==== | 29 35 60 112 ASURED T ======= | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 52E-01 +- 55E-01 +- 66E-01 +- 66E-01 +- 56E-01 +- UNKN(|) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 DWN,SUM or | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PEA C.L. | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 | 7 7 7 7 7 | | | | | |
| ME ==== ==== PK. # | 29 35 60 112 ASURED T ====== ENERGY (keV) | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- UNKNO NET COUNTS |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 JWN, SUM or UN- CERTAINTY | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 pCi/g ESCAPE PEA C.L. COUNTS | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG COUNTS | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) | 7 7 7 7 7 7 7 7 7 7 | | | | | |
| ME ==== PK. # | 29 35 60 112 ASURED T ======= ENERGY (keV) ====== 53.39 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 OTAL: 5.6 ADDRESS CHANNEL 109.50 | 6E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- UNKNO NET COUNTS |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 WN,SUM or UN- CERTAINTY 63 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 pCi/g ESCAPE PEA C.L. COUNTS 49 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG COUNTS 677 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) 0.41 | | | | | | |
| ME ==== PK. # 1 2 | 29 35 60 112 ASURED T ====== ENERGY (keV) 53.39 72.89 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 ==================================== | 6E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 06E-01 +- UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(UNKN(|) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 1 0WN,SUM or UN- CERTAINTY 63 94 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PEZ C.L. COUNTS 49 74 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG COUNTS 677 1335 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) 0.41 0.50 | 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | | | | | |
| ME ==== PK. # 1 2 3 | 29 35 60 112 ASURED T ====== ENERGY (keV) 53.39 72.89 74.77 | ADDRESS CHANNEL 109.50 148.45 15.21 5.21 5.21 5.25 5.21 5.25 5.21 5.25 5.25 | 6E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- UNKNO NET COUNTS 101 210 1620 |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 JUN- CERTAINTY 63 94 207 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 pCi/g ESCAPE PEA C.L. COUNTS 49 74 157 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG COUNTS 677 1335 2225 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) 0.41 0.50 0.88 | 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | | | | | |
| ME ==== PK. # 1 2 3 4 | 29 35 60 112 ASURED T ====== ENERGY (keV) | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.5 OTAL: 5.6 ADDRESS CHANNEL 109.50 148.45 152.20 156.72 | 6E-01 +- 5E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- UNKNO NET COUNTS 101 210 1620 2546 |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 WN,SUM or UN- CERTAINTY 63 94 207 231 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 OCi/g ESCAPE PEA C.L. COUNTS 49 74 157 171 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG COUNTS 677 1335 2225 2225 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 0.41 0.50 0.88 0.80 | 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | | | | | |
| ME ==== PK. # 1 2 3 | 29 35 60 112 ASURED T ====== ENERGY (keV) 53.39 72.89 74.77 77.03 84.13 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 CTAL: 5.6 ADDRESS CHANNEL 109.50 148.45 152.20 156.72 170.90 | 6E-01 +- 5E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 0E-01 +- 101 |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 0WN,SUM or UN- CERTAINTY 63 94 207 231 227 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PEA C.L. COUNTS 49 74 157 171 184 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 6.73E-02 AKS BKG COUNTS 677 1335 2225 2225 2588 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) 0.41 0.50 0.88 0.80 1.15 | FLAG Unknown Unknown Unknown Unknown Unknown | | | | | |
| ME ==== PK. # 1 2 3 4 5 | 29 35 60 112 ASURED T ====== ENERGY (keV) 53.39 72.89 74.77 77.03 84.13 87.12 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 06E-01 +- 01 +- 06E-01 +- 06E-01 +- 01 +- 06E-01 +- 01 +- 06E-01 +- 01 +- 06E-01 +- 01 +- 01 01 +- 01 01 +- 01 +- 01 01 +- 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 - |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 0WN,SUM or UN- CERTAINTY 63 94 207 231 227 208 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PEA C.L. COUNTS 49 74 157 171 184 160 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 AKS BKG COUNTS 677 1335 2225 2288 2218 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) 0.41 0.50 0.88 0.80 1.15 1.03 | 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | | | | | |
| ME ==== PK. # 1 2 3 4 5 6 | 29 35 60 112 ASURED T ====== ENERGY (keV) 53.39 72.89 74.77 77.03 84.13 | rage:x 5.6 5.21 5.5 1.92 5.6 9.31 5.6 0.29 4.9 OTAL: 5.6 | 6E-01 +- 5E-01 +- 5E-01 +- 6E-01 +- 6E-01 +- 6E-01 +- 0E-01 +- 101 |) 2.38E-02 5.19E-02 3.78E-02 4.16E-02 9.35E-02 2.38E-02 0WN,SUM or UN- CERTAINTY 63 94 207 231 227 | MDA 7.52E-02 5.25E-02 5.85E-02 1.37E-01 PCi/g ESCAPE PEA C.L. COUNTS 49 74 157 171 184 | Level 3.72E-02 2.60E-02 2.90E-02 6.73E-02 6.73E-02 AKS BKG COUNTS 677 1335 2225 2225 2588 | (hrs) 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 1.40E+0 FWHM (keV) 0.41 0.50 0.88 0.80 1.15 | FLAG Unknown Unknown Unknown Unknown Unknown | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| * = = = = = = = = = = = = = = = = = = = | |
|-----------------------------------------|--|
| | |

| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | |
|-----|---------|---------|--------|-----------|--------|--------|-------|----------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| | | | | | | | | |
| 8 | 92.87 | 188.35 | 1282 | 254 | 200 | 2957 | 1.33 | Unknown |
| 9 | 105.58 | 213.72 | 193 | 131 | 105 | 2033 | 0.99 | Unknown |
| 10 | 129.15 | 260.77 | 443 | 104 | 78 | 1354 | 0.71 | Unknown |
| 11 | 154.09 | 310.58 | 130 | 81 | 64 | 996 | 0.45 | Unknown |
| 12 | 185.95 | 374.19 | 892 | 204 | 160 | 1885 | 1.04 | Unknown |
| 13 | 209.19 | 420.59 | 733 | 115 | 83 | 1404 | 0.90 | Unknown |
| 14 | 238.60 | 479.33 | 8456 | 249 | 138 | 1479 | 0.92 | Unknown |
| 15 | 241.44 | 484.99 | 1162 | 181 | 138 | 1726 | 1.22 | Unknown |
| 16 | 270.30 | | 652 | 133 | 101 | 1603 | 1.26 | Unknown |
| 17 | 277.40 | 556.79 | 251 | 88 | 68 | 928 | 0.74 | Unknown |
| 19 | 300.11 | 602.13 | 573 | 104 | 76 | 1054 | 1.05 | Unknown |
| 20 | 328.04 | 657.90 | 359 | 87 | 65 | 841 | 0.78 | Unknown |
| 21 | 338.31 | 678.41 | 1574 | 118 | 72 | 966 | 0.91 | Unknown |
| 23 | 409.51 | | 248 | 81 | 62 | 706 | 1.03 | Unknown |
| 24 | 427.93 | 857.34 | 78 | 81 | 65 | 729 | 1.17 | Unknown |
| 25 | 462.98 | 927.34 | 558 | 96 | 68 | 812 | 1.54 | Unknown |
| 26 | 510.98 | 1023.18 | 789 | 316 | 256 | 1220 | 2.20 | Unknown |
| 27 | 562.50 | 1126.04 | 81 | 56 | 44 | 433 | 0.88 | Unknown |
| 28 | 583.22 | 1167.42 | 2790 | 157 | 95 | 647 | 1.29 | Unknown |
| 30 | 609.34 | 1219.57 | 2284 | 1017 | 791 | 738 | 1.29 | 1120SEsc |
| 31 | 609.34 | 1219.57 | 322 | 2071 | 133 | 738 | 1.29 | Unknown |
| 32 | 665.33 | 1331.36 | 70 | 62 | 49 | 478 | 1.12 | Unknown |
| 33 | 694.96 | 1390.52 | 176 | 117 | 94 | 1131 | 2.51 | Unknown |
| 34 | 727.35 | 1455.20 | 628 | 80 | 52 | 494 | 1.37 | 1238SEsc |
| 35 | 755.51 | 1511.42 | 114 | 78 | 62 | 598 | 1.75 | Unknown |
| 36 | 768.46 | 1537.29 | 200 | 62 | 45 | 400 | 1.08 | Unknown |
| 37 | 772.48 | 1545.32 | 84 | 52 | 40 | 343 | 0.94 | Unknown |
| 38 | 782.10 | 1564.51 | 71 | 53 | 41 | 339 | 1.15 | Unknown |
| 39 | 785.73 | 1571.76 | 177 | 71 | 54 | 484 | 1.69 | Unknown |
| 40 | 795.00 | 1590.27 | 346 | 76 | 54 | 483 | 1.57 | Unknown |
| 41 | 835.66 | 1671.46 | 86 | 65 | 51 | 485 | 1.26 | Unknown |
| 42 | 860.58 | 1721.22 | 365 | 66 | 45 | 389 | 1.51 | Unknown |
| 43 | 904.78 | 1809.48 | 45 | 47 | 37 | 297 | 1.21 | Unknown |
| 44 | 911.37 | 1822.63 | 1977 | 152 | 101 | 356 | 1.50 | Unknown |
| 45 | 934.07 | 1867.96 | 128 | 74 | 58 | 511 | 2.36 | Unknown |
| 46 | 964.85 | 1929.41 | 392 | 62 | 39 | 310 | 1.36 | Unknown |
| 47 | 969.05 | 1937.79 | 1217 | 89 | 46 | 387 | 1.56 | Unknown |
| 48 | 1001.10 | 2001.79 | 120 | 71 | 55 | 470 | 2.31 | Unknown |
| 49 | 1014.08 | 2027.72 | 59 | 62 | 49 | 409 | 1.92 | Unknown |
| 51 | 1238.15 | 2475.10 | 203 | 56 | 40 | 305 | 1.51 | Unknown |
| 52 | | 2605.61 | 54 | | 27 | 158 | 1.13 | Unknown |
| 53 | | 2653.05 | 34 | | 30 | 179 | 1.27 | Unknown |
| 54 | | 2753.71 | 108 | | 58 | 228 | 1.94 | Unknown |
| 55 | | 2801.09 | 48 | | 35 | 224 | 2.02 | Unknown |
| 56 | | 2814.79 | 81 | | 26 | 149 | 1.37 | Unknown |
| 57 | | 2919.98 | 4174 | | 81 | 179 | 1.95 | Unknown |
| | | Page 00 | | | | | | |
| | | | - | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|---------|
| 58 | 1510.12 | 3018.14 | 78 | 46 | 35 | 203 | 2.43 | Unknown |
| 59 | 1588.21 | 3174.06 | 164 | 45 | 31 | 180 | 1.74 | Unknown |
| 60 | 1592.23 | 3182.09 | 90 | 44 | 33 | 196 | 1.89 | Unknown |
| 61 | 1620.96 | 3239.45 | 57 | 32 | 23 | 115 | 1.47 | Unknown |
| 62 | 1630.69 | 3258.89 | 54 | 34 | 25 | 129 | 1.60 | Unknown |
| 63 | 1729.80 | 3456.78 | 87 | 31 | 20 | 86 | 1.46 | Unknown |
| 64 | 1764.58 | 3526.22 | 426 | 78 | 55 | 129 | 2.17 | Unknown |
| 65 | 1847.91 | 3692.61 | 56 | 33 | 24 | 106 | 1.92 | Unknown |

c:\SEEKER\BIN\210805d02A.res Analysis Results Saved.

•

| | | 210802D02.5 | SPC Analyzed | HC Yd | | | | | | | | |
|---------------------------------------------------|----------------|--------------------|------------------------------|----------------------------------------|-------------|----------------|---------------|----------------------------------------|--|--|--|--|
| | | | A ANAL | ************************************** | RESU | | | ************************************** | | | | |
| | | _ | | - | | | | | | | | |
| ALS Laboratory Group - Fort Collins GammaScan | | | | | | | | | | | | |
| GammaJCan ************************************ | | | | | | | | | | | | |
| Geo 13 / Solid | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Sample ID: 2106442-2 GS210619-1 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | 4/2021 12:0 | | | | | | | | | |
| | | | 4/2021 12:0 | | | | | | | | | |
| | | | 0.00E+000 . 4.05E+0 | | | | | | | | | |
| | | | · · · · 1. | | | | | | | | | |
| | | | | | | | | | | | | |
| _ | (*) | | | | etector 2) | | | | | | | |
| | | | 0.501*Ch + 0 0.019*En + 4 | | | | | | | | | |
| | (184) - | 0.33 + 0 | | | nergy in k | | 0//29/2 | 2020 | | | | |
| | | | | | | | | | | | | |
| Searc | ch Sensit | ivity: 1.0 | 0 Sigma M | ultiplier | : 2.00 Se | earch Sta | rt/End: | 80/4000 | | | | |
| | | | | | | | | | | | | |
| | | | | SEARCH R | | | | | | | | |
| ==== | | | | | | | | | | | | |
| PK. | FNFDCV | ADDEEGG | NET/MDA | TTNT_ | A T | BKG | | | | | | |
| # | (keV) | | COUNTS CE | | | | FWHM (keV) | FLAG | | | | |
| | | | | | | | | | | | | |
| 1 | 63.45 | 129.53 | 529 | 268 | 217 | 11617 | 0.51 a | L | | | | |
| 2 3 | 72.74 74.83 | 148.09 152.25 | 1202 22901 | 434 538 | 352 366 | 25025 27012 | 0.89 0.84 | | | | | |
| 4 | 77.13 | 156.84 | 40971 | 658 | 427 | 31052 | 0.84 | | | | | |
| 5 | 79.42 | 161.41 | 526 | 315 | 257 | 14612 | 0.83 | | | | | |
| 6 | 81.26 | 165.08 | -4692 | 506 | 431 | 31654 | 1.50 | NET< CL | | | | |
| 7 | 84.33 | 171.22 | 5766 | 514 | 404 | 27880 | 1.09 | | | | | |
| 8 | 87.20 | 176.94 | -835 | 639 | 527 | 47451 | 0.07 | NET< CL | | | | |
| 9 10 | 89.94 93.25 | 182.41 189.01 | -15205 15893 | 645 527 | 568 201 | 54972 | 3.46 | NET< CL | | | | |
| 11 | 99.60 | 201.70 | 3820 | 527 | 381 410 | 24742 26579 | 0.99 1.10 | | | | | |
| 12 | 105.43 | 213.32 | 5679 | 474 | 370 | 23311 | 1.17 a | | | | | |
| 13 | 108.93 | 220.32 | 1791 | 360 | 287 | 16651 | 0.89 t | | | | | |
| 14 | 115.31 | 233.05 | 2287 | 360 | 286 | 16448 | 0.85 a | | | | | |
| 15 | 129.19 | 260.76 | 8991 | 414 | 302 | 18433 | 0.74 a | | | | | |
| 16 | 154.12 | 310.52 | 3222 | 358 | 280 | 15759 | 0.90 a | | | | | |
| 17 | 166.50 | 335.23 | 405 | 284 | 231 | 11814 | 0.72 a | L | | | | |
| 18 | 186.03 | 374.21 | 3870 | 390 | 304 | 17084 | 0.99 a | | | | | |
| 19 | 199.19 | 400.48 | 1091 | 370 | 299 | 16563 | 0.99 a | | | | | |
| 20 | 203.95 | 409.97 | 410 | 321 | 262 | 13803 | 0.82 b | | | | | |
| 21 | 209.21 | 420.46 Page 001 | 15640 | 396 | 253 | 12871 | U.80 a | HiResid | | | | |
| | | ra j a nat | | | | | | | | | | |

Page 002

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|-----------|---------------|--------------------|----------------|-------------------|---------------------|-----------------------|------------------|---|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) FLAG | |
| 22 | 211.98 | 426.00 | 38 | 216 | 177 | 7723 | 0.48 b NET< CL | - |
| | | | 20 | 210 | 1// | 1145 | HiResid | |
| 23 | 216.05 | 434.12 | 1236 | 358 | 289 | 15445 | | |
| 24 | 233.36 | 468.67 | 266 | | 173 | 7394 | | |
| 25 | 238.74 | 479.42 | 183421 | 917 | 269 | 13413 | 0.97 a HiResid | |
| 26 | 241.25 | 484.42 | 19648 | 461 | 301 | 14378 | | |
| 27 | 252.75 | 507.38 | 946 | 279 | 224 | 9261 | 0.96 a | |
| 28 | 270.40 | | | 371 | 243 | 10102 | 1.09 a | |
| 29 | 277.55 | | | 313 | 215 | 8563 | 0.94 a | |
| 30 | 279.21 | | 503 | | 215 | 8563 | 1.06 b | |
| 31 | 288.33 | | 1264 | 295 | 235 | 9436 | 1.11 a | |
| 32 | 295.36 | | 8073 | 308 | 206 | 7816 | 0.95 a | |
| 33 | 300.28 | | 11465 | 329 | 206 | 7816 | 1.02 b | |
| 34 | 321.64 | | | | 174 | 6072 | | |
| 35 | | 657.77 | | | 198 | 7257 | | |
| 36 | | 678.42 | | | 191 | 6760 | | |
| 37 | | 683.71 | | | 215 | 7887 | | |
| 38 | 352.03 | | 14177 | | 203 | 7012 | 1.08 a | |
| 39 | 409.72 | | | 270 | 188 | 6007 | | |
| 40 | 440.72 | | 334 | 179 | 144 | 4365 | 0.97 a | |
| 41 | 453.14 | | 830 | | 142 | 4262 | 0.93 a | |
| 42 | | 927.44 | 10635 | 281 | 157 | 4857 | 1.16 a | |
| 43 | | 957.97 | | | 123 | 3463 | 0.78 a | |
| 44 | 503.98 | | | | 153 | 4624 | | |
| 45 | 509.28 | | | | 169 | 5284 | 1.27 b | |
| 46 | 511.14 | | | | 169 | 5284 | 1.38 c | |
| 47 | 546.83 | | | 199 | 159 | 4677 | | |
| 48 | 550.17 | 1101.02 | 337 | 215 | 174 | 5262 | 1.40 b | |
| 49 | 558.67 | 1117.99 | 247 | 141 | 113 | 2914 | 0.77 a | |
| 50 51 | | 1126.24 | 1874 | | 144 | 4080 | | |
| 51 52 | 571.27 | 1143.13 1146.79 | 525 | 268 | 218 | 6993 | | |
| 52 53 | 573.10 | | 245 | 141 | 113 | 2914 | 0.84 b | |
| 53 54 | 609.62 | 1219.70 | 62580 11225 | 536 | 157 | 4573 | 1.31 a | |
| 55 | 616.24 | | 11335 167 | 281 182 | 151 | 4189 | 1.34 a | |
| 56 | 652.24 | 1304.76 | 132 | 182 | 148 147 | 4071 | 1.35 a | |
| 57 | 666.19 | 1332.59 | 303 | 165 | 133 | 3977 | 1.39 a NET< CL | |
| 58 | 702.66 | 1405.39 | 303 | 105 | 161 | 3482 4501 | 1.11 a | |
| 59 | 702.00 | 1415.62 | 422 | 216 | | | 1.42 a | |
| 60 | 727.64 | 1415.02 | 13599 | 294 | 175 1 4 7 | 5001 37 4 6 | 1.69 b 1.45 a | |
| 61 | 742.78 | 1485.48 | 57 | 29 4 99 | 81 | 1609 | 0.71 a NET< CL | |
| 62 | 755.68 | 1511.21 | 1737 | 188 | 139 | 3354 | 1.40 a | |
| 63 | 763.92 | 1527.67 | 1092 | 175 | 133 | 3354 | 1.40 a 1.44 a | |
| 64 | 768.80 | 1537.41 | 983 | 173 | 133 | 3070 | 1.53 b | |
| 65 | 772.75 | 1545.30 | 2614 | 203 | 133 | 3411 | 1.55 b 1.56 c | |
| 66 | 782.72 | 1545.30 | 831 | 203 | 115 | | | |
| 00 | /04./4 | T202.T2 | 03T | TOT | TTD | 2438 | 1.29 a | |

| = = = = = = = = = = = = = = = = = = = |
|---------------------------------------|

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|-----|---------|----------|---------|-----------|--------|--------|---------------|---------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | | LAG |
| | | | | | | | | |
| 67 | 786.03 | 1571.81 | 1975 | 177 | 126 | 2743 | 1.42 b | |
| 68 | 795.43 | 1590.57 | 7130 | 224 | 122 | 2567 | 1.50 a | |
| 69 | 803.41 | 1606.49 | 259 | 144 | 115 | 2306 | 1.43 a | |
| 70 | 806.55 | 1612.75 | 162 | 95 | 75 | 1281 | 0.85 b | |
| 71 | 830.96 | 1661.48 | 831 | 135 | 101 | 1875 | 1.33 a | |
| 72 | 836.14 | 1671.82 | 2915 | 181 | 119 | 2344 | 1.59 b | |
| 73 | 840.72 | 1680.97 | 1626 | 166 | 119 | 2344 | 1.65 c | |
| 74 | 860.99 | 1721.42 | 7633 | 215 | 103 | 1958 | 1.58 a | |
| 75 | 894.08 | 1787.47 | 418 | 104 | 78 | 1332 | 1.16 a | |
| 76 | 904.84 | 1808.95 | 1108 | 138 | 99 | 1827 | 1.65 a | |
| 77 | 911.78 | 1822.79 | 43429 | 434 | 99 | 1827 | 1.59 b | |
| 78 | 934.54 | 1868.22 | 487 | | 91 | 1521 | 1.62 a | |
| 79 | 944.79 | 1888.68 | 123 | 89 | 71 | 1092 | 1.09 a | |
| 80 | 952.53 | 1904.13 | 184 | 97 | 77 | 1218 | 1.24 a | |
| 81 | 959.15 | 1917.36 | 346 | 85 | 63 | 913 | 1.02 Ъ | |
| 82 | 965.27 | 1929.57 | 7850 | 209 | 91 | 1522 | 1.72 c | |
| 83 | 969.48 | 1937.96 | 26078 | 341 | 91 | 1522 | 1.65 đ | |
| 84 | 976.72 | 1952.41 | 64 | 83 | 67 | 986 | 1.17 a M | NET< CL |
| 85 | 988.85 | 1976.62 | 240 | 98 | 77 | 1149 | 1.49 a | |
| 86 | 1001.53 | 2001.94 | 104 | 75 | 59 | 804 | 0.96 a | |
| 87 | 1034.01 | 2066.77 | 260 | 90 | 69 | 988 | 1.39 a | |
| 88 | 1040.86 | 2080.44 | 108 | 79 | 63 | 865 | 1.21 b | |
| 89 | 1065.66 | 2129.93 | 281 | 100 | 77 | 1158 | 1.41 a | |
| 90 | 1079.31 | 2157.19 | 705 | 114 | 83 | 1264 | 1.59 a | |
| 91 | 1094.91 | 2188.32 | 761 | 150 | 114 | 1861 | 2.54 a | |
| 92 | 1111.12 | 2220.68 | 492 | 109 | 82 | 1238 | 1.66 a | |
| 93 | 1120.90 | 2240.21 | 2490 | 149 | 91 | 1404 | 1.89 a | |
| 94 | 1153.51 | 2305.29 | 112 | 70 | 55 | 697 | 0.97 a | |
| 95 | 1154.64 | 2307.55 | 207 | 101 | 79 | 1162 | 1.59 b | |
| 96 | 1156.09 | 2310.44 | 187 | 93 | 73 | 1046 | 1.49 c | |
| 97 | 1238.84 | 2475.61 | 839 | 115 | 81 | 1225 | 1.68 a | |
| 98 | 1247.47 | 2492.83 | 651 | 152 | 117 | 1960 | 2.55 b | |
| 99 | 1282.14 | 2562.02 | 228 | 103 | 81 | 1163 | 1.80 a | |
| 100 | 1288.20 | 2574.13 | 133 | 121 | 98 | 1480 | 2.24 b | |
| 101 | 1374.92 | 2747.22 | 179 | 87 | 68 | 938 | 1.68 a | |
| 102 | 1378.45 | 2754.27 | 636 | 107 | 78 | 1125 | 1.97 b | |
| 103 | 1385.98 | 2769.30 | 84 | 73 | 58 | 750 | 1.37 c | |
| 104 | 1402.18 | 2801.64 | 213 | 100 | 79 | 1095 | 2.17 a | |
| 105 | 1408.78 | 2814.80 | 306 | 81 | 60 | 758 | 1.53 b | |
| 106 | 1461.44 | 2919.91 | 7659 | 196 | 73 | 952 | 2.20 a B | liResid |
| 107 | 1496.60 | 2990.09 | 1110 | 103 | 64 | 760 | 1.98 a | |
| 108 | 1502.31 | 3001.50 | 547 | 95 | 68 | 823 | 2.14 b | |
| 109 | 1510.11 | 3017.05 | 234 | 84 | 64 | 760 | 1.94 c | |
| 110 | 1513.57 | 3023.96 | 419 | 92 | 68 | 823 | 2.09 đ | |
| 111 | 1529.14 | 3055.05 | 57 | 67 | 54 | 590 | 1.58 a | |
| 112 | 1539.20 | 3075.13 | 82 | 70 | 56 | 628 | 1.71 a | |
| | | Page 003 | | | | | | |

| PK. # | | CHANNEL | COUNTS | UN- CERTAINTY | COUNTS | COUNTS | (keV) | |
|----------|---------|---------|--------|------------------|--------|--------|--------|---|
| 113 | 1558.18 | | | 82 | | | | |
| 114 | 1581.46 | 3159.48 | 696 | 104 | 74 | 902 | 2.50 a | L |
| 115 | 1588.99 | 3174.50 | 3681 | 146 | 66 | 782 | 2.09 1 | • |
| 116 | 1593.18 | 3182.86 | 2020 | 127 | 74 | 902 | 2.44 | ; |
| 117 | 1621.50 | 3239.40 | 1736 | 114 | 64 | 717 | 2.12 a | L |
| 118 | 1625.73 | 3247.83 | 272 | 76 | 56 | 607 | 1.84 1 | • |
| 119 | 1631.39 | 3259.13 | 1955 | 120 | 67 | 772 | 2.25 c | ; |
| 120 | 1639.05 | 3274.42 | 465 | 81 | 56 | 607 | 1.85 d | L |
| 121 | 1662.12 | 3320.46 | 101 | 54 | 41 | 389 | 1.12 a | L |
| 122 | 1667.21 | 3330.64 | 173 | 78 | 60 | 666 | 1.94 1 | • |
| 123 | 1679.78 | 3355.72 | 127 | 80 | 63 | 709 | 2.16 a | L |
| 124 | 1686.20 | 3368.53 | 123 | 89 | 71 | 818 | 2.38 1 | • |
| 125 | 1730.47 | 3456.89 | 408 | 87 | 63 | 703 | 2.11 a | L |
| 126 | 1765.35 | 3526.53 | 1957 | 121 | 68 | 786 | 2.29 a | L |
| 127 | 1807.06 | 3609.76 | 106 | 82 | 65 | | | |
| 128 | 1848.44 | 3692.37 | 197 | 98 | 77 | 947 | 2.54 a | L |
| 129 | 1887.76 | 3770.85 | 73 | 69 | 55 | 601 | | |

ALS Laboratory Group - Fort Collins

GammaScan

Background File:. DET020707.BKG (210707-2 LONGBKGCAL)

Bkg.File Detector #: 2

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | |
|-----|---------|---------|-----------|----------|---------|-----------|----------|-----------------------|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL | FLAG |
| | 63.45 | 529 | | 217 | | 325 | | |
| 3 | | 22901 | | 366 | | | | |
| 4 | 77.13 | | | 427 | | | | |
| 7 | 84.33 | 5766 | 514 | | 5674 | | | |
| 8 | 87.20 | -835 | 639 | | | | | TET <cl< td=""></cl<> |
| 10 | 93.25 | 15893 | 527 | 381 | | | | |
| 11 | 99.60 | 3820 | 513 | 410 | 3781 | | | |
| 18 | 186.03 | 3870 | | | 3598 | | | |
| 19 | 199.19 | 1091 | 370 | 299 | 774 | | | |
| 25 | 238.74 | 183421 | 917 | 269 | 183168 | | | |
| 26 | 241.25 | 19648 | 461 | 301 | 19551 | 475 | | |
| 32 | 295.36 | 8073 | 308 | 206 | 8009 | 331 | | |
| 38 | 352.03 | 14177 | 343 | 203 | 13982 | 372 | 237 | |
| 45 | 509.28 | 1343 | 218 | 169 | 1341 | 338 | 272 | |
| 46 | 511.14 | 19623 | 348 | 169 | 17517 | 443 | 292 | |
| 49 | 558.67 | 247 | 141 | 113 | -74 | 184 | 152 N | ET <cl< td=""></cl<> |
| 51 | 571.27 | 525 | 268 | 218 | 451 | 283 | 230 | |
| 53 | 583.49 | 62580 | 536 | 157 | 62478 | 543 | 174 | |
| 54 | 609.62 | 11335 | 281 | 151 | 11166 | 314 | 191 | |
| 69 | 803.41 | 259 | 144 | 115 | 95 | 181 | 148 N | ET <cl< td=""></cl<> |
| 77 | 911.78 | 43429 | 434 | 99 | 43342 | 448 | 135 | |
| 93 | 1120.90 | 2490 | 149 | 91 | 2447 | 160 | 103 | |
| 102 | 1378.45 | 636 | 107 | 78 | 606 | 121 | 91 | |
| 106 | 1461.44 | 7659 | 196 | 73 | 7417 | 214 | 105 | |
| 126 | 1765.35 | 1957 | 121 | 68 | 1908 | 133 | 83 | |

| | 210802 | D02.SPC A | nalyzed by | | | | | | | | |
|---------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------|------|--|--|--|--|
| ******* SEEKER | ************ | ************************************** | ************************************** | ********** | ********** | ************************************** | **** | | | | |
| geenen | F | TNAU | ACTIV. | LTI KI | SPORT | version 2.2 | 5. L | | | | |
| | | ALS L | aboratory Gro | oup - Fort | Collins | | | | | | |
| | | | | aScan | | | | | | | |
| ****** | *************************************** | | | | | | | | | | |
| | | | Geo 13 | / Solid | | | | | | | |
| Sample ID: 2106442-2 GS210619-1 | | | | | | | | | | | |
| | | | | | | | | | | | |
| Sampling | Start: | 06/14/20 | 21 12:00:00 | | Start. | 07/10/2021 14:01 | | | | | |
| | | | 21 12:00:00 | | | 6.26e+002 | | | | | |
| | | | | | | 60000 | Sec | | | | |
| | | | 4.05e+002 g | | | | | | | | |
| | | | | | | 210802D02. | | | | | |
| Cr. Leve | e coniiden | ce interv | al: 95 % | Det. Limi | t Confiden | ce Interval: 9 | 95 % | | | | |
| | | D | etector #: | 2 (Detector | : 2) | | | | | | |
| Efficier | ncy File: () | |).EFF (Geo 1: | | | | | | | | |
| | | | 2*L +-4.58E+(| | | | | | | | |
| | | | | | En^2] Abc | ve 300.00 keV | | | | | |
| Library | | RAL (SUB R | A228).LI (Na | • | | | | | | | |
| | | | ASURED or MD | | | ======================================= | | | | | |
| | | | | | | | | | | | |
| | N | | | | | | | | | | |
| | | | ntration | | Critical | | | | | | |
| Nuclide | (keV) T | (pCi/g | - | MDA | Level | (hrs) | | | | | |
| Th-234 | | | +- 4.89E -01 | • • • • | ••••• | 3.92E+13 | | | | | |
| | - | | +- 1.26E+00 | | | 3.92E+13 | | | | | |
| | | | +- 5.31E-01 | | | | | | | | |
| Pb-212 | - | | +- 1.08E-01 | | • • • • | | | | | | |
| | | | +- 2.60E+00 | | | | | | | | |
| | 238.63 300.09 | | +- 1.10E-01 +- 5.66E-01 | | | | | | | | |
| U-235 | | | +- 1.26E-01 | 7.12E-01 | 3.53E-01 | 1.27E+1 4 6.17E+12 | | | | | |
| • | 185.72 | I.D. | • • • • | •••• | •••• | | | | | | |
| | 205.31 | 3.94E-01 | +- 3.08E-01 | 5.05E-01 | | | | | | | |
| | | | +- 1.38E-01 | 2.29E-01 | 1.14E-01 | 6.17 E +12 | | | | | |
| T1-208 | - | 6.71E+00 | +- 5.47E-02 | | • • • • | | | | | | |
| | | | | | | | | | | | |
| | | | +- 2.63E-01 | | | | | | | | |
| | 583.14 | 6.68E+00 | +- 5.81E-02 | 3.75E-02 | 1.86E-02 | 1.27E+14 | | | | | |
| Pb-214 | 583.14 860.47 | 6.68E+00 7.37E+00 | +- 5.81E-02 +- 2.08E-01 | 3.75E-02 2.01E-01 | 1.86E-02 9.94E-02 | 1.27E+14 1.27E+14 | | | | | |
| Pb-214 | 583.14 860.47 | 6.68E+00 7.37E+00 2.20E+00 | +- 5.81E-02 +- 2.08E-01 +- 8.57E-02 | 3.75E-02 2.01E-01 | 1.86E-02 9.94E-02 | 1.27E+14 1.27E+14 1.40E+07 | | | | | |
| Pb-214 | 583.14 860.47 Average:x | 6.68E+00 7.37E+00 2.20E+00 2.20E+00 | +- 5.81E-02 +- 2.08E-01 | 3.75E-02 2.01E-01 | 1.86E-02 9.94E-02 6.30E-02 | 1.27E+14 1.27E+14 1.40E+07 1.40E+07 | | | | | |
| Pb-214 Ra-228 | 583.14 860.47 Average:x 295.22 351.99 | 6.68E+00 7.37E+00 2.20E+00 2.20E+00 2.20E+00 | +- 5.81E-02 +- 2.08E-01 +- 8.57E-02 +- 9.10E-02 | 3.75E-02 2.01E-01 1.27E-01 | 1.86E-02 9.94E-02 6.30E-02 1.90E-01 | 1.27E+14 1.27E+14 1.40E+07 1.40E+07 1.40E+07 | | | | | |
| | 583.14 860.47 Average:x 295.22 351.99 Average:x 338.40 | 6.68E+00 7.37E+00 2.20E+00 2.20E+00 2.20E+00 2.10E+01 2.03E+01 | +- 5.81E-02 +- 2.08E-01 +- 8.57E-02 +- 9.10E-02 +- 2.55E-01 +- 1.42E-01 +- 2.46E-01 | 3.75E-02 2.01E-01 1.27E-01 3.80E-01 2.11E-01 | 1.86E-02 9.94E-02 6.30E-02 1.90E-01 1.05E-01 | 1.27E+14 1.27E+14 1.40E+07 1.40E+07 1.40E+07 5.04E+04 5.04E+04 | | | | | |
| | 583.14 860.47 Average:x 295.22 351.99 Average:x 338.40 | 6.68E+00 7.37E+00 2.20E+00 2.20E+00 2.20E+00 2.10E+01 2.03E+01 2.12E+01 | +- 5.81E-02 +- 2.08E-01 +- 8.57E-02 +- 9.10E-02 +- 2.55E-01 +- 1.42E-01 +- 2.46E-01 | 3.75E-02 2.01E-01 1.27E-01 3.80E-01 2.11E-01 | 1.86E-02 9.94E-02 6.30E-02 1.90E-01 1.05E-01 | 1.27E+14 1.27E+14 1.40E+07 1.40E+07 1.40E+07 5.04E+04 5.04E+04 | | | | | |

MEASURED or MDA CONCENTRATIONS

| | N | | | | | | | | | |
|---------|-----------|--------------|----------|--------------------|--------------|----------|--|--|--|--|
| | ENERGY E | Concentr | ation | | Critical | Halflife | | | | |
| Nuclide | (keV) T | (pCi/g |) | MDA | Level | (hrs) | | | | |
| | 968.90 | 2.18E+01 +- | 2.85E-01 | 1.54E-01 | 7.58E-02 | 5.04E+04 | | | | |
| Bi-214 | Average:x | 2.27E+00 +- | 5.88E-02 | • • • • | • • • • | 1.40E+07 | | | | |
| | 609.32 | 2.26E+00 +- | 6.36E-02 | 7.79E-02 | 3.87E-02 | 1.40E+07 | | | | |
| | 1120.28 | 2.36E+00 +- | 1.54E-01 | 2.02E-01 | 9.95E-02 | 1.40E+07 | | | | |
| Bi-212 | 727.17 | 2.19E+01 +- | 4.73E-01 | 4.78E-01 | 2.37E-01 | 1.27E+14 | | | | |
| Pa-234m | 1001.03 | 2.37E+00 +- | 1.69E+00 | 2.74E+00 | 1.34E+00 | 3.92E+13 | | | | |
| K-40 | 1460.75 | 1.19E+01 +- | 3.45E-01 | 3.42E-01 | 1.69E-01 | 1.12E+13 | | | | |
| Pb-210 | 46.50 N | 4.76E+00 +- | 7.56E+00 | 1.25E+01 | 6.20E+00 | 1.95E+05 | | | | |
| Th-227 | 236.00 N- | -1.07E+01 +- | 3.91E+00 | 6.44E+00P | 3.22E+00 | 1.90E+05 | | | | |
| Cs-137 | 661.62 N- | -7.11E-03 +- | 2.09E-02 | 3. 49E -02B | 1.73E-02 | 2.64E+05 | | | | |

MEASURED TOTAL: 1.08E+02 +- 1.10E+01 pCi/g

UNKNOWN, SUM or ESCAPE PEAKS

| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | |
|-------|--------|------------|--------|-----------|---------|--------|-------|----------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| 2 | 72.74 | 148.09 | 1202 | 434 | 352 | 25025 | 0.89 | 1095DEsc |
| 3 | 74.83 | 152.25 | 22778 | 556 | 384 | 27012 | 0.84 | 1095DEsc |
| 4 | 77.13 | 156.84 | 40846 | 678 | 447 | 31052 | 0.83 | Unknown |
| 5 | 79.42 | 161.41 | 526 | 315 | 257 | 14612 | 0.83 | Unknown |
| 6 | 81.26 | 165.08 | -4692 | 506 | 431 | 31654 | 1.50 | Deleted |
| 7 | 84.33 | 171.22 | 5674 | 540 | 427 | 27880 | 1.09 | Unknown |
| 8 | 87.20 | 176.94 | -872 | 654 | 540 | 47451 | 0.07 | Deleted |
| 9 | 89.94 | 182.41 | -15205 | 645 | 568 | 54972 | 3.46 | Deleted |
| 11 | 99.60 | 201.70 | 3781 | 548 | 439 | 26579 | 1.10 | 1121DEsc |
| 12 | 105.43 | 213.32 | 5679 | 474 | 370 | 23311 | 1.17 | Unknown |
| 13 | 108.93 | 220.32 | 1791 | 360 | 287 | 16651 | 0.89 | Unknown |
| 15 | 129.19 | 260.76 | 8991 | 414 | 302 | 18433 | 0.74 | Unknown |
| 16 | 154.12 | 310.52 | 3222 | 358 | 280 | 15759 | 0.90 | Unknown |
| 17 | 166.50 | 335.23 | 405 | 284 | 231 | 11814 | 0.72 | Unknown |
| 19 | 199.19 | 400.48 | 774 | 398 | 324 | 16563 | 0.99 | Unknown |
| 21 | 209.21 | 420.46 | 15640 | 396 | 253 | 12871 | 0.80 | Unknown |
| 22 | 211.98 | 426.00 | 38 | 216 | 177 | 7723 | 0.48 | Deleted |
| 23 | 216.05 | 434.12 | 1236 | 358 | 289 | 15445 | 1.02 | 1239DEsc |
| 24 | 233.36 | 468.67 | 266 | 213 | 173 | 7394 | 0.49 | Unknown |
| 26 | 241.25 | 484.42 | 19551 | 475 | 316 | 14378 | 1.27 | Unknown |
| 27 | 252.75 | 507.38 | 946 | 279 | 224 | 9261 | 0.96 | Unknown |
| 28 | 270.40 | 542.62 | 12559 | 371 | 243 | 10102 | 1.09 | Unknown |
| 30 | 279.21 | 560.20 | 503 | 266 | 215 | 8563 | 1.06 | Unknown |
| 31 | 288.33 | 578.40 | 1264 | 295 | 235 | 9436 | 1.11 | Unknown |
| 34 | 321.64 | 644.88 | 503 | 216 | 174 | 6072 | 0.82 | Unknown |
| 35 | 328.10 | 657.77 | 9498 | 310 | 198 | 7257 | 1.05 | Unknown |
| 37 | 341.09 | 683.71 | 1101 | 270 | 215 | 7887 | 1.10 | Unknown |
| | | Page 007 | | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | |
|-----|---------|----------|--------|-----------|--------|--------|-------|----------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| | | | | | | | | |
| 38 | 352.03 | 705.55 | 13982 | 372 | 237 | 7012 | 1.08 | SPLIT |
| 39 | 409.72 | 820.69 | 5206 | 270 | 188 | 6007 | 1.12 | Unknown |
| 40 | 440.72 | 882.56 | 334 | 179 | 144 | 4365 | 0.97 | 1461DEsc |
| 41 | 453.14 | 907.35 | 830 | 182 | 142 | 4262 | 0.93 | Unknown |
| 42 | 463.20 | 927.44 | 10635 | 281 | 157 | 4857 | 1.16 | Unknown |
| 43 | 478.50 | 957.97 | 278 | 154 | 123 | 3463 | 0.78 | 1502DEsc |
| 44 | 503.98 | 1008.83 | 453 | 191 | 153 | 4624 | 1.13 | Unknown |
| 45 | 509.28 | 1019.41 | 1341 | 338 | 272 | 5284 | 1.27 | Unknown |
| 46 | 511.14 | 1023.12 | 17517 | 443 | 292 | 5284 | 1.38 | Unknown |
| 47 | 546.83 | 1094.36 | 514 | 199 | 159 | 4677 | 1.33 | Unknown |
| 48 | 550.17 | 1101.02 | 337 | 215 | 174 | 5262 | 1.40 | Unknown |
| 49 | 558.67 | 1117.99 | -74 | 184 | 152 | 2914 | 0.77 | Deleted |
| 50 | 562.80 | 1126.24 | 1874 | 195 | 144 | 4080 | 1.21 | Unknown |
| 51 | 571.27 | 1143.13 | 451 | 283 | 230 | 6993 | 1.96 | 1593DEsc |
| 52 | 573.10 | 1146.79 | 245 | 141 | 113 | 2914 | 0.84 | 1593DEsc |
| 55 | 616.24 | 1232.91 | 167 | 182 | 148 | 4071 | 1.35 | 1639DEsc |
| 56 | 652.24 | 1304.76 | 132 | 180 | 147 | 3977 | 1.39 | Deleted |
| 57 | 666.19 | 1332.59 | 303 | 165 | 133 | 3482 | 1.11 | 1686DEsc |
| 58 | 702.66 | 1405.39 | 337 | 199 | 161 | 4501 | 1.42 | Unknown |
| 59 | 707.78 | 1415.62 | 422 | 216 | 175 | 5001 | 1.69 | 1730DEsc |
| 61 | 742.78 | 1485.48 | 57 | 99 | 81 | 1609 | 0.71 | Deleted |
| 62 | 755.68 | 1511.21 | 1737 | 188 | 139 | 3354 | 1.40 | Unknown |
| 63 | 763.92 | 1527.67 | 1092 | 175 | 133 | 3070 | 1.44 | Unknown |
| 64 | 768.80 | 1537.41 | 983 | 173 | 133 | 3070 | 1.53 | Unknown |
| 65 | 772.75 | 1545.30 | 2614 | 203 | 144 | 3411 | 1.56 | 1282SEsc |
| 66 | 782.72 | 1565.19 | 831 | 151 | 115 | 2438 | 1.29 | Unknown |
| 67 | 786.03 | 1571.81 | 1975 | 177 | 126 | 2743 | 1.42 | 1807DEsc |
| 68 | 795.43 | 1590.57 | 7130 | 224 | 122 | 2567 | 1.50 | Unknown |
| 69 | 803.41 | 1606.49 | 95 | 181 | 148 | 2306 | 1.43 | Deleted |
| 70 | 806.55 | 1612.75 | 162 | 95 | 75 | 1281 | 0.85 | Unknown |
| 71 | 830.96 | 1661.48 | 831 | 135 | 101 | 1875 | 1.33 | Unknown |
| 72 | 836.14 | 1671.82 | 2915 | 181 | 119 | 2344 | 1.59 | Unknown |
| 73 | 840.72 | 1680.97 | 1626 | 166 | 119 | 2344 | 1.65 | Unknown |
| 75 | 894.08 | 1787.47 | 418 | 104 | 78 | 1332 | 1.16 | Unknown |
| 76 | 904.84 | 1808.95 | 1108 | 138 | 99 | 1827 | 1.65 | Unknown |
| 78 | 934.54 | 1868.22 | 487 | 119 | 91 | 1521 | 1.62 | Unknown |
| 79 | 944.79 | 1888.68 | 123 | 89 | 71 | 1092 | 1.09 | Unknown |
| 80 | 952.53 | 1904.13 | 184 | 97 | 77 | 1218 | 1.24 | Unknown |
| 81 | 959.15 | 1917.36 | 346 | 85 | 63 | 913 | 1.02 | Unknown |
| 82 | 965.27 | 1929.57 | 7850 | 209 | 91 | 1522 | 1.72 | Unknown |
| 84 | | 1952.41 | 64 | 83 | 67 | 986 | 1.17 | Deleted |
| 85 | 988.85 | 1976.62 | 240 | 98 | 77 | 1149 | 1.49 | Unknown |
| 87 | 1034.01 | | 260 | 90 | 69 | 988 | 1.39 | Unknown |
| 88 | | 2080.44 | 108 | 79 | 63 | 865 | 1.21 | Unknown |
| 89 | | 2129.93 | 281 | 100 | 77 | 1158 | 1.41 | Unknown |
| 90 | 1079.31 | | 705 | 114 | 83 | 1264 | 1.59 | 1589SEsc |
| | | Page 008 | | | ~~ | | | |
| | | | | | | | | |

INKNOWN SIM OF ESCAPE DEAKS

| | UNKNOWN, SUM OF ESCAPE PEAKS | | | | | | | | | |
|----------|------------------------------|--------------------|---------------|------------------|----------------|---------------|---------------|----------------|--|--|
| | | | =========== | | | | | ============== | | |
| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG | | |
| 91 | 1094.91 | 2188.32 | 761 | 150 | 114 | 1861 | 2.54 | Unknown | | |
| 92 | 1111.12 | 2220.68 | 492 | 109 | 82 | 1238 | 1.66 | 1622SEsc | | |
| 94 | 1153.51 | 2305.29 | 112 | 70 | 55 | 697 | 0.97 | Unknown | | |
| 95 | 1154.64 | 2307.55 | 207 | 101 | 79 | 1162 | 1.59 | 1667SEsc | | |
| 96 | 1156.09 | 2310.44 | 187 | 93 | 73 | 1046 | 1.49 | 1667SEsc | | |
| 97 | 1238.84 | 2475.61 | 839 | 115 | 81 | 1225 | 1.68 | Unknown | | |
| 98 | 1247.47 | 2492.83 | 651 | 152 | 117 | 1960 | 2.55 | Unknown | | |
| 99 | 1282.14 | 2562.02 | 228 | 103 | 81 | 1163 | 1.80 | Unknown | | |
| 100 | 1288.20 | 2574.13 | 133 | 121 | 98 | 1480 | 2.24 | Unknown | | |
| 101 | 1374.92 | 2747.22 | 179 | 87 | 68 | 938 | 1.68 | Unknown | | |
| 102 | 1378.45 | 2754.27 | 606 | 121 | 91 | 1125 | 1.97 | Unknown | | |
| 103 | 1385.98 | 2769.30 | 84 | 73 | 58 | 750 | 1.38 | Unknown | | |
| 104 | 1402.18 | 2801.64 | 213 | 100 | 79 | 1095 | 2.17 | Unknown | | |
| 105 | 1408.78 | 2814.80 | 306 | 81 | 60 | 758 | 1.53 | Unknown | | |
| 107 | 1496.60 | 2990.09 | 1110 | 103 | 64 | 760 | 1.98 | Unknown | | |
| 108 | 1502.31 | 3001.50 | 547 | 95 | 68 | 823 | 2.14 | Unknown | | |
| 109 | 1510.11 | 3017.05 | 234 | 84 | 64 | 760 | 1.94 | Unknown | | |
| 110 | 1513.57 | 3023.96 | 419 | 92 | 68 | 823 | 2.09 | Unknown | | |
| 111 | 1529.14 | 3055.05 | 57 | 67 | 54 | 590 | 1.58 | Unknown | | |
| 112 | 1539.20 | 3075.13 | 82 | 70 | 56 | 628 | 1.71 | Unknown | | |
| 113 | 1558.18 | 3113.00 | 247 | 82 | 62 | 684 | 2.18 | Unknown | | |
| 114 | 1581.46 | 3159.48 | 696 | 104 | 74 | 903 | 2.50 | Unknown | | |
| 115 | 1588.99 | 3174.50 | 3681 | 146 | 66 | 782 | 2.09 | Unknown | | |
| 116 | 1593.18 | 3182.86 | 2020 | 127 | 74 | 903 | 2.44 | Unknown | | |
| | | | | | | | | | | |

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1.84

2.25

1.85

1.12

1.94

2.16

Unknown

Unknown

Unknown

Unknown

Unknown

Unknown

Unknown

| | | | | •• | •• | | | |
|-----|---------|---------|------|------|-----|------|------|----------|
| 124 | 1686.20 | 3368.53 | 123 | 89 | 71 | 818 | 2.38 | Unknown |
| 125 | 1730.47 | 3456.89 | 408 | 87 | 63 | 703 | 2.11 | Unknown |
| 126 | 1765.35 | 3526.53 | 1908 | 133 | 83 | 786 | 2.29 | Unknown |
| 127 | 1807.06 | 3609.76 | 106 | 82 | 65 | 753 | 2.18 | Unknown |
| 128 | 1848.44 | 3692.37 | 197 | 98 | 77 | 947 | 2.54 | Unknown |
| 129 | 1887.76 | 3770.85 | 73 | 69 | 55 | 601 | 1.68 | Unknown |
| 131 | 352.03 | 705.55 | 1002 | 3099 | 237 | 7012 | 1.08 | 1375DEsc |
| | | | | | | | | |

c:\SEEKER\BIN\210802d02.res Analysis Results Saved.

1736

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1955

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123

1621.50 3239.40

1625.73 3247.83

1631.39 3259.13

1639.05 3274.42

1662.12 3320.46

1667.21 3330.64

1679.78 3355.72

| | | | SPC Analyzed | | | | | | | |
|----------------------|------------------------------------------|----------------------|------------------------------------------------------------|-------------------------------------------------|-------------------------------------|--------------------------------------|------------------------------------|------------------------------------------|--|--|
| | | | ************ A ANAI | v | | | *********** S Version | | | |
| | | 7 | LS Laborato | rv Group | - Fort Coli | lins | | | | |
| | * * * * * * * * * * | | | GammaSca | n | | | | | |
| | ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ | ****** | | ****** | ***** | ****** | ****** | ***** | | |
| | | | G | eo 13 / S | olid | | | | | |
| Samp | le ID: 21 | .06442-2 GS | 8210619-1 | | | | | | | |
| Samp Buil Samp | ling Stop dup Time. le Size . |): 06/1 · · · · · | 4/2021 12:0 4/2021 12:0 0.00E+000 . 4.05E+0 1. | 0:00 Co 0:00 De Hrs Li 02 g Re | cay Time. ve Time . al Time . | rt: 07 • • • • • • • • • • • • | /10/2021 1 . 6.26E+ 60 60 | 4:01:00 002 Hrs 000 Sec 274 Sec | | |
| FWHM | Collection Efficiency 1.0000 Spc. File | | | | | | | | | |
| sear | cn Sensit | .ivity: 1.0 | 00 Sigma M | ultiplier | 2.00 S | earch Sta | rt/End: 8 | 0/4000 | | |
| | | | | | | | | | | |
| ==== | | | PEAK ==================================== | SEARCH R | | | | | | |
| | | | | | | | | | | |
| PK. # | ENERGY (keV) | | NET/MDA COUNTS CE | | | BKG COUNTS | | LAG | | |
| | 63.45 | 129.53 | 529 | 268 | 217 | 11617 | 0.51 a | | | |
| 2 | 72.74 | 148.09 | 1202 | 434 | 352 | 25025 | 0.89 | | | |
| 3 | 74.83 | 152.25 | 22901 | 538 | 366 | 27012 | 0.84 | | | |
| 4 | 77.13 | 156.84 | 40971 | 658 | 427 | 31052 | 0.83 | | | |
| 5 | 79.42 | 161.41 | 526 | 315 | 257 | 14612 | 0.83 | | | |
| 6 | 81.26 | 165.08 | -4692 | 506 | 431 | 31654 | | ET< CL | | |
| 7 | 84.33 | 171.22 | 5766 | 514 | 404 | 27880 | 1.09 | | | |
| 8 9 | 87.20 89.94 | 176.94 182.41 | -835 -15205 | 639 645 | 527 | 47451 | | ET< CL | | |
| 10 | 93.25 | 182.41 | 15893 | 527 | 568 381 | 54972 24742 | 3.46 N 0.99 | ET< CL | | |
| 11 | 99.60 | 201.70 | 3820 | 513 | 410 | 26579 | 1.10 | | | |
| 12 | 105.43 | 213.32 | 5679 | 474 | 370 | 23311 | 1.17 a | | | |
| 13 | 108.93 | 220.32 | 1791 | 360 | 287 | 16651 | 0.89 b | | | |
| 14 | 115.31 | 233.05 | 2287 | 360 | 286 | 16448 | 0.85 a | | | |
| 15 | 129.19 | 260.76 | 8991 | 414 | 302 | 18433 | 0.74 a | | | |
| 16 | 154.12 | 310.52 | 3222 | 358 | 280 | 15759 | 0.90 a | | | |
| 17 | 166.50 | 335.23 | 405 | 284 | 231 | 11814 | 0.72 a | | | |
| 18 | 186.03 | 374.21 | 3870 | 390 | 304 | 17084 | 0.99 a | | | |
| 19 | 199.19 | 400.48 | 1091 | 370 | 299 | 16563 | 0.99 a | | | |
| 20 | 203.95 | 409.97 | 410 | 321 | 262 | 13803 | 0.82 Ъ | | | |
| 21 | | | | | | | | | | |
| | 209.21 | 420.46 Page 001 | 15640 | 396 | 253 | 12871 | 0.80 a H | iResid | | |

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|----------|------------------|----------|---------|-----------|------|--------|---------------|---------|
| # | (keV) | CHANNEL | | CERTAINTY | | COUNTS | (keV) | FLAG |
| | | | | | | | | |
| 22 | 211.98 | 426.00 | 38 | 216 | 177 | 7723 | 0.48 b | NET< CL |
| | | | | | | | | HiResid |
| 23 | 216.05 | 434.12 | 1236 | 358 | 289 | 15445 | 1.02 c | HiResid |
| 24 | 233.36 | 468.67 | | 213 | 173 | 7394 | 0.49 a | |
| 25 | 238.74 | 479.42 | | 917 | 269 | 13413 | 0.97 a | HiResid |
| 26 | 241.25 | 484.42 | | 461 | 301 | 14378 | 1.27 b | HiResid |
| 27 | 252.75 | 507.38 | | | 224 | 9261 | 0.96 a | |
| 28 | 270.40 | 542.62 | | | 243 | 10102 | 1.09 a | |
| 29 | 277.55 | 556.88 | 7331 | 313 | 215 | 8563 | 0.94 a | |
| 30 | 279.21 | 560.20 | 503 | 266 | 215 | 8563 | 1.06 b | ı |
| 31 | 288.33 | 578.40 | | | 235 | 9436 | 1.11 a | |
| 32 | 295.36 | 592.44 | | | 206 | 7816 | 0.95 a | |
| 33 | 300.28 | 602.25 | | | 206 | 7816 | 1.02 b | |
| 34 | 321.64 | 644.88 | | 216 | 174 | 6072 | 0.82 a | |
| 35 | 328.10 | 657.77 | | | 198 | 7257 | 1.05 a | |
| 36 | 338.44 | 678.42 | | | 191 | 6760 | 1.04 a | |
| 37 | 341.09 | 683.71 | | | 215 | 7887 | 1.10 b | |
| 38 | 352.03 | 705.55 | 14177 | | 203 | 7012 | 1.08 a | |
| 39 | 409.72 | 820.69 | 5206 | 270 | 188 | 6007 | 1.12 a | |
| 40 | 440.72 | 882.56 | | 179 | 144 | 4365 | 0.97 a | |
| 41 | 453.14 | 907.35 | | | 142 | 4262 | 0.93 a | |
| 42 | | 927.44 | | 281 | 157 | 4857 | 1.16 a | |
| 43 | | 957.97 | - | 154 | 123 | 3463 | 0.78 a | |
| 44 | 503.98 | 1008.83 | 453 | 191 | 153 | 4624 | 1.13 a | |
| 45 | 509.28 | 1019.42 | | 218 | 169 | 5284 | 1.27 b | |
| 46 | 511.14 | 1023.12 | | 348 | 169 | 5284 | 1.38 c | |
| 47 | 546.83 | 1094.36 | 514 | 199 | 159 | 4677 | 1.33 a | |
| 48 | 550.17 | 1101.02 | 337 | 215 | 174 | 5262 | 1.40 b | |
| 49 | 558.67 | 1117.99 | | 141 | 113 | 2914 | 0.77 a | |
| 50 | 562.80 | 1126.24 | | 195 | 144 | 4080 | 1.21 b | |
| 51 | 571.27 | 1143.13 | 525 | 268 | 218 | 6993 | 1.96 a | |
| 52 52 | 573.10 | 1146.79 | 245 | 141 | 113 | 2914 | 0.84 Ъ | |
| 53 54 | 583.49 | 1167.54 | 62580 | 536 | 157 | 4573 | 1.31 a | |
| | 609.62 616.24 | 1219.70 | 11335 | 281 | 151 | 4189 | 1.34 a | |
| 55 56 | 652.24 | 1232.91 | 167 | 182 | 148 | 4071 | 1.35 a | |
| 50 57 | 666.19 | 1304.76 | 132 | 180 | 147 | 3977 | | NET< CL |
| 58 | | 1332.59 | 303 | 165 | 133 | 3482 | 1.11 a | |
| 58 59 | 702.66 | 1405.39 | 337 | 199 | 161 | 4501 | 1.42 a | |
| | 707.78 | 1415.62 | 422 | 216 | 175 | 5001 | 1.69 b | |
| 60 61 | 727.64 | 1455.26 | 13599 | 294 | 147 | 3746 | 1.45 a | |
| 61 62 | 742.78 | 1485.48 | 57 | 99 | 81 | 1609 | | NET< CL |
| 62 62 | 755.68 | 1511.21 | 1737 | 188 | 139 | 3354 | 1.40 a | |
| 63 | 763.92 | 1527.67 | 1092 | 175 | 133 | 3070 | 1.44 a | |
| 64 65 | 768.80 | 1537.41 | 983 | 173 | 133 | 3070 | 1.53 b | |
| 65 | 772.75 | 1545.30 | 2614 | 203 | 144 | 3411 | 1.56 c | |
| 66 | 782.72 | 1565.19 | 831 | 151 | 115 | 2438 | 1.29 a | |
| | 1 | Page 002 | | | | | | |

PEAK SEARCH RESULTS

| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | |
|----------|--------------------|--------------------|------------|-----------|----------|--------|--------|-----------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| | | | | | | | | |
| 67 | 786.03 | | | | 126 | 2743 | 1.42 | |
| 68 | 795.43 | | | | 122 | 2567 | | |
| 69 | | 1606.49 | 259 | | 115 | 2306 | 1.43 | |
| 70 | 806.55 | | 162 | | 75 | 1281 | | |
| 71 | 830.96 | 1661.48 | 831 | | 101 | 1875 | 1.33 | |
| 72 | 836.14 | 1671.82 | | | 119 | 2344 | 1.59 | |
| 73 | 840.72 | 1680.97 | | | 119 | 2344 | 1.65 | |
| 74 | 860.99 | 1721.42 | 7633 | | 103 | 1958 | 1.58 | |
| 75 | 894.08 | 1787.47 | 418 | | 78 | 1332 | | |
| 76 | 904.84 | 1808.95 | | | 99 | 1827 | | |
| 77 | | | | | 99 | 1827 | 1.59 | |
| 78 | 934.54 | | | | 91 | 1521 | 1.62 | |
| 79 | 944.79 | | 123 | | 71 | 1092 | 1.09 | |
| 80 | 952.53 | 1904.13 | 184 | | 77 | 1218 | 1.24 | |
| 81 | 959.15 | 1917.36 | | | 63 | 913 | 1.02 | |
| 82 | 965.27 | 1929.57 | | | 91 | 1522 | 1.72 | |
| 83 | 969.48 | 1937.96 | | | 91 | 1522 | 1.65 | |
| 84 | 976.72 | 1952.41 | 64 | | 67 | 986 | | A NET< CL |
| 85 | 988.85 | 1976.62 | | | 77 | 1149 | | |
| 86 | 1001.53 | | | | 59 | 804 | 0.96 | |
| 87 | 1034.01 | | | | 69 | 988 | | |
| 88 | 1040.86 | | 108 | | 63 | 865 | 1.21 | |
| 89 | 1065.66 | | 281 | 100 | 77 | 1158 | 1.41 | |
| 90 01 | 1079.31 | | | | 83 | 1264 | 1.59 | |
| 91 | 1094.91 1111.12 | 2188.32 | 761 | | 114 | 1861 | 2.54 | |
| 92 93 | | 2220.68 | 492 | 109 | 82 | 1238 | 1.66 a | |
| 94 | 1120.90 | 2240.21 2305.29 | | | 91 | 1404 | 1.89 8 | |
| 95 | 1153.51 1154.64 | | | 70 | 55 | 697 | 0.97 8 | |
| 95 96 | 1154.04 | 2307.55 | | | 79 | 1162 | | |
| | 1238.84 | 2310.44 2475.61 | 187 | | 73 | 1046 | 1.49 | |
| 97 98 | 1230.04 | 24/5.01 2492.83 | 839 | 115 | 81 | 1225 | 1.68 a | |
| 99 | 1282.14 | 2492.03 | 651 | 152 | 117 | 1960 | 2.55 1 | |
| 100 | 1282.14 | 2502.02 | 228 | 103 | 81 | 1163 | 1.80 a | |
| 101 | 1374.92 | 2747.22 | 133 | 121 | 98 | 1480 | 2.24 1 | |
| 101 | 1378.45 | 2754.27 | 179 636 | 87 | 68 70 | 938 | 1.68 | |
| 102 | 1385.98 | 2769.30 | 84 | 107 | 78 | 1125 | 1.97 1 | |
| 103 | 1402.18 | 2789.30 2801.64 | | 73 | 58 | 750 | 1.37 0 | |
| 105 | 1402.18 | | 213 | 100 | 79 | 1095 | 2.17 a | |
| 105 | 1408.78 | 2814.80 | 306 | 81 | 60 70 | 758 | 1.53 1 | |
| 105 | | 2919.91 | 7659 | 196 | 73 | 952 | | A HiResid |
| | 1496.60 1502 31 | 2990.09 | 1110 | 103 | 64 | 760 | 1.98 8 | |
| 108 | 1502.31 | 3001.50 | 547 | 95 | 68 | 823 | 2.14 1 | |
| 109 | 1510.11 | 3017.05 | 234 | 84 | 64 | 760 | 1.94 | |
| 110 | 1513.57 | 3023.96 | 419 | 92 | 68 | 823 | 2.09 d | |
| 111 | 1529.14 | 3055.05 | 57 | 67 | 54 | 590 | 1.58 & | |
| 112 | 1539.20 | 3075.13 | 82 | 70 | 56 | 628 | 1.71 a | L |
| | | Page 003 | | | | | | |

PEAK SEARCH RESULTS

| PK. # | (keV) | CHANNEL | COUNTS | UN- CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
|----------|---------|---------|--------|------------------|--------|--------|-------|-------|
| | | | | 82 | | | | 8 |
| 114 | | | | 104 | | | | |
| 115 | 1588.99 | | 3681 | | 66 | | | |
| 116 | 1593.18 | 3182.86 | 2020 | | 74 | | | |
| 117 | 1621.50 | 3239.40 | 1736 | 114 | 64 | | | |
| 118 | 1625.73 | 3247.83 | 272 | 76 | 56 | | | |
| 119 | 1631.39 | 3259.13 | 1955 | 120 | 67 | 772 | | |
| 120 | 1639.05 | 3274.42 | 465 | 81 | 56 | 607 | 1.85 | đ |
| 121 | 1662.12 | 3320.46 | 101 | 54 | 41 | 389 | 1.12 | a |
| 122 | 1667.21 | 3330.64 | 173 | 78 | 60 | 666 | 1.94 | Ъ |
| 123 | 1679.78 | 3355.72 | 127 | 80 | 63 | 709 | 2.16 | a |
| 124 | 1686.20 | 3368.53 | 123 | 89 | 71 | 818 | 2.38 | Ъ |
| 125 | 1730.47 | 3456.89 | 408 | 87 | 63 | 703 | 2.11 | a |
| 126 | 1765.35 | 3526.53 | 1957 | 121 | 68 | 786 | 2.29 | a |
| 127 | 1807.06 | 3609.76 | 106 | 82 | 65 | 753 | 2.18 | a |
| 128 | 1848.44 | 3692.37 | 197 | 98 | 77 | 947 | 2.54 | a |
| 129 | 1887.76 | 3770.85 | 73 | 69 | 55 | 601 | 1.68 | a |

SEEKER BACKGROUND SUBTRACT RESULTS Vers. 2.2.1

ALS Laboratory Group - Fort Collins GammaScan

Background File:. DET020707.BKG (210707-2 LONGBKGCAL)

Bkg.File Detector #: 2

BACKGROUND SUBTRACT RESULTS

| PK# | | | OLD UN- CERTAINTY | | | NEW UN- CERTAINTY | | FLAG |
|---------|---------|--------|----------------------|-----|-------|----------------------|-------|----------------------|
| 1 | | 529 | | 217 | 350 | 325 | 266 | |
| 3 | 74.83 | 22901 | 538 | 366 | 22778 | 556 | 384 | |
| 4 | 77.13 | 40971 | 658 | 427 | 40846 | 678 | 447 | |
| 7 | 84.33 | 5766 | 514 | 404 | 5674 | 540 | 427 | |
| 8 | 87.20 | -835 | 639 | 527 | -872 | 654 | 540 N | ET <cl< td=""></cl<> |
| 10 | 93.25 | 15893 | 527 | 381 | 15473 | 555 | 408 | |
| 11 | 99.60 | 3820 | 513 | 410 | 3781 | 548 | 439 | |
| 18 | 186.03 | 3870 | 390 | 304 | 3598 | 417 | 329 | |
| 19 | 199.19 | 1091 | 370 | 299 | 774 | 398 | 324 | |
| 25 | 238.74 | 183421 | 917 | 269 | | | 289 | |
| 26 | 241.25 | 19648 | 461 | 301 | 19551 | 475 | 316 | |
| 32 | 295.36 | 8073 | 308 | 206 | 8009 | 331 | 229 | |
| 38 | 352.03 | 14177 | 343 | 203 | 13982 | 372 | 237 | |
| 45 | 509.28 | 1343 | 218 | 169 | 1341 | 338 | 272 | |
| 46 | 511.14 | 19623 | 348 | 169 | 17517 | 443 | 292 | |
| 49 | 558.67 | 247 | 141 | 113 | -74 | 184 | 152 N | ET <cl< td=""></cl<> |
| 51 | 571.27 | 525 | 268 | 218 | 451 | 283 | 230 | |
| 53 | 583.49 | 62580 | 536 | 157 | 62478 | 543 | 174 | |
| 54 | 609.62 | 11335 | 281 | 151 | 11166 | 314 | 191 | |
| 69 | 803.41 | 259 | 144 | 115 | 95 | 181 | | ET <cl< td=""></cl<> |
| 77 | 911.78 | 43429 | 434 | 99 | 43342 | 448 | 135 | |
| 93 | 1120.90 | 2490 | 149 | 91 | 2447 | 160 | 103 | |
| 102 | 1378.45 | 636 | 107 | 78 | 606 | 121 | | |
| 106 | 1461.44 | 7659 | 196 | 73 | 7417 | 214 | | |
| 126 | 1765.35 | 1957 | 121 | 68 | 1908 | 133 | 83 | |

| ***: | * * * * * * * * * | 210802D02. | | yzed by | ***** | ****** | ah ah ah ah ah ah ah ah a | | | |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------|--------------|------------|-----------------------|---------------------------|-----------------------------------------|--|--|
| SEE | KER | FIN | ALA | CTIVI | TY RE | PORT | Ver | sion 2.2.1 | | |
| | | | | | | | | | | |
| | | | ALS Labo | ratory Gro | - | Collins | | | | |
| *** | ****** | ***** | ****** | Gamma. | | * * * * * * * * * * * | *** | * * * * * * * * * * * * | | |
| | | | | | | ****** | ***** | * * * * * * * * * * * * * * | | |
| | | | | Geo 13 | / Solid | | | | | |
| Sam | Sample ID: 2106442-2 GS210619-1 | | | | | | | | | |
| | | | | | | | | | | |
| | Sampling Start: 06/14/2021 12:00:00 Counting Start: 07/10/2021 14:01:00 | | | | | | | | | |
| Sampling Stop: 06/14/2021 12:00:00 Decay Time 6.26e+002 Hrs Buildup Time | | | | | | | | | | |
| | Buildup Time. . . 0.00e+000 Hrs Live Time . . 60000 Sec Sample Size . . 4.05e+002 g Real Time . . 60274 Sec | | | | | | | | | |
| Coll | lection E | fficiency | | | | | | L0802D02.SPC | | |
| | | | | | | | | rval: 95 % | | |
| | | | | | | | | | | |
| | · • | | | ctor #: 2 | | 2) | | | | |
| | | ile: (D02) | | | | | | | | |
| | Eff=10^[-8.02E+01 +1.04E+02*L +-4.58E+01*L^2 +6.67E+00*L^3] 10/10/2020 Eff.= EXP[-2.35E-01 + -5.84E-01 * En + -1.09E-02 * En^2] Above 300.00 keV | | | | | | | | | |
| | | •336-01 T | | L ~ En + | | | |).00 kev | | |
| | | ••••• | | | | | | | | |
| ===: | | | | | | | | ======================================= | | |
| | | | | RED or MDA | | | | | | |
| ===: | ========= | ====================================== | *====== | | | | ******* | | | |
| | EN | ERGY E | Concentra | ation | | Critical | Walflid | - | | |
| Nuc] | | keV) T (p | | | | Level | | | | |
| | | | | | | | | | | |
| Ra-2 | | rage:x 2.2 | | | • • • • | • • • • | | | | |
| | | 5.21 2.20 | | | 1.27E-01 | | | | | |
| | | | | | 3.79E-01 | | | | | |
| | | 9.31 2.20 0.29 2.24 | | | | | | | | |
| | 114 | 0.29 2.2 | 867UU +- | 4.48E-UI | 5.95E-01 | 2.96E-01 | 1.40E+0 |)7 | | |
| ME | ASURED T | OTAL: 2.24 | 4E+00 +- | 5.07E-02 g | Ci/g | | | | | |
| | | =============================== | | | | | | | | |
| | | | | OWN,SUM or | | | | | | |
| | | | | | | | _ = = = = = = = = = = | : = = = = = = = = = = = = = = = = = = = | | |
| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | | | |
| # | (keV) | CHANNEL | | CERTAINTY | | COUNTS | (keV) | FLAG | | |
| | | | | | | | | | | |
| 1 | 63.45 | | 350 | 325 | 266 | 11617 | 0.51 | Unknown | | |
| 2 | 72.74 | | 1202 | 434 | 352 | 25025 | 0.89 | 1095DEsc | | |
| 3 | 74.83 | | 22778 | 556 | 384 | 27012 | 0.84 | 1095DEsc | | |
| 4 5 | 77.13 | | 40846 | 678 31 5 | 447 | 31052 | 0.83 | Unknown | | |
| 5 6 | 79.42 84.33 | | 526 5674 | 315 540 | 257 427 | 14612 27880 | | Unknown | | |
| 7 | 93.25 | | 15473 | 540 | 427 | 27880 | 0.99 | Unknown Unknown | | |
| | | Page 006 | 204/3 | 555 | 200 | 42/24 | •• • • • • | OTTTIOMI | | |
| | Page 006 | | | | | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | |
|-----|--------|----------|--------|-----------|--------|--------|-------|----------|
| # | (keV) | CHANNEL | | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| | | | | | | | | 1101 |
| 8 | 99.60 | | 3781 | 548 | 439 | 26579 | 1.10 | 1121DEsc |
| 9 | 105.43 | | 5679 | 474 | 370 | 23311 | 1.17 | Unknown |
| 10 | 108.93 | 220.32 | 1791 | 360 | 287 | 16651 | 0.89 | Unknown |
| 11 | 115.31 | 233.05 | 2287 | 360 | 286 | 16448 | 0.85 | Unknown |
| 12 | 129.19 | 260.76 | 8991 | 414 | 302 | 18433 | 0.74 | Unknown |
| 13 | 154.12 | 310.52 | 3222 | 358 | 280 | 15759 | 0.90 | Unknown |
| 14 | 166.50 | 335.23 | 405 | 284 | 231 | 11814 | 0.72 | Unknown |
| 15 | 186.03 | 374.21 | 3598 | 417 | 329 | 17084 | 0.99 | Unknown |
| 16 | 199.19 | 400.48 | 774 | 398 | 324 | 16563 | 0.99 | Unknown |
| 17 | 203.95 | | 410 | 321 | 262 | 13803 | 0.82 | Unknown |
| 18 | 209.21 | 420.46 | 15640 | 396 | 253 | 12871 | 0.80 | Unknown |
| 19 | 216.05 | | 1236 | 358 | 289 | 15445 | 1.02 | 1239DEsc |
| 20 | 233.36 | 468.67 | 266 | 213 | 173 | 7394 | 0.49 | Unknown |
| 21 | 238.74 | 479.42 | 183168 | 925 | 289 | 13413 | 0.97 | Unknown |
| 22 | 241.25 | 484.42 | 19551 | 475 | 316 | 14378 | 1.27 | Unknown |
| 23 | 252.75 | | 946 | 279 | 224 | 9261 | 0.96 | Unknown |
| 24 | 270.40 | | 12559 | 371 | 243 | 10102 | 1.09 | Unknown |
| 25 | 277.55 | 556.88 | 7331 | 313 | 215 | 8563 | 0.94 | Unknown |
| 26 | 279.21 | 560.20 | 503 | 266 | 215 | 8563 | 1.06 | Unknown |
| 27 | 288.33 | 578.40 | 1264 | 295 | 235 | 9436 | 1.11 | Unknown |
| 29 | 300.28 | 602.25 | 11465 | 329 | 206 | 7816 | 1.02 | Unknown |
| 30 | 321.64 | 644.88 | 503 | 216 | 174 | 6072 | 0.82 | Unknown |
| 31 | 328.10 | 657.77 | 9498 | 310 | 198 | 7257 | 1.05 | Unknown |
| 32 | 338.44 | 678.42 | 37015 | 450 | 191 | 6760 | 1.04 | Unknown |
| 33 | 341.09 | 683.71 | 1101 | 270 | 215 | 7887 | 1.10 | Unknown |
| 34 | 352.03 | 705.55 | 13982 | 372 | 237 | 7012 | 1.08 | 1375DEsc |
| 36 | 352.03 | 705.55 | 1002 | 3099 | 237 | 7012 | 1.08 | Unknown |
| 37 | 409.72 | 820.69 | 5206 | 270 | 188 | 6007 | 1.12 | Unknown |
| 38 | 440.72 | 882.56 | 334 | 179 | 144 | 4365 | 0.97 | 1461DEsc |
| 39 | 453.14 | 907.35 | 830 | 182 | 142 | 4262 | 0.93 | Unknown |
| 40 | 463.20 | 927.44 | 10635 | 281 | 157 | 4857 | 1.16 | Unknown |
| 41 | 478.50 | 957.97 | 278 | 154 | 123 | 3463 | 0.78 | 1502DEsc |
| 42 | 503.98 | 1008.83 | 453 | 191 | 153 | 4624 | 1.13 | Unknown |
| 43 | 509.28 | 1019.41 | 1341 | 338 | 272 | 5284 | 1.27 | Unknown |
| 44 | 511.14 | 1023.12 | 17517 | 443 | 292 | 5284 | 1.38 | Unknown |
| 45 | 546.83 | 1094.36 | 514 | 199 | 159 | 4677 | 1.33 | Unknown |
| 46 | 550.17 | 1101.02 | 337 | 215 | 174 | 5262 | 1.40 | Unknown |
| 47 | 562.80 | 1126.24 | 1874 | 195 | 144 | 4080 | 1.21 | Unknown |
| 48 | 571.27 | 1143.13 | 451 | 283 | 230 | 6993 | 1.96 | 1593DEsc |
| 49 | 573.10 | 1146.79 | 245 | 141 | 113 | 2914 | 0.84 | 1593DEsc |
| 50 | 583.49 | 1167.54 | 62478 | 543 | 174 | 4573 | 1.31 | 1095SEsc |
| 52 | | 1232.91 | 167 | 182 | 148 | 4071 | 1.35 | 1639DEsc |
| 53 | | 1332.59 | 303 | 165 | 133 | 3482 | 1.11 | 1686DEsc |
| 54 | | 1405.39 | 337 | 199 | 161 | 4501 | 1.42 | Unknown |
| 55 | | 1415.62 | 422 | 216 | 175 | 5001 | 1.69 | 1730DEsc |
| 56 | | 1455.26 | 13599 | 294 | 147 | 3746 | 1.45 | 1239SEsc |
| | | Dage 007 | | | | -/ | | |

Page 007

UNKNOWN, SUM OF ESCAPE PEAKS

| PK. | ENERGY | ADDRESS | NET | UN- | C.L. | BKG | FWHM | |
|----------|----------------------------|----------|--------|-----------|--------|--------|-------|-------------------|
| # | (keV) | CHANNEL | COUNTS | CERTAINTY | COUNTS | COUNTS | (keV) | FLAG |
| | | | | | | | | |
| 57 | | 1511.21 | 1737 | 188 | 139 | 3354 | 1.40 | Unknown |
| 58 | | 1527.67 | 1092 | 175 | 133 | 3070 | 1.44 | Unknown |
| 59 | | 1537.41 | 983 | 173 | 133 | 3070 | 1.53 | Unknown |
| 60 | | 1545.30 | 2614 | 203 | 144 | 3411 | 1.56 | 1282SEsc |
| 61 | | 1565.19 | 831 | 151 | 115 | 2438 | 1.29 | Unknown |
| 62 | | 1571.81 | 1975 | 177 | 126 | 2743 | 1.42 | 1807DEsc |
| 63 | | 1590.57 | 7130 | 224 | 122 | 2567 | 1.50 | Unknown |
| 64 CE | | 1612.75 | 162 | 95 | 75 | 1281 | 0.85 | Unknown |
| 65 | | 1661.48 | 831 | 135 | 101 | 1875 | 1.33 | Unknown |
| 66 | | 1671.82 | 2915 | 181 | 119 | 2344 | 1.59 | Unknown |
| 67 60 | | 1680.97 | 1626 | 166 | 119 | 2344 | 1.65 | Unknown |
| 68 | | 1721.42 | 7633 | 215 | 103 | 1958 | 1.58 | Unknown |
| 69 70 | | 1787.47 | 418 | 104 | 78 | 1332 | 1.16 | Unknown |
| 70 | | 1808.95 | 1108 | 138 | 99 | 1827 | 1.65 | Unknown |
| 71 | | 1822.79 | 43342 | 448 | 135 | 1827 | 1.59 | Unknown |
| 72 | | 1868.22 | 487 | 119 | 91 | 1521 | 1.62 | Unknown |
| 73 | 944.79 | | 123 | 89 | 71 | 1092 | 1.09 | Unknown |
| 74 | 952.53 | | 184 | 97 | 77 | 1218 | 1.24 | Unknown |
| 75 76 | | 1917.36 | 346 | 85 | 63 | 913 | 1.02 | Unknown |
| 70 | 965.27 | | 7850 | 209 | 91 | 1522 | 1.72 | Unknown |
| | 969.48 | | 26078 | 341 | 91 | 1522 | 1.65 | Unknown |
| 78 | | 1976.62 | 240 | 98 | 77 | 1149 | 1.49 | Unknown |
| 79 80 | 1001.53 | | 104 | 75 | 59 | 804 | 0.96 | 1514SEsc |
| 80 81 | 1034.01 | | 260 | 90 | 69 | 988 | 1.39 | Unknown |
| 82 | 1040.86 1065.66 | | 108 | 79 | 63 | 865 | 1.21 | Unknown |
| 83 | | | 281 | 100 | 77 | 1158 | 1.41 | Unknown |
| 84 | 1079.31 | | 705 | 114 | 83 | 1264 | 1.59 | 1589 SEs c |
| 85 | 1094.91 1111.12 | | 761 | 150 | 114 | 1861 | 2.54 | Unknown |
| 86 | 1120.90 | | 492 | 109 | 82 | 1238 | 1.66 | 1622SEsc |
| | | | 2447 | 160 | 103 | 1404 | 1.89 | SPLIT |
| 87 88 | 1153.51 115 4.64 | | 112 | 70 | 55 | 697 | 0.97 | Unknown |
| 89 | 1154.04 | | 207 | 101 | 79 | 1162 | 1.59 | 1667 SEs c |
| 90 | 1238.84 | | 187 | 93 | 73 | 1046 | 1.49 | 1667 SEs c |
| 90 91 | 1247.47 | | 839 | 115 | 81 | 1225 | 1.68 | Unknown |
| 92 | 1282.14 | | 651 | 152 | 117 | 1960 | 2.55 | Unknown |
| 93 | 1282.14 | | 228 | 103 | 81 | 1163 | 1.80 | Unknown |
| 93 94 | 1374.92 | | 133 | 121 | 98 | 1480 | 2.24 | Unknown |
| | | | 179 | 87 | 68 | 938 | 1.68 | Unknown |
| 95 06 | 1378.45 | | 606 | 121 | 91 | 1125 | 1.97 | Unknown |
| 96 07 | 1385.98 | | 84 | 73 | 58 | 750 | 1.38 | Unknown |
| 97 | 1402.18 | | 213 | 100 | 79 | 1095 | 2.17 | Unknown |
| 98 | 1408.78 | | 306 | 81 | 60 | 758 | 1.53 | Unknown |
| 99 | 1461.44 | | 7417 | 214 | 105 | 952 | 2.20 | Unknown |
| 100 | 1496.60 | | 1110 | 103 | 64 | 760 | 1.98 | Unknown |
| 101 | 1502.31 | | 547 | 95 | 68 | 823 | 2.14 | Unknown |
| 102 | 1510.11 | | 234 | 84 | 64 | 760 | 1.94 | Unknown |
| | | Page 008 | | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|---------|
| 103 | 1513.57 | 3023.96 | 419 | 92 | 68 | 823 | 2.09 | Unknown |
| 104 | 1529.14 | 3055.05 | 57 | 67 | 54 | 590 | 1.58 | Unknown |
| 105 | 1539.20 | 3075.13 | 82 | 70 | 56 | 628 | 1.71 | Unknown |
| 106 | 1558.18 | 3113.00 | 247 | 82 | 62 | 684 | 2.18 | Unknown |
| 107 | 1581.46 | 3159.48 | 696 | 104 | 74 | 903 | 2.50 | Unknown |
| 108 | 1588.99 | 3174.50 | 3681 | 146 | 66 | 782 | 2.09 | Unknown |
| 109 | 1593.18 | 3182.86 | 2020 | 127 | 74 | 903 | 2.44 | Unknown |
| 110 | 1621.50 | 3239.40 | 1736 | 114 | 64 | 717 | 2.12 | Unknown |
| 111 | 1625.73 | 3247.83 | 272 | 76 | 56 | 607 | 1.84 | Unknown |
| 112 | 1631.39 | 3259.13 | 1955 | 120 | 67 | 772 | 2.25 | Unknown |
| 113 | 1639.05 | 3274.42 | 465 | 81 | 56 | 607 | 1.85 | Unknown |
| 114 | 1662.12 | 3320.46 | 101 | 54 | 41 | 389 | 1.12 | Unknown |
| 115 | 1667.21 | 3330.64 | 173 | 78 | 60 | 666 | 1.94 | Unknown |
| 116 | 1679.78 | 3355.72 | 127 | 80 | 63 | 709 | 2.16 | Unknown |
| 117 | 1686.20 | 3368.53 | 123 | 89 | 71 | 818 | 2.38 | Unknown |
| 118 | 1730.47 | 3456.89 | 408 | 87 | 63 | 703 | 2.11 | Unknown |
| 119 | 1765.35 | 3526.53 | 1908 | 133 | 83 | 786 | 2.29 | Unknown |
| 120 | 1807.06 | 3609.76 | 106 | 82 | 65 | 753 | 2.18 | Unknown |
| 121 | 1848.44 | 3692.37 | 197 | 98 | 77 | 947 | 2.54 | Unknown |
| 122 | 1887.76 | 3770.85 | 73 | 69 | 55 | 601 | 1.68 | Unknown |
| 124 | 1120.90 | 2240.21 | 122 | 983 | 103 | 1404 | 1.89 | |

c:\SEEKER\BIN\210802d02A.res Analysis Results Saved.

| 210799D01.SPC Analyzed by Jul | | | | | | | | | | | |
|-------------------------------|-----------|--------------|------------|------------|---------------|-----------|---------|------------------------------|--|--|--|
| **** | | ******* | | | ****** | ******** | ****** | **** | | | |
| SEEI | | | | v | RESU | LTS P | S Versi | on 1.8.4 | | | |
| | | А | LS Laborat | | - Fort Coli | lins | | | | | |
| | GammaScan | | | | | | | | | | |
| **** | ******* | ******* | ******* | ******* | ****** | ****** | ***** | ***** | | | |
| Geo 13 / Solid | | | | | | | | | | | |
| Samp] | le ID: GS | 5210619-1MB | GS210619- | 1 | | | | | | | |
| Samol | ling Star | -+• 07/1 | 1/2021 13. | | unting Sta | | | | | | |
| | | | | • | cay Time. | | | | | | |
| | | | | | ve Time . | | | | | | |
| | | | | • | al Time . | | | | | | |
| | | | | | c. File . | | | | | | |
| | | | | • | | | 210 | / J J J J J J J J J J | | | |
| | | | | | etector 1) | | | | | | |
| Ener | rv(keV)= | -1.99 + 0 | | - | $h^2 + 0.001$ | E+00*CP*3 | 07/11/ | 2021 | | | |
| - | | | | | $n^2 + 0.001$ | | • • • | | | | |
| | (| 0072 0 | | | nergy in k | | 00/22/ | 2020 | | | |
| | | | | | | | | | | | |
| Searc | ch Sensit | vity: 1.0 | 0 Sigma | Multiplier | : 2.00 S | earch Sta | rt/End: | 80/4000 | | | |
| | | | | | | | | | | | |
| ==== | | | | | | | | | | | |
| | | | PEA | K SEARCH R | ESULTS | | | | | | |
| ====: | | | | | | | | ========= | | | |
| | | | | | | | | | | | |
| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | | | | |
| # | (keV) | CHANNEL | COUNTS C | ERTAINTY | COUNTS | COUNTS | (keV) | FLAG | | | |
| | | | | | | | | | | | |
| 1 | 53.86 | 111.47 | 69 | 109 | 89 | 1253 | | a NET< CL | | | |
| 2 | 66.45 | 136.61 | 104 | 59 | 46 | 517 | 0.47 | | | | |
| 3 | 69.37 | 142.43 | 13 | 56 | 46 | 517 | | b NET< CL | | | |
| 4 | 74.94 | 153.55 | 95 | 60 | 47 | 547 | 0.49 | | | | |
| 5 | 84.63 | 172.90 | 92 | 84 | 67 | 839 | 0.95 a | | | | |
| 6 | 92.59 | 188.79 | 172 | 102 | 81 | 1048 | 1.37 a | | | | |
| 7 | 97.05 | 197.68 | 55 | 61 | 49 | 524 | 0.66 1 | | | | |
| 8 | 139.94 | 283.29 | 181 | 64 | 48 | 512 | 0.73 a | | | | |
| 9 | 154.18 | 311.72 | 62 | 83 | 67 | 829 | | a NET< CL | | | |
| 10 | 185.72 | 374.67 | 162 | 103 | 82 | 1059 | 1.35 a | | | | |
| 11 | 198.32 | 399.84 | 119 | 72 | 57 | 648 | 0.74 | | | | |
| 12 | 238.47 | 479.96 | 183 | 86 | 67 | 763 | 1.20 4 | | | | |
| 13 | 261.42 | 525.78 | 24 | 51 | 41 | 417 | | a NET< CL | | | |
| 14 | 295.08 | 592.97 | 44 | 71 | 58 | 655 | | a NET< CL | | | |
| 15 | 351.66 | 705.90 | 175 | 75 | 58 | 624 | 1.23 a | | | | |
| 16 | 508.28 | 1018.53 | -3 | 35 | 29 | 210 | 0.72 a | a NET< CL | | | |
| | | | | | | | | Wide Pk | | | |
| 17 | 511.11 | 1024.17 | 1408 | 125 | 83 | 840 | 2.64 1 | D | | | |
| 18 | 537.99 | 1077.83 | 69 | 68 | 54 | 455 | 1.87 a | 1 | | | |
| 19 | 558.44 | 1118.65 | 156 | 63 | 47 | 388 | 1.54 a | 1 | | | |
| 20 | 569.80 | 1141.31 | 61 | 62 | 49 | 419 | 1.40 a | | | | |
| | | Page 001 | | | | | | | | | |
| | | | | | | | | | | | |

PEAK SEARCH RESULTS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS | UN- CERTAINTY | C.L. Counts | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|-------------------|------------------|----------------|---------------|---------------|-----------|
| | | | | | | | | |
| 21 | 583.43 | 1168.53 | 128 | 95 | 76 | 657 | 2.88 | a Wide Pk |
| 22 | 596.33 | 1194.27 | 50 | 56 | 44 | 389 | 1.18 | A |
| 23 | 609.33 | 1220.22 | 141 | 59 | 45 | 409 | 1.32 | a |
| 24 | 768.70 | 1538.33 | 51 | 53 | 42 | 301 | 1.98 | 1 |
| 25 | 802.83 | 1606.46 | 65 | 43 | 33 | 221 | 1.32 | 8 |
| 26 | 911.38 | 1823.14 | 85 | 43 | 32 | 195 | 1.53 | A |
| 27 | 1121.02 | 2241.58 | 47 | 55 | 44 | 290 | 2.72 | 1 |
| 28 | 1461.11 | 2920.41 | 672 | 60 | 25 | 103 | 2.24 | A |
| 29 | 1764.75 | 3526.49 | 78 | 28 | 18 | 55 | 2.35 | A |

.

SEEKER BACKGROUND SUBTRACT RESULTS Vers. 2.2.1

ALS Laboratory Group - Fort Collins GammaScan

Background File:. DET010707.BKG (210707-1 LONGBKGCAL)

Bkg.File Detector #: 1

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | |
|-----|---------|---------|-----------|----------|---------|-----------|-----------------------------------|---|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL FLA | G |
| 2 | 66.45 | 104 | 59 | 46 | -31 | 133 | 110 NET <c< td=""><td>L</td></c<> | L |
| 4 | 74.94 | 95 | 60 | 47 | -28 | 152 | 125 NET <c< td=""><td>L</td></c<> | L |
| 6 | 92.59 | 172 | 102 | 81 | 25 | 181 | 149 NET <c< td=""><td>L</td></c<> | L |
| 8 | 139.94 | 181 | 64 | 48 | 101 | 125 | 101 NET <c< td=""><td>L</td></c<> | L |
| 9 | 154.18 | 62 | 83 | 67 | 20 | 131 | 107 NET <c< td=""><td>L</td></c<> | L |
| 10 | 185.72 | 162 | 103 | 82 | 65 | 195 | 160 NET <c< td=""><td>L</td></c<> | L |
| 11 | 198.32 | 119 | 72 | 57 | -55 | 179 | 147 NET <c< td=""><td>L</td></c<> | L |
| 12 | 238.47 | 183 | 86 | 67 | 90 | 161 | 132 NET <c< td=""><td>L</td></c<> | L |
| 14 | 295.08 | 44 | 71 | 58 | -0 | 165 | 135 NET <c< td=""><td>L</td></c<> | L |
| 15 | 351.66 | 175 | 75 | 58 | 73 | 122 | 100 NET <c< td=""><td>L</td></c<> | L |
| 17 | 511.11 | 1408 | 125 | 83 | 415 | 258 | 210 | |
| 19 | 558.44 | 156 | 63 | 47 | -27 | 133 | 110 NET<c< b=""></c<> | L |
| 21 | 583.43 | 128 | 95 | 76 | 47 | 146 | 120 NET <c< td=""><td>L</td></c<> | L |
| 23 | 609.33 | 141 | 59 | 45 | 16 | 151 | 124 NET <c< td=""><td>L</td></c<> | L |
| 25 | 802.83 | 65 | 43 | 33 | -53 | 93 | 77 NET <c< td=""><td>L</td></c<> | L |
| 26 | 911.38 | 85 | 43 | 32 | 16 | 89 | 73 NET <c< td=""><td>L</td></c<> | L |
| 27 | 1121.02 | 47 | 55 | 44 | 19 | 78 | 63 NET <c< td=""><td>L</td></c<> | L |
| 28 | 1461.11 | 672 | 60 | 25 | 27 | 134 | 110 NET<c< b=""></c<> | L |
| 29 | 1764.75 | 78 | 28 | 18 | 13 | 81 | 66 NET <c< td=""><td>L</td></c<> | L |

| 210799D01.SPC Analyzed by | | | | | | | | | | |
|-----------------------------------------|------------------------------------|---------------------------------------|----------------------------|-------------|----------------------|-------------------------------|-----|--|--|--|
| ************************************** | | | | | | | | | | |
| | | | | | FURI | | • ـ | | | |
| | | ALS La | boratory Gro | up - Fort (| Collins | | | | | |
| | | | Gamma | | | | | | | |
| *************************************** | | | | | | | | | | |
| Geo 13 / Solid | | | | | | | | | | |
| Sample I | Sample ID: GS210619-1MB GS210619-1 | | | | | | | | | |
| | | | | | | | | | | |
| | | | | - | | 07/11/2021 13:16 | | | | |
| | - | | • | - | | 2.69e-001 | | | | |
| - | | | | | | 60000 | | | | |
| - | | | | | | 60110 210799D01. | | | | |
| | | - | | - | | ce Interval: 9 | | | | |
| | | | | | | | | | | |
| | | De | tector #: 1 | (Detector | 1) | | | | | |
| | - | | .EFF (Geo 13 | - | | | | | | |
| | - | | *L +-6.36E+0 | | - | | | | | |
| | - | | •01 * En + 0. | | - | 300.00 keV | | | | |
| | | | | | | | | | | |
| - | | • | • • | - | ******** | | === | | | |
| | | ME | SURED or MDA | CONCENTRA | TIONS | | | | | |
| | | = = = = = = = = = = = = = = = = = = = | | | | z z z z z z z z z z z z z z z | === | | | |
| | | N | | | | | | | | |
| | | E Concer | | | Critical | | | | | |
| Nuclide | (keV) | T (pCi/g |) | MDA | Level | (hrs) | | | | |
| Th-234 | 92.50 | N 3.22E-02 | +- 2.32E-01 | 3.85E-01 | 1.91E-01 | 3.92E+13 | | | | |
| Pb-212 | | | +- 1.93E-02 | | 1.58E-02 | 1.27E+14 | | | | |
| Pb-214 | 351.99 | N 1.33E-02 | +- 2.23E-02 | 3.68E-02 | 1.81E-02 | 1.40E+07 | | | | |
| T1-208 | 583.14 | N 5.74E-03 | +- 1.78E-02 | 2.95E-02 | 1.46E-02 | 1.27E+14 | | | | |
| Bi-214 | 609.32 | N 3.83E-03 | +- 3.50E-02 | 5.81E-02 | 2.87E-02 | 1.40E+07 | | | | |
| Ra-228 | | | +- 5.19E-02 | | 4.26E-02 | 5.04E+04 | | | | |
| K-40 | | | +- 2.71E-01 | | 2.22E-01 | 1.12E+13 | | | | |
| Pb-210 | | | +- 6.78E+00 | | 5.60E+00 | 1.95E+05 | | | | |
| U-235 Th-227 | | | +- 3.35E-02 +- 5.36E-02 | | 2.75E-02 4 40E-02 | 6.17E+12 1.90E+05 | | | | |
| Cs-137 | | | +- 7.14E-03 | | 4.40E-02 5.98E-03 | 2.64E+05 | | | | |
| Bi-212 | | | +- 9.29E-02 | | 7.19E-02 | 1.27E+14 | | | | |
| Pa-234m | | | +- 1.15E+00 | | 9.09E-01 | 3.92E+13 | | | | |
| | | | | | | | | | | |

MEASURED TOTAL: 1.13E+00 +- 1.98E+00 pCi/g

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|---------|
| 1 | 53.86 | 111.47 | 69 | 109 | 89 | 1253 | 1.29 | Deleted |
| 2 | 66.45 | 136.61 | -31 | 133 | 110 | 517 | 0.47 | Deleted |
| 3 | 69.37 | 142.43 | 13 | 56 | 46 | 517 | 0.50 | Deleted |
| 4 | 74.94 | 153.55 | -28 | 152 | 125 | 547 | 0.49 | Deleted |
| 5 | 84.63 | 172.90 | 92 | 84 | 67 | 839 | 0.95 | Unknown |
| 7 | 97.05 | 197.68 | 55 | 61 | 49 | 524 | 0.66 | Unknown |
| 8 | 139.94 | 283.29 | 101 | 125 | 101 | 512 | 0.73 | Deleted |
| 9 | 154.18 | 311.72 | 20 | 131 | 107 | 829 | 1.06 | Deleted |
| 10 | 185.72 | 374.67 | 65 | 195 | 160 | 1059 | 1.35 | Deleted |
| 11 | 198.32 | 399.84 | -55 | 179 | 147 | 648 | 0.74 | Deleted |
| 13 | 261.42 | 525.78 | 24 | 51 | 41 | 417 | 0.59 | Deleted |
| 14 | 295.08 | 592.97 | -0 | 165 | 135 | 655 | 1.12 | Deleted |
| 16 | 508.28 | 1018.53 | -3 | 35 | 29 | 210 | 0.72 | Deleted |
| 17 | 511.11 | 1024.17 | 415 | 258 | 210 | 840 | 2.64 | Unknown |
| 18 | 537.99 | 1077.83 | 69 | 68 | 54 | 455 | 1.87 | Unknown |
| 19 | 558.44 | 1118.65 | -27 | 133 | 110 | 388 | 1.54 | Deleted |
| 20 | 569.80 | 1141.31 | 61 | 62 | 49 | 419 | 1.40 | Unknown |
| 22 | 596.33 | 1194.27 | 50 | 56 | 44 | 389 | 1.18 | Unknown |
| 24 | 768.70 | 1538.33 | 51 | 53 | 42 | 301 | 1.98 | Unknown |
| 25 | 802.83 | 1606.46 | -53 | 93 | 77 | 221 | 1.32 | Deleted |
| 27 | 1121.02 | 2241.58 | 19 | 78 | 63 | 290 | 2.72 | Deleted |
| 29 | 1764.75 | 3526.49 | 13 | 81 | 66 | 55 | 2.35 | Deleted |

c:\SEEKER\BIN\210799d01.res Analysis Results Saved.

| | | | | \wedge | | | | |
|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 2 | 10799D01.S | SPC Analyze | d pr 3H / | I | | | |
| **** | ****** | ****** | ******* | ******* | ******* | ******* | ****** | ****** |
| SEEF | ŒR | GAMM | A ANA | LYSIS | RESUI | TS P | S Versi | lon 1.8.4 |
| | | А | LS Laborat | ory Group · | - Fort Coll | ins | | |
| | | - | | GammaScal | | | | |
| **** | ****** | ****** | ****** | **** | ****** | ******* | ***** | ****** |
| | | | | | | | | |
| | | | | Geo 13 / So | oliđ | | | |
| Sampl | Le ID: GS | 210619-1ME | GS210619- | -1 | | | | |
| - | | | | | | | | |
| | | | | | | | | |
| - | - | | | 00:00 Con 00:00 Dec | - | | | |
| - | • • | | | 00:00 Dec 0 Hrs Liv | - | | | |
| | - | | | 002 g Real | | | | 60110 Sec |
| - | | | | .0000 Sp | | | | |
| | | | · · · · · | | | · · · · · · | | |
| | | | Detecto | or #: 1 (De | etector 1) | | | |
| Energ | y(keV)= | -1.99 + 0 | .501*Ch + | 0.00E+00*C | $h^2 + 0.001$ | S+00*Ch^3 | 07/11/ | 2021 |
| FWHM | (keV) = | 0.74 + 0 |).020*En + | 4.70E-04*E | $n^2 + 0.001$ | C+00*En^3 | 08/22/ | 2020 |
| | | | Where E | n = Sqrt(E | nergy in ke | €V) | | |
| | | | | | | | | |
| Searc | ch Sensit | ivity: 1.0 |)0 Sigma | Multiplier | : 2.00 Se | earch Sta | rt/End: | 80/4000 |
| | | | | | | | | |
| | | ********** | | | | | ======= | |
| | | | השמ | T CEADOU DI | POTT MO | | | |
| | | | | K SEARCH R | | | | |
| ==== | | | | | | | ====== | |
| ====: PK. | ENERGY | ADDRESS | | | | BKG | ===== FWHM | |
| | | | NET/MDA | | | BKG COUNTS | FWHM (keV) | FLAG |
| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS C | UN- CERTAINTY | C.L. COUNTS | COUNTS | (keV) | |
| PK. # | ENERGY (keV) 53.86 | ADDRESS CHANNEL 111.47 | NET/MDA COUNTS (69 | UN- CERTAINTY 109 | C.L. COUNTS 89 | COUNTS 1253 | (keV) 1.29 | a NET< CL |
| РК. # 1 2 | ENERGY (keV) 53.86 66.45 | ADDRESS CHANNEL 111.47 136.61 | NET/MDA COUNTS C 69 104 | UN- CERTAINTY 109 59 | C.L. COUNTS 89 46 | COUNTS 1253 517 | (keV) 1.29 0.47 | a NET< CL a |
| PK. # 1 2 3 | ENERGY (keV) 53.86 66.45 69.37 | ADDRESS CHANNEL 111.47 136.61 142.43 | NET/MDA COUNTS C 69 104 13 | UN- CERTAINTY 109 59 56 | C.L. COUNTS 89 46 46 | COUNTS 1253 517 517 | (keV) 1.29 0.47 0.50 | a NET< CL a b NET< CL |
| PK. # 1 2 3 4 | ENERGY (keV) 53.86 66.45 69.37 74.94 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 | NET/MDA COUNTS C 69 104 13 95 | UN- CERTAINTY 109 59 56 60 | C.L. COUNTS 89 46 46 46 47 | COUNTS 1253 517 517 547 | (keV) 1.29 0.47 0.50 0.49 | a NET< CL a b NET< CL a |
| PK. # 1 2 3 4 5 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 | NET/MDA COUNTS (69 104 13 95 92 | UN- CERTAINTY 109 59 56 60 84 | C.L. COUNTS 89 46 46 46 47 67 | COUNTS 1253 517 517 547 839 | (keV) 1.29 0.47 0.50 0.49 0.95 | a NET< CL a b NET< CL a a |
| PK. # 1 2 3 4 5 6 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 | NET/MDA COUNTS C 69 104 13 95 | UN- CERTAINTY 109 59 56 60 | C.L. COUNTS 89 46 46 46 47 | COUNTS 1253 517 517 547 | (keV) 1.29 0.47 0.50 0.49 | a NET< CL a b NET< CL a a a |
| PK. # 1 2 3 4 5 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 | NET/MDA COUNTS (69 104 13 95 92 172 | UN- CERTAINTY 109 59 56 60 84 102 | C.L. COUNTS 89 46 46 46 47 67 81 | COUNTS 1253 517 517 547 839 1048 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 | a NET < CL a b NET < CL a a a b |
| PK. # 1 2 3 4 5 6 7 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 | NET/MDA COUNTS C 69 104 13 95 92 172 55 | UN- CERTAINTY 109 59 56 60 84 102 61 | C.L. COUNTS 89 46 46 46 47 67 81 49 | COUNTS 1253 517 517 547 839 1048 524 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 | a NET < CL a b NET < CL a a a b |
| PK. # 1 2 3 4 5 6 7 8 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 | UN- CERTAINTY 109 59 56 60 84 102 61 61 64 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 | COUNTS 1253 517 517 547 839 1048 524 512 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 | a NET < CL a b NET < CL a a b a a NET < CL |
| PK. # 1 2 3 4 5 6 7 8 9 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 | NET/MDA COUNTS (69 104 13 95 92 172 55 181 62 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 | COUNTS 1253 517 517 547 839 1048 524 512 829 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 | a NET < CL a b NET < CL a a b a a NET < CL a |
| PK. # 1 2 3 4 5 6 7 8 9 10 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 | a NET < CL a b NET < CL a a b a a NET < CL a a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 119 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 | a NET < CL a b NET < CL a a b a a NET < CL a a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 119 183 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 67 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 | (keV) 1.29 0.47 0.50 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 | a NET < CL a b NET < CL a a b a a NET < CL a a a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 162 119 183 24 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 67 41 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 | (keV) 1.29 0.47 0.50 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 | a NET < CL a b NET < CL a a b a a NET < CL a a NET < CL a NET < CL a NET < CL |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 295.08 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 705.90 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 162 119 183 24 44 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 71 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 67 41 58 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 655 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 1.12 1.23 | a NET < CL a b NET < CL a a b a a NET < CL a a NET < CL a NET < CL a NET < CL |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 295.08 351.66 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 705.90 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 119 183 24 44 175 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 71 71 75 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 67 41 58 58 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 655 624 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 1.12 1.23 | a NET < CL a b NET < CL a a b a a NET < CL a a NET < CL a NET < CL a NET < CL a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 295.08 351.66 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 705.90 1018.53 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 119 183 24 44 175 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 71 71 75 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 67 41 58 58 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 655 624 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 1.12 1.23 | a NET < CL a b NET < CL a a b a a NET < CL a NET < CL a NET < CL a a NET < CL a a NET < CL a u NET < CL a a NET < CL a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 295.08 351.66 508.28 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 705.90 1018.53 1024.17 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 162 119 183 24 44 175 -3 | UN- ERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 71 75 35 125 68 | C.L. COUNTS 89 46 46 47 67 81 49 48 67 82 57 67 41 58 58 58 29 83 54 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 655 624 210 840 455 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 1.12 1.23 0.72 2.64 1.87 | a NET < CL a b NET < CL a a b a b a a NET < CL a a NET < CL a nET < CL a nET < CL a u nET < CL a a nET < CL a a a nET < CL a a a a a nET < CL a a a a a a a a a a a a a a a a a a a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 295.08 351.66 508.28 511.11 537.99 558.44 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 705.90 1018.53 1024.17 1077.83 1118.65 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 162 162 119 183 24 44 175 -3 1408 69 156 | UN- CERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 71 71 75 35 125 68 63 | C.L. COUNTS 89 46 46 46 47 67 81 49 48 67 82 57 67 41 58 57 67 41 58 58 29 83 54 47 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 655 624 210 840 455 388 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 1.12 1.23 0.72 2.64 1.87 1.54 | a NET < CL a b NET < CL a a b a a NET < CL a a NET < CL a NET < CL a a NET < CL a u a NET < CL a a a NET < CL a a a NET < CL a a a NET < CL a a a a NET < CL a a a a a NET < CL a a a a a a a a a a a a a a a a a a a |
| PK. # 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 | ENERGY (keV) 53.86 66.45 69.37 74.94 84.63 92.59 97.05 139.94 154.18 185.72 198.32 238.47 261.42 295.08 351.66 508.28 511.11 537.99 558.44 569.80 | ADDRESS CHANNEL 111.47 136.61 142.43 153.55 172.90 188.79 197.68 283.29 311.72 374.67 399.84 479.96 525.78 592.97 705.90 1018.53 1024.17 1077.83 1118.65 | NET/MDA COUNTS C 69 104 13 95 92 172 55 181 62 162 162 119 183 24 44 175 -3 1408 69 | UN- ERTAINTY 109 59 56 60 84 102 61 64 83 103 72 86 51 71 75 35 125 68 | C.L. COUNTS 89 46 46 47 67 81 49 48 67 82 57 67 41 58 58 58 29 83 54 | COUNTS 1253 517 517 547 839 1048 524 512 829 1059 648 763 417 655 624 210 840 455 | (keV) 1.29 0.47 0.50 0.49 0.95 1.37 0.66 0.73 1.06 1.35 0.74 1.20 0.59 1.12 1.23 0.72 2.64 1.87 | a NET < CL a b NET < CL a a b a a NET < CL a a NET < CL a NET < CL a a NET < CL a u a NET < CL a a a NET < CL a a a NET < CL a a a NET < CL a a a a NET < CL a a a a a NET < CL a a a a a a a a a a a a a a a a a a a |

PEAK SEARCH RESULTS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|-------------------|------------------|----------------|---------------|---------------|-----------|
| 21 | 583.43 | 1168.53 | 128 | 95 | 76 | 657 | 2.88 | a Wide Pk |
| 22 | 596.33 | 1194.27 | 50 | 56 | 44 | 389 | 1.18 | a |
| 23 | 609.33 | 1220.22 | 141 | 59 | 45 | 409 | 1.32 | a |
| 24 | 768.70 | 1538.33 | 51 | 53 | 42 | 301 | 1.98 | a |
| 25 | 802.83 | 1606.46 | 65 | 43 | 33 | 221 | 1.32 | a |
| 26 | 911.38 | 1823.14 | 85 | 43 | 32 | 195 | 1.53 | a |
| 27 | 1121.02 | 2241.58 | 47 | 55 | 44 | 290 | 2.72 | a |
| 28 | 1461.11 | 2920.41 | 672 | 60 | 25 | 103 | 2.24 | a |
| 29 | 1764.75 | 3526.49 | 78 | 28 | 18 | 55 | 2.35 | a |

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SEEKER BACKGROUND SUBTRACT RESULTS Vers. 2.2.1

ALS Laboratory Group - Fort Collins

GammaScan

Background File:.... DET010707.BKG (210707-1 LONGBKGCAL)

Bkg.File Detector #: 1

BACKGROUND SUBTRACT RESULTS

| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW |
|-----|---------|---------|-----------|----------|---------|-----------|---------------------------|
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL FLAG |
| 2 | 66.45 | 104 | 59 | 46 | -31 | 133 | 110 NET <cl< td=""></cl<> |
| 4 | 74.94 | 95 | 60 | 47 | -28 | 152 | 125 NET <cl< td=""></cl<> |
| 6 | 92.59 | 172 | 102 | 81 | 25 | 181 | 149 NET <cl< td=""></cl<> |
| 8 | 139.94 | 181 | 64 | 48 | 101 | 125 | 101 NET <cl< td=""></cl<> |
| 9 | 154.18 | 62 | 83 | 67 | 20 | 131 | 107 NET <cl< td=""></cl<> |
| 10 | 185.72 | 162 | 103 | 82 | 65 | 195 | 160 NET <cl< td=""></cl<> |
| 11 | 198.32 | 119 | 72 | 57 | -55 | 179 | 147 NET <cl< td=""></cl<> |
| 12 | 238.47 | 183 | 86 | 67 | 90 | 161 | 132 NET <cl< td=""></cl<> |
| 14 | 295.08 | 44 | 71 | 58 | -0 | 165 | 135 NET <cl< td=""></cl<> |
| 15 | 351.66 | 175 | 75 | 58 | 73 | 122 | 100 NET <cl< td=""></cl<> |
| 17 | 511.11 | 1408 | 125 | 83 | 415 | 258 | 210 |
| 19 | 558.44 | 156 | 63 | 47 | -27 | 133 | 110 NET <cl< td=""></cl<> |
| 21 | 583.43 | 128 | 95 | 76 | 47 | 146 | 120 NET <cl< td=""></cl<> |
| 23 | 609.33 | 141 | 59 | 45 | 16 | 151 | 124 NET <cl< td=""></cl<> |
| 25 | 802.83 | 65 | 43 | 33 | -53 | 93 | 77 NET <cl< td=""></cl<> |
| 26 | 911.38 | 85 | 43 | 32 | 16 | 89 | 73 NET <cl< td=""></cl<> |
| 27 | 1121.02 | 47 | 55 | 44 | 19 | 78 | 63 NET <cl< td=""></cl<> |
| 28 | 1461.11 | 672 | 60 | 25 | 27 | 134 | 110 NET <cl< td=""></cl<> |
| 29 | 1764.75 | 78 | 28 | 18 | 13 | 81 | 66 NET <cl< td=""></cl<> |

| **** | ****** | 210799D01.8 | - | | ******* | ****** | ***** | ***** | | |
|------------------------------|--------------------------------------------------|------------------------------------------|---------------------------------|------------------------------------------------------------|------------------------------------------------------------------|------------------------------|------------------------------|----------------------------------------------------------------------------------|--|--|
| SEEK | SEEKER FINAL ACTIVITY REPORT Version 2.2.1 | | | | | | | | | |
| **** | ALS Laboratory Group - Fort Collins GammaScan | | | | | | | | | |
| | | | | ~ | | | | | | |
| | | | | Geo 13 | / Solid | | | | | |
| Samp | le ID: | GS210619-11 | 0B GS2100 | 519-1 | | | | | | |
| Samp Buil Samp Coll | ling Sto dup Time le Size ection E | p: 07/1 | L1/2021 : 0.00e- . 5.00 | L3:00:00 +000 Hrs De+002 g 1.0000 95 % | Decay Time Live Time Real Time Spectrum D Det. Limit | e File t Confidend | 2. 21 ce Inter | 21 13:16:08 69e-001 Hrs 60000 Sec 60110 Sec 0799D01.SPC val: 95 % | | |
| | | | Dete | | (Detector | | | | | |
| Eff | =10^[-1. | ile: (D01) 10E+02 +1.4 97E-01 + -8 | (Sh13).E 4E+02*L 3.38E-01 | FF (Geo 13 +-6.36E+0 * En + 0. | Eff Cal) 1*L^2 +9.3 | 3E+00*L^3] n^2] Above | 300.0 | | | |
| Libr | - | • • • • • | | - | | | • • | | | |
| | | =================== | | | CONCENTRA | | ====== | | | |
| | | ========= | | | | | | | | |
| | EN | n Ergy e (| loncentr | tion | | Critical | Walflif | | | |
| Nucl | | keV) T (p(| | | | Level | | 5 | | |
| Ra-2 | 26 35 | 1.92 N 3.00 | 5E-02 +- | 1.36E-02 | | 1.05E-02 | | | | |
| ME | ASURED T | OTAL: 3.00 | 5E-02 +- | 1.36E-02 | pCi/g | | | | | |
| ==== | | ============ | | | ESCAPE PE | | | | | |
| ==== | | | | | | | | = = = = = = = = = = = = = | | |
| PK. | FREDCY | ADDEECC | NTEV/III | UN- | C T | PZO | | | | |
| # | (keV) | | NET COUNTS | CERTAINTY | C.L. COUNTS | | FWHM (keV) | FLAG | | |
| | | | | | | | | | | |
| | | 172.90 197.68 | 92 55 | 84 61 | 67 49 | | | Unknown Unknown | | |
| 3 | | 1024.17 | 415 | 258 | | | | Unknown | | |
| 4 | | 1077.83 | 69 | 68 | | | | Unknown | | |
| 5 | 569.80 | 1141.31 | 61 | 62 | 49 | 419 | 1.40 | Unknown | | |
| | | 1194.27 | 50 | 56 | | | | Unknown | | |
| 7 | 768.70 | 1538.33 | 51 | 53 | 42 | 301 | 1.98 | Unknown | | |
| ~ • • • • | ידי / משעים | N1 21 0799401 | N | nalwaia Bo | aulta Como | a | | | | |

c:\SEEKER\BIN\210799d01A.res Analysis Results Saved.

| **** | | 10798D01. | | ed by JH | ****** | ***** | ***** | **** | | | | |
|----------------------------|------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------|----------------------|--------------------------------------------------|--|--|--|--|
| SEE | KER | GAMM | A ANZ | LYSIS | RESU | LTS P | S Versi | on 1.8.4 | | | | |
| **** | ALS Laboratory Group - Fort Collins GammaScan ************************************ | | | | | | | | | | | |
| | | | | Geo 13 / 8 | Solid | | | | | | | |
| Sam | ole ID: GS | 210619-110 | CS GS21061 | .9-1 | | | | | | | | |
| Sam Buil Sam Coll | oling Stop dup Time. ole Size . .ection Ef | ficiency | 11/2021 12 . 0.00E+C 5.00E | 2:00:00 De 000 Hrs L: 2+002 g Re 1.0000 Sy | ive Time . Bal Time . Do. File . | • • • • • • • • • • • • • • • • • • | . 1.7 210 | 5E-001 Hrs 1800 Sec 1866 Sec 798D01.SPC | | | | |
| Ener FWHM | rgy(keV)= I(keV) = | -1.99 + (0.74 + (| Detect 0.501*Ch + 0.020*En + Where | or #: 1 (1 0.00E+00*(4.70E-04*) En = Sqrt() Multiplies | Detector 1) Ch^2 + 0.00 En^2 + 0.00 Energy in k | E+00*Ch^3 E+00*En^3 eV) | 07/11/ 08/22/ | 2021 2020 | | | | |
| | | | | ZAK SEARCH I | | | | | | | | |
| === | | | | | | | ====== | | | | | |
| | | | | UN- CERTAINTY | | - | | FLAG | | | | |
| 1 | 59.49 | 122.72 | 4753 | 179 | 94 | 1792 | 0.86 | a | | | | |
| 2 | 87.94 | 179.50 | 7147 | 204 | 94 | 1767 | | a HiResid | | | | |
| 3 4 | 122.07 136. 4 7 | 247.63 276.36 | 2092 223 | 146 117 | 93 93 | 1610 1606 | 0.98 | | | | | |
| 5 | 165.82 | 334.95 | 154 | 100 | 93 79 | 1273 | 0.91 0.81 | | | | | |
| 6 | 228.65 | 460.36 | 56 | 83 | 67 | 1000 | | a NET< CL | | | | |
| 7 | 279.88 | 562.63 | 62 | 69 | 56 | 759 | 0.60 | | | | | |
| 8 | 297.18 | 597.16 | 65 | 88 | 71 | 1066 | 1.02 | a NET< CL | | | | |
| 9 | 479.19 | 960.47 | 35 | 58 | 46 | 532 | | A NET< CL | | | | |
| 10 | 661.66 | 1324.68 | 17530 | 276 | 64 | 753 | | A HiResid | | | | |
| 11 12 | 1173.23 1332.40 | 2345.79 2663.51 | 13915 12670 | 244 229 | 51 32 | 462 177 | | A HiResid | | | | |
| 13 | 1460.91 | 2920.01 | 23 | 19 | 32 13 | 177 32 | 2.35 1.94 | a HiResid a | | | | |

210798D01.SPC Analyzed by SEEKER BACKGROUND SUBTRACT RESULTSVers. 2.2.1 ALS Laboratory Group - Fort Collins GammaScan Background File:.... DET010707.BKG (210707-1 LONGBKGCAL) Bkg.File Detector #: 1 BACKGROUND SUBTRACT RESULTS

| PK# | ENERGY (keV) | OLD NET COUNTS | OLD UN- CERTAINTY | OLD CR.LEVEL | NEW NET COUNTS | NEW UN- CERTAINTY | NEW CR.LEVEL | FLAG |
|-----|-----------------|-------------------|----------------------|-----------------|-------------------|----------------------|-----------------|----------------------|
| 3 | 122.07 | 2092 | 146 | 93 | 2092 | 146 | 93 | |
| 8 | 297.18 | 65 | 88 | 71 | 64 | 88 | 71 N | ET <cl< td=""></cl<> |
| 13 | 1460.91 | 23 | 19 | 13 | 4 | 19 | 15 N | et <cl< td=""></cl<> |

| ****** | 210798 | D01.SPC Analy | | ******** | * * * * * * * * * * * * * | | ***** |
|-----------------|--------------------------|---------------------------------------|---------------------|----------------|---------------------------|--------------------|---------------------------------------|
| SEEKER | F | INAL A | | | | Vers | ion 2.2.1 |
| | | | | | | | |
| | | ALS Labo: | ratory Gro Gamma | up - Fort (| Collins | | |
| ****** | ******** | ********* | | | ****** | ****** | ***** |
| | | | | | | | |
| | | | Geo 13 | / Solid | | | |
| Sample] | D: GS2106 | 19-1LCS GS21 | 0619-1 | | | | |
| | | | | | | | |
| | | 07/11/2021 07/11/2021 | | | | | |
| | - | • • • • • • • • • • • • • • • • • • • | | | | | |
| | | 5.0 | | | | | |
| | | ncy | | - | | | |
| Cr. Leve | el Confiden | ce Interval: | 95 % | Det. Limi | t Confidence | ce Inter | val: 95 % |
| | | Dete | ctor #: 1 | (Detector | 1) | | |
| Efficier | ncy File: () | D01)(Sh13).E | FF (Geo 13 | Eff Cal) | | | |
| | - | +1.44E+02*L | | | - | | |
| | | + -8.38E-01 | | | - | | |
| | | ANALYTICA | | | | | |
| - | | ================= | | - | | | |
| | | MEASU | RED or MDA | CONCENTRA | TIONS | | |
| | :======= N | = = = = = = = = = = = = = = = = = = = | | ======= | | | = = = = = = = = = = = = = = = = = = = |
| | | Concentra | ation | | Critical | Halflif | A |
| Nuclide | | (pCi/g | | MDA | Level | | - |
| | | | | | | | |
| Am-241 | 59.54 | 2.03E+02 +- | | 8.19E+00 | 4.04E+00 | 3.79E+0 | |
| Cd-109 Co-57 | 88.02 122.07 | 5.13E+02 +- 3.95E+00 +- | | | 6.72E+00 1.76E-01 | 1.11E+0 6.50E+0 | |
| Ce-139 | | 3.01E-01 +- | | | 1.55E-01 | | |
| | | 1.34E-01 +- | | | 1.20E-01 | | - |
| Cs-137 | 661.62 | 7.86E+01 +- | | 5.85E-01 | 2.86E-01 | 2.64E+0 | 5 |
| Co-60 | - | 8.65E+01 +- | | | • • • • | | |
| | | 8.59E+01 +- 8.71E+01 +- | | | 3.15E-01 | | |
| Sn-113 | 391.68 | MDA | 1.5/6700 | | 2.22E-01 3.08E-01 | | |
| Y-88 | 898.02 | MDA | • • • • | | 4.00E-01 | | |
| | | | | - • • | | | |
| | | 8.86E+02 +- | | | | | |
| | | | | ESCAPE PE | | | |
| ******* | | | • | | | | ============ |
| | | 00 | TTLT | . | BVA | | |
| | ERGY ADDRE (ev) chann | | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
| π (л | | | | | | (78¥) | |
| 4 13 | 36.47 276. | 36 223 | 117 | 93 | 1606 | 0.91 | Unknown |
| | Page | 003 | | | | | |

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. Counts | BKG COUNTS | FWHM (keV) | FLAG |
|--------------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|---------|
| 6 | 228.65 | 460.36 | 56 | 83 | 67 | 1000 | 0.57 | Deleted |
| 8 | 297.18 | 597.16 | 64 | 88 | 71 | 1066 | 1.02 | Deleted |
| 9 | 479.19 | 960.47 | 35 | 58 | 46 | 532 | 0.70 | Deleted |
| 13 | 1460.91 | 2920.01 | 4 | 19 | 15 | 32 | 1.94 | Deleted |

c:\SEEKER\BIN\210798d01.res Analysis Results Saved.

Gamma Spectrometer Run Log

Date: 7 10 707 7 11 207

Reviewed By/Date: TS 7/(z/z)

| Sample ID Verl Dat. No. Geo? Count Dat. Start Time Analyst File ID.SPC Save? 210551)-29 7 76 30 13/25 91 710756.007.00 0 -30 10 1 1 210756.007.00 0 0 0 0 6527060127.m8 1 1 1 1 210745.007.00 0 0 1 1 1 1 1 1 210747.00 0 0 1 1 1 1 1 1 21074000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | T | 1 | 1 | 1 | <u> </u> | | | 1 | ר |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|----------|------------------|--------------|----------------------------------------------------|-------------------------------|--------------------------------------|---------------|--------------|
| -30 IG 2 2 10 10 GSZRUG (87,m8 I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I | Sample ID | Ver ¹ | Det. No. | Geo ² | | Start Time | Analyst | File ID.SPC | Saved? | |
| G S2/Q/G (B-7,n-B) I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I | 2105511-29 | Ű. | 7 | 76 | 30 | 13:25 | M | Z10756007 | Ju - | |
| 1 LGJ 7 1 13.7C 71.CC 1/D2 (D) 21064472.1 0 1 13 1000 14/20 21074001 (D) -2 7 7 1 13.58 711040 (D2 (D) 1000 -2 7 7 1 13.58 711040 (D2 (D) 1000 -2 7 7 1 13.58 711040 (D) 1000 -9 5 1 13.58 711040 (D) 1000 1000 -10 7 1 1 710757007 (D) 1000 1000 1000 -11 10 1 10000 (D) 10000 (D) 10000 1000 1000 1000 -10 7 1 10000 (D) 10000 (D) 10000 (D) 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 100000 100000 100000 1000000 100000 | | | iĠ | | | | | 26779010 | ()) | |
| 21064421 1 1 13 1000 1420 10194001 101 -2 2 1 1420 210194001 10194001 101 10194001 101 2106545-7 3 1 173:56 211060202 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 | 65210618-7mB | | ۱ | | | l | | 210795001 | P | |
| Z Z I I4:01 ZIO802002 (0) ZIO6545-7 3 1 I3:58 ZII060023 (0) E 4 I ZIO73000 (0) I I0 7 I ZIO73000 (0) I I1 I0 I ZIO73000 (0) I I1 I0 I ZIO73000 (0) I I1 I0 I ZIO73000 (0) I I0 7 I I ZIO73000 (0) I I1 I0 I ZIO73000 (0) I I I1 I0 I ZIO790 (0) TS I I1 I0 I ZIO790 (0) TS I -IMb TS 1 I0000 (0) I I ZIO790 (0) TS ZIO 6545-12 3 1 ZIO740 (0) TS I ZIO740 (0) IS -I15 7 I3/17 ZIO750007 TS IS IS IS IS -I15 7 I3/17 ZIO7740005 TS IS IS< | 165 | | 7 | | | 13:24 | | 710801120 | \mathcal{V} | LI |
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| -8 4 1 2112641004 (0 -9 5 1 210741045 (0 -10 7 1 20751071 (0 -11 10 1 13 30 12'10 (0) 210796001 (0) -11 10 1 13 30 12'10 (0) 210796001 (0) 7 -11 10 1 13 30 12'10 (0) 210799001 (75) 1 -11 1000 13:16 210799001 (75) 1 1 1000 (75) 1 -110 2 1 1000 (75) 1 1 1000 (75) 1 2106595002 75 1 210749005 75 1 1 1 -13 4 210749005 75 1 1 1 1 1 -14 10 12'17 210759007 75 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1< | 5- | | 2 | 1 | | 14:01 | | 210202002 | (T) | \mathbb{H} |
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| -IC 7 I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I | 9- 1 | | 4 | | | | | 711784004 | Ø | |
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| C S2 104 [9·14] N 1 13 30 12'10 V 2 10796 D/l -1M13 TS 1 1060 13·16 1 210799 D01 TS 210 (4 4/42-10) 2 1 1060 13·16 1 21062 D03 TS 210 (4 5/45-12) 3 1 1 21062 D03 TS 1 10 2 1 210799 D01 TS 1 2106505 12 3 1 21062 D03 TS 1 1060 13'16 1 210799 D01 TS 1 106595 12 3 1 21078007 TS 1 13'17 210759 D07 TS 13'17 210759 D07 TS 1 10'10 1 10'10 10'10 10'10 10'10 10'10 1 10'10 10'10 10'10 10'10 10'10 10'10 10'10 1 10'10 10'10 10'10 10'10'10 10'10'10 10'10'10 10'10'10'10'10'10'10'10'10'10'10'10'10'1 | -10 | | 7 | | | | | 210757007 | (M) | |
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| -1,M13 TS 1 1060 13:16 7 210799 001 TS 1 Z10 & 414Z-10 Z I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I | 65710419-165 | 1 | 1 | 13 | 30 | 17:10 | (1) | | | · ····· |
| ZIC (444Z-ID) Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z < | | | 1 | | | | <u> </u> | | TS | |
| 7106545-12 3 1 2106203 TS -13 4 210749005 TS -14 210749005 TS -15 7 13'.11 210759007 -16 10 10 10 10 -16 10 10 10 10 10 -18 7 13'.11 210759007 TS -16 10 10 10 10 10 -16 10 10 10 10 10 10 -18 7/12 7 13'.11 7 10759007 TS -16 10 10 10 10 10 10 10 -18 7 13 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 | | 13 | 7 | | | 1 | | | | 1 |
| -13 4 211288 D044 TS -13 4 210749 D05 TS -15 7 13'.17 -16 10 10 -16 10 10 -16 10 10 -17 13'.17 21075 9007 TS -16 10 10 -17 13'.17 71075 9007 TS -16 10 10 -17 13'.17 710732 010 TS -17 77 13'.17 -18 77 717 -19 77 13'.17 -10 10 10 -11 10 10 -11 77 13'.17 -11 77 77 -11 77 77 -11 77 77 -11 77 77 -11 77 77 -11 77 77 -11 77 77 -11 77 77 -11 77 77 -11 | | | 3 | 1 | | | | | | |
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| -1\$ 7 13'.17 Z10759007 TS -16 10 N Z16732010 TS -17 7/12 N Z16732010 TS -16 10 N Z16732010 TS -17 7/12 N Z16732010 TS -17 7/12 N Z16732010 TS -17 -16 10 -16 -16 -17 -16 10 -16 -16 -16 -17 -16 10 -16 -17 -17 -17 -17 -16 -16 -17 -16 -17 -17 -17 -17 -16 -16 -16 -16 -17 -17 -17 | _14 | | E | | | - | | | | 2 |
| -IG IG I | -15 | | -7 | | | 13:17 | | | 1 | |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. KEY: * sample was counted on a puck * sample was counted with air flow arrow pointing up 7/12 | -16 | | 10 | | | | | | | |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. | | V | | | | | | | | |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. | | | | | | | | | | |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. | | | | | | | | | | 1 |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. | | | | | | | | | | 1 |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. | | | | | | | | | | 75 |
| Analyst will verify the position, detector, and geometry when the sample is removed from the detector. | | | | L | l | L | L | | L | 7/12/ |
| | | | | ometry | <u>KEY</u> : | sample was sample was | s counted on s counted wit | a puck th air flow arrow pointing | up | |
| | - | | | | | 1 | | | | |

Count duration.

B 495267

A Recount: Peak Shift

Form 754r16b.doc (10/27/11)

<u>Technical Comments Regarding Analysis using the Natural (SubRa228).LIB</u> <u>Gamma Spectroscopy Library</u>

Analysis using the **Natural (SubRa228).LIB** library is limited to the list of gamma emitting radionuclides specified by ALS Laboratory Group. ALS Laboratory Group specifies all values assigned to the nuclides in this library. In cases where multiple gamma emissions are used to quantify activity, the most abundant emission is used for quantification in the absence of any supporting gamma emissions. It should be noted that the current software program used for gamma spectroscopic analysis is limited to a +/- 2.0 keV photo-peak resolution tolerance. Thus, any gamma emissions occurring within the same +/- 2.0 keV range will suffer interference, consequently preventing accurate quantification. Nuclide specific information regarding analysis using the **Natural (SubRa228).LIB** library is as follows:

Nuclide: ²²⁸Ra

Energy: various

Photon Abundance: various

All activity values for ²²⁸Ra are calculated using the emissions of the ²²⁸Ac daughter. It is assumed that secular equilibrium is achieved between the ²²⁸Ra parent and the ²²⁸Ac progeny.

Nuclide: ²¹²Bi, ²¹²Pb, ²⁰⁸Tl

Energy: various

Photon Abundance: various

All activity values for ²¹²Bi, ²¹²Pb, and ²⁰⁸Tl are calculated using the half-life, t_{1/2}=1.45E+10 years, of the long-lived ²³²Th parent. It is assumed that secular equilibrium is achieved between the ²³²Th parent and the ²¹²Bi, ²¹²Pb, ²⁰⁸Tl progeny.

Nuclide: ²¹⁴Bi, ²¹⁴Pb

Energy: various

Photon Abundance: various

All activity values for ²¹⁴Bi and ²¹⁴Pb are calculated using the half-life, t_{1/2}=1600 years, of the long-lived ²²⁶Ra parent. It is assumed that secular equilibrium is achieved between the ²²⁶Ra parent and the ²¹⁴Bi and ²¹⁴Pb progeny.

Nuclide: ¹³⁷Cs Energy: 661.62 keV

Photon Abundance: 0.8512

¹³⁷Cs does not emit any gamma photons useful for quantification. However, it can be assumed to be in secular equilibrium with the short-lived ^{137m}Ba daughter product. Therefore, the activity for ¹³⁷Cs is determined from the 661.62 keV gamma emission of the ^{137m}Ba daughter product. The calculated gamma photon abundance used in the library is the product of the 0.8998 abundance of the 661.62 keV ^{137m}Ba photon and the 0.946 branching ratio between ¹³⁷Ba and ^{137m}Ba.

Nuclide: 40 K Energy: 1460.75 keV Photon Abundance: 0.1100 (γ /dis)

The only gamma emission useful for quantification of this nuclide suffers from possible resolution interference due to the ²²⁸Ac gamma emission occurring at 1459.2 keV (0.0104, abundance). Therefore, a possibility of a high bias to the ⁴⁰K results may occur in the presence of elevated ²²⁸Ac activity.

Nuclide: ²²⁶Ra

Energy: 186.21 Photon Abundance: 0.0359

Quantifying ²²⁶Ra activity using the 186.21 keV photo-peak is vulnerable to a significant high bias due to interference from gamma emissions from ²³⁵U occurring at 185.72 keV (0.5720,

abundance). Therefore this nuclide will be "SI" flagged, indicating that significant spectral interference prohibits accurate quantification.

Nuclide: ²³⁴Th & ^{234m}Pa

Energy: various

Photon Abundance: various

²³⁴Th and ^{234m}Pa are assumed to be in secular equilibrium with their parent, ²³⁸U. The activities for these nuclides are therefore calculated using the half-life of the parent, which is $t_{1/2}$ =4.468E+9 years.

Nuclide: ²²⁷Th

Energy: 236.00

Photon Abundance: 0.1230

All activity values for ²²⁷Th are calculated using the half-life, $t_{1/2}=21.7$ yrs, of the long-lived ²²⁷Ac parent. It is assumed that secular equilibrium is achieved between the ²²⁷Ac parent and the ²²⁷Th progeny.

Nuclide: ²³⁴Th

Energy: 92.50

Photon Abundance: 0.0553

- The 92.50 keV photo-peak used in this library for ²³⁴Th quantification is actually two separate photo-peaks, occurring at 92.4 keV and 92.8 keV. The current software used for gamma spectroscopic analysis cannot resolve two photo-peaks that occur within the 2-keV resolution tolerance. Therefore, these two photopeaks are observed as a single photo-peak. Therefore, the average of the two photo-peak energies is used in this library. Also, the sum of the two photo-peak abundances, 0.0553, is used in the activity calculations for this observed 'single' photo-peak.
- All activity values for 234 Th are calculated using the half-life, $t_{1/2}$ =4.468E+09 yrs, of the longlived ²³⁸U parent. It is assumed that secular equilibrium is achieved between the ²³⁸U parent and the ²³⁴Th progeny.

Nuclide: ²³⁵U

Energy: 185.72

Photon Abundance: 0.5720

Quantifying ²³⁵U activity using the 185.72 keV photo-peak is vulnerable to a significant high bias due to interference from gamma emissions from ²²⁶Ra occurring at 186.21 keV (0.0328, abundance). Therefore, this emission will be used as an identifier only and not in the activity calculations for this nuclide.

Gamma Spectroscopist

Radiochemistry Instrumentation Laboratory

Radiochemistry Manager

Library File: Natural(SUB RA228).LIB File I.D.: Natural.LIB

| Pk. | Energy | Isotope | 2ndary | | Gamma | |
|-----|---------|-----------------|---------|-------|----------|-----------------------|
| # | (keV) | Name | Pk # | Туре | Fraction | Halflife |
| | | | ======= | | | |
| 19 | 727.17 | Bi-212 | 0 | NET | 0.0658 | 1.4500E+10 yrs |
| 17 | 609.32 | Bi-214 | 24 | NET | 0.4609 | 1.6000E+03 yrs |
| 24 | 1120.28 | Bi-214 | 17 | QUANT | 0.1510 | 1.6000E+03 yrs |
| 18 | 661.62 | Cs-137 | 0 | NET | 0.8512 | 3.0104E+01 yrs |
| 25 | 1460.75 | K-40 | 0 | NET | 0.1100 | 1.2800E+09 yrs |
| 23 | 1001.03 | Pa-234 m | 0 | NET | 0.0059 | 4.4680E+09 yrs |
| 1 | 46.50 | Pb-210 | 0 | NET | 0.0405 | 2.2260E+01 yrs |
| 4 | 115.18 | Pb-212 | 10 | QUANT | 0.0059 | 1.4500E+10 yrs |
| 10 | 238.63 | Pb-212 | 13 | net | 0.4330 | 1.4500E+10 yrs |
| 13 | 300.09 | Pb-212 | 4 | QUANT | 0.0327 | 1.4500E+10 yrs |
| 12 | 295.22 | Pb-214 | 15 | QUANT | 0.1920 | 1.6000E+03 yrs |
| 15 | 351.99 | Pb-214 | 12 | NET | 0.3710 | 1.6000E+03 yrs |
| 14 | 338.40 | Ra-228 | 21 | QUANT | 0.1127 | 5.7500E+00 yrs |
| 21 | 911.07 | Ra-228 | 22 | NET | 0.2580 | 5.7500E+00 yrs |
| 22 | 968.90 | Ra-228 | 14 | QUANT | 0.1580 | 5.7500E+00 yrs |
| 9 | 236.00 | Th-227 | 0 | NET | 0.1230 | 2.1700E+01 yrs |
| 2 | 63.29 | Th-234 | 3 | QUANT | 0.0390 | 4.4680E+09 yrs |
| 3 | 92.50 | Th-234 | 2 | NET | 0.0553 | 4.4680E+09 yrs |
| 11 | 277.36 | T1-208 | 16 | QUANT | 0.0631 | 1.4500E+10 yrs |
| 16 | 583.14 | T1-208 | 20 | NET | 0.8450 | 1.4500E+10 yrs |
| 20 | 860.47 | T1-208 | 11 | QUANT | 0.1242 | 1.4500E+10 yrs |
| 5 | 143.76 | U-235 | 6 | NET | 0.1096 | 7.0379E+08 yrs |
| 6 | 163.35 | U-235 | 7 | QUANT | 0.0508 | 7.0379E+08 yrs |
| 7 | 185.72 | U-235 | 8 | ID | 0.5720 | 7.0379E+08 yrs |
| 8 | 205.31 | U-235 | 5 | QUANT | 0.0501 | 7.0379E+08 yrs |

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Technical Comments Regarding Gamma Spectroscopy Libraries

Library File: Ra-226.LIB

Nuclide: **Ra-226** Energy: various

Photon Abundance: various

Samples analyzed by this library are sealed in a steel can and allowed to ingrow for a 21day period to ensure the capture and full ingrowth of the Rn-222 gas and associated progeny. The Bi-214 and Pb-214 daughters are assumed to be in secular equilibrium with their parent, Ra-226. Ra-226 is then quantified from the ingrown Pb-214 and Bi-214 daughters using the 1600 year half-life of the Ra-226 parent.

Gamma Spectroscopist Radiochemistry Instrumentation Laboratory

Date

Library File: Ra226.lib File I.D.: Ra-226 (215g steel can)

| $\left(\begin{array}{c} \\ \end{array} \right)$ | Energy (keV) | Isotope Name | 2ndary Pk # | Type | Gamma Fraction | Halflife |
|--------------------------------------------------|-----------------|-----------------|----------------|-------|-------------------|----------------|
| | | | | | | |
| 1 | 295.21 | Ra-226 | 2 | QUANT | 0.1920 | 1.6000E+03 yrs |
| 2 | | Ra-226 | 3 | NET | 0.3710 | 1.6000E+03 yrs |
| 4 | | | _ | | | 1.6000E+03 yrs |
| 2 | 609.31 | Ra-226 | 4 | QUANT | 0.4609 | T.0000F+02 Ars |
| 3 | 003.27 | Ka-110 | - | | •• | |
| 4 | 1120.29 | Ra-226 | 1 | QUANT | 0.1510 | 1.6000E+03 yrs |

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TECHNICAL BULLETIN ADDENDUM

The library used for analysis defines the gamma emission(s) to be used for analysis of each nuclide. If multiple gamma emissions are used for quantification, then a 'NET' quantification emission (or peak) must be defined in the library. This designation provides for the calculation of nuclide activity concentrations and detection limits in the case of non-presence of the nuclide. When the nuclide is not present, or the software is unable to resolve a peak at the library defined 'NET' energy, the software evaluates the 'NET' region of interest ('NET' peak energy +/- 2 keV) by performing a summation of the net counts above the background level. This 'NET' quantification can result in net negative, zero, or positive activity results, and is highly dependent on the spectral distribution in the region of interest of the 'NET' peak. In cases where only the 'NET' peak is found, and the software performs a net quantification, the nuclide result will be flagged with an 'NQ' qualifier on the final reports. This indicates that the nuclide is not detected or supported at any level above the reported MDC. Results are submitted without further qualification.

All nuclides specified in the library of analysis for gamma spectroscopy are evaluated for positive <u>OR</u> tentative identification on the following criteria:

- The individual abundances for the gamma emissions specified for each nuclide are summed to obtain a total nuclide abundance.
- From the total nuclide abundance, a positive identification criterion is set as 75% of this total nuclide abundance.
- For all nuclide peaks that are not net quantified, those peak abundances are summed. The total non-net quantified peak sum is compared to the calculated 75% abundance criterion. If this sum is greater than the 75% criterion, the nuclide is considered to be positively identified at the reported concentration. If the sum is less than the 75% criterion, the nuclide is tentatively identified at the reported concentration. These results will be flagged with a 'TI' qualifier on the final reports to indicate that the 75% abundance criterion was not met.

Section 6

QUALITY ASSURANCE SUMMARY REPORTS



No NON-CONFORMANCE REPORTS or QUALITY ASSURANCE SUMMARY SHEETS are included in this data package.

Section 7

LABORATORY BENCH SHEETS



ALS -- Fort Collins

Radiochemistry Instrument Worksheet



| | | | | | | | ¢ | - | 4 | | | | | | | | | | | | |
|-------------|------------------------------|------------|----------|----------------------|---------------|-----------------|--------------------------------|-------------------|---------------------|--------------------------------|-------------------|---------------------|--------------------------------|-------------------|---------------------|-------------------------------|--------|-------------------------|-------------|------|----------|
| Prep | Prep Procedure: | nre: | ש | GAMMASCAN | IAS(| CAN | $\sum_{i=1}^{N}$ | | 020 | 2 | | | | | Analytic | Analytical QASS / NCR? Y /(N) | NCR? Y | Ň, | N (A | | |
| Prep Num | Lab ID Collection Date | AC Type | Init Alq | Adj Alq %Moist | Units Geo. | Report Units | Cnt 1 File Cnt Dur (min) | Cnt 1 Inst/Det | Cnt 1 Count Date | Cnt 2 File Cnt Dur (min) | Cnt 2 Inst/Det | Cnt 2 Count Date | Cnt 3 File Cnt Dur (min) | Cnt 3 Inst/Det | Cnt 3 Count Date | | | Notes | | | |
| - | 2106442-1 06/14/21 12:03 | 3 SMP | 425.7 | 377.6 11.293 | ¤ ₽ | pCi/g | aco | r | U light | 1202 | 1000 | $\eta L $ | 12020 | | | | | | | | |
| - | 2106442-1 06/14/21 12:03 | 3 DUP | 425.7 | 377.6 11.293 | ۍ ت | pCi/g | | NID | _ | | | Z 71 | 11/2021 | | | | | | | | |
| - | 2106442-2 06/14/21 12:14 | 4 SMP | 443.8 | 405 8.7523 | | pCi/g | 0001 | 5 | 191101 | 1 1202 | 0a 7 | IL 2 | 1202 0 | | | | | | | | |
| - | GS210619-1 06/19/21 10:34 | A MB | 200 | 200 | в (1 | pCi/g | | NIA | | | | 1 | 11 292 | | \setminus | | | | | | |
| - | GS210619-1 06/19/21 10:34 | 4 LCS | 200 | 500 | 9 13 | pCi/g | | ~ | | • • • | <u>3</u> | | | \bigvee | | | | | 102/51/L HC | 2121 | n |
| | < | | | | | | | | | < | | | 4 | | Spike Solution | tion Inform | ation | | | | |
| | Ţ | _ | | _ | 2 | h | NI 4 / / Ka/ (C). | | 1. 21 | | S | Soln # Nuclide | | SolnID | Exp Date F | Prep Conc | Units | Prep Date Aliquot Units | Aliquot | | Pipet ID |
| | 11 N & | 561 | Naysy F | • | 20 | | | י ג ו | | | | S1 Am | Am-241 1 | 1098 | | 444.544 | DPM/g | 06/19/21 | 500 | 6 | AA |
| | | • - | | | Č | | (| | | | | S1 Cd- | Cd-109 1 | 1098 | | 1,262.024 | DPM/g | 06/19/21 | 500 | 5 | Ą |
| | | _ | 1 | ~ | 2 | 2 | | | | | | | Ce-139 1 | 1098 | | 0.899 | DPM/g | 06/19/21 | 500 | 5 | Ą |
| | Jh. | ダン | 1 | T, | Ľ | としん | | | | | | S1 Co | Co-57 1 | 1098 | | 8.934 | DPM/g | 06/19/21 | 500 | 0 | A |
| | | . 1 . |) | | | | | | | | | | Co-60 1 | 1098 | | 191.699 | DPM/g | 06/19/21 | 500 | 0 | ¥ |
| | | | | | | | | | | | | | Cs-137 1 | 1098 | | 169.591 | DPM/g | 06/19/21 | 500 | ŋ | ¥ |
| | | | | | | | | | | | | | Hg-203 1 | 1098 | | 0.000 | DPM/g | 06/19/21 | 500 | 0 | ¥ |
| | | | | | | | | | | | | S1 Sn- | Sn-113 1 | 1098 | | 0.540 | DPM/g | 06/19/21 | 500 | 0 | ¥ |
| | | | | | | | | | | | | S1 Υ- | Y-88 1 | 1098 | | 0.527 | DPM/g | 06/19/21 | 200 | 5 | AA |
| Samn | Samnle Barcodes | sep | | | | | | | | | | | | | | | | | | | |
| 2 | >>====== | >>>> | | | | | | | | | | | | | | | | | | | |

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| *GS210619-1PS3* | |
|-------------------------------|--------------------------------|
| 2106442-2 GS210619-1PS3 | |
| *GS210619-1PS2* | *GS210619-1PS6* |
| 2106442-1DUP GS210619-1PS2 | GS210619-1LCS GS210619-1PS6 |
| *GS210619-1PS1* | *GS210619-1PS5* |
| 2106442-1 GS210619-1PS1 | GS210619-1MB GS210619-1PS5 |

GAMMASCAN Instrument Sheet

14:27

6/23/2021

Date Printed: Page 1 of 2

ALS -- Fort Collins LIMS Version: 7.536

ALS -- Fort Collins

Radiochemistry Instrument Worksheet



| | Analytical QASS / NCR? Y /(N) NIA | Cnt 3 Count Date | | | | | Splike Solution Information | ate Prep Conc Units Prep Date Aliquot Units Pipet ID | 444.544 DPM/g 06/19/21 500 g NA | 1,262.024 DPM/g 06/19/21 500 g NA | 06/19/21 500 g | 06/19/21 500 9 | 06/19/21 500 g | 06/19/21 500 g | 0.000 DPM/g 06/19/21 500 g NA | 06/19/21 500 9 | 0.527 DPM/g 06/19/21 500 g NA |
|---------------|-----------------------------------|-------------------------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|-----------------------------|------------------------------------------------------|---------------------------------|-----------------------------------|----------------|----------------|----------------|----------------|-------------------------------|----------------|-------------------------------|
| | • | Cnt 3 Inst/Det | | | | | 10g | SolnID Exp Date | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 |
| | | Cnt 2 Count Cnt 3 File Date Cnt Dur (min) | | | | | | Soln # Nuclide | S1 Am-241 | S1 Cd-109 | S1 Ce-139 | S1 Co-57 | | | S1 Hg-203 | | |
| | | Cnt 2 Inst/Det | | | | | | <u> </u> | <u> </u> | | | | | | | | |
| Para a second | | Cnt 1 Count Cnt 2 File Date Cnt Dur (min) | n Xus | | | | | | | | | | | | | | |
| | | Cnt 1 Inst/Det | Cuma | | | Ĺ | | | | 1100 | 601 | | | | | | |
| | | Cnt 1 File Cnt Dur (min) | a S | | | | | | / | | 1/bb/(| × × | | | | | |
| | 8 | Units Report Geo. Units | pCi/g | pCi/g | pCi/g | pCi/g | | R | Ś | 0 / | | • | | | | | |
| | 26/22 | | 9 E | 95 | 9 Ç | | | | Ś | ς | 2) |) | | | | | |
| | Ra_226/228 | lq Adj Alq Moist | SMP 425.7 377.6 11.293 | 425.7 377.6 11.293 | | | | | Ž | | 1 | ۲ ن | | | | | |
| | | QC Init Alq Type | 1P 425. | DUP 425. | IP 443.8 | B 500 | | | | | 1.0 | 2 | - | _ | 7 | , , | |
| | dure: | | | 2:03 | 2:14 | 9-1A MB | _ | | 5 | Ĺ | | > | (| _ | 11 |) | |
| | Prep Procedure: | Lab ID Collection Date | 2106442-1 06/14/21 12:03 | 2106442-1 06/14/21 12:03 | 2106442-2 06/14/21 12:14 | GS210619-1A 06/19/21 10:34 | | | (10) | > | | | (- | | | 7 | |
| | Prep | Prep Num |]-] | -] | - | - | | | | | | | | | | | |

V · S /

| <u>а</u> | | | | | | | | | |
|--------------------|----------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Units | 0 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 0 |
| Aliquot | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Prep Date | 06/19/21 500 9 | 06/19/21 | 06/19/21 | 06/19/21 | 06/19/21 | 06/19/21 | 06/19/21 | 06/19/21 | 06/19/21 |
| Units | DPM/g | DPM/g | DPM/g | DPM/g | DPM/g | DPM/g | DPM/g | DPM/g | DPM/g |
| Exp Date Prep Conc | | | 0.899 | 8.934 | 191.699 | 169.591 | 0.000 | 0.540 | 0.527 |
| Exp Date | | | | | | | | | |
| SolnID | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 |
| Nuclide | Am-241 | Cd-109 | Ce-139 | Co-57 | Co-60 | Cs-137 | Hg-203 | Sn-113 | Y-88 |
| Soln # | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 |

Sample Barcodes

| 2106442-1 GS210619-1PS1 | *GS210619-1PS1* | 2106442-1DUP GS210619-1PS2 | *GS210619-1PS2* | 2106442-2 GS210619-1PS3 | *GS210619-1PS3* |
|--------------------------------|-----------------|-------------------------------|-----------------|----------------------------|-----------------|
| GS210619-1AMB GS210619-1PS4 | *GS210619-1PS4* | | | | |
| Reporting Units | 0 | | | | |

| LablD: | TstGrpName: | RptUnits: |
|-----------|-----------------|-----------|
| 2106442-1 | GAMMA_Ra226 | pCi/g |
| 2106442-1 | Gamma_NP_Custom | pCi/g |
| 2106442-2 | GAMMA_Ra226 | pCi/g |
| 2106442-2 | Gamma_NP_Custom | pCi/g |

Date Printed:

| - ALS - | ALS Fort Collins | llins | | | | Å | adioche | mistry P | Radiochemistry Prep Worksheet | ksheet | Prep Batch: G\$210619-1 | |
|----------------------|----------------------------------|---------------------|--------------|-------------------------|-----------|-------------|--------------------------------|-----------------|---------------------------------|-------------|-------------------------------------|------------|
| | | | | | | ſ | | | | | | 1-1-1 |
| Prep F | Prep Procedure: | | GAMMASCAN | ASCA | z | | | | 9 | | Reviewed By: jcp (M Review Date: 6/ | 119/202161 |
| | | | \downarrow | | | | | | | | | |
| Non-Ro | Non-Routine Pre-Treatment? Y (N) | eatment? | z) > ~ ~ | / Batch: (| h: [] | | Ĩ | Re-Prep? Y (N | 🗸 Batch: 🗕 | | Prep QASS / NCR? Y I/N / W | |
| Prep | Prep SOP: PAI 739 | 39 Rev: 13 | 13 | | | Dron Ang | Dron Analyst: John C. Datrovic | Datrovic | | Balance: 46 |) | |
| Prep | Prep SOP: NONE | | | | | Dran D | Pren Date: 6/19/2021 | 1 | | Balance: NA | | |
| Matrix | Matrix Class: solid | | | | | Prep D | Prep Dept: GM | - | | | | |
| | | | | | | | | | | | | |
| Samp Prep Num Num | Prep LablD Num | QC Dish Type No. | | Init Alq Fin Alq 9 g | | Prep Basis | Geometry | Dish Weight (g) | Dry Weight + Dish Weight (g) | Standards | Prep Notes | |
| - | 1 2106442-1 | -1 SMP | Ň | 425.7 | 425.7 A | As Received | 13 | 47.9 | 473.6 | | | |
| 2 | 1 2106442-1 | -1 DUP | 7 | 425.7 | 425.7 A | As Received | 13 | 47.9 | 473.6 | | Count Duplicate | |
| £ | 1 2106442-2 | -2 SMP | | 443.8 4 | 443.8 A | As Received | 13 | 49.2 | 493 | | | , |
| 4 | 1 GS210619-1 | 9-1 MB | | 500 | 500 A | As Received | 13 | | | | | |
| ъ | 1 GS210619-1 | 9-1 LCS | | 500 | 500 A | As Received | 13 | | | S1 | | |
| Com | Comments | | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| Spi | Spiked By: <u>N/A</u> | | | Date | Date: N/A | | | | | | | |
| Witnes | Witnessed By: N/A | | | Date | Date: N/A | | | | | | | |
| | | | | | | | | | | | Spike Solution Information | |

| | | | Spike So | lution Inform | ation | | | | |
|--------|---------|--------|----------|---------------|-------|-------------------------|---------|-------|----------|
| Soln # | Nuclide | SoinID | Exp Date | Prep Conc | Units | Prep Date Aliquot Units | Aliquot | Units | Pipet ID |
| S1 | Am-241 | 1098 | | 444.544 | DPM/g | 06/19/21 | 500 | 6 | AN |
| S1 | Cd-109 | 1098 | | 1,262.024 | DPM/g | 06/19/21 | 500 | 5 | AN |
| S1 | Ce-139 | 1098 | | 0.899 | DPM/g | 06/19/21 | 500 | 5 | AN |
| S1 | Co-57 | 1098 | | 8.934 | DPM/g | 06/19/21 | 500 | 6 | AN |
| S1 | Co-60 | 1098 | | 191.699 | DPM/g | 06/19/21 | 500 | 6 | AN |
| S1 | Cs-137 | 1098 | | 169.591 | DPM/g | 06/19/21 | 500 | 5 | AN |
| S1 | Hg-203 | 1098 | | 0.000 | DPM/g | 06/19/21 | 500 | 5 | AN |
| S1 | Sn-113 | 1098 | | 0.540 | DPM/g | 06/19/21 | 500 | D | AN |
| S1 | Y-88 | 1098 | | 0.527 | DPM/g | 06/19/21 | 500 | 6 | NA |

GAMMASCAN Bench Sheet 6/19/2021 11:25

ALS -- Fort Collins LIMS Version: 7.536

| ALS Fort Collins | llins | | | ₽ ∠ | adioche | emistry F | Radiochemistry Prep Worksheet | rksheet | Prep Batch: GS210619-1 | |
|--------------------------------------------------------------------|---------------------|--------------|-------------------------|-------------------------|-------------------------------------------------------------------------|-----------------|---------------------------------|----------------------------|--------------------------|-------------------------|
| Prep Procedure: | | Ra_226/228 | , 28 | | | | (| | Reviewed By: jcp | (0 19/2021 6/19/2021 |
| Non-Routine Pre-Treatment? Y | atment? Y | Z | Batch: | * | | Re-Prep? Y N) | N) Batch: _ | V | Prep QASS / NCR? Y / N F | |
| Prep SOP: PAI 739 Rev: 13 Prep SOP: NONE Matrix Class: solid | 9 Rev: 13 | $\mathbf{)}$ | | Prep An Prep Prep | Prep Analyst: John C. Petrovic Prep Date: 6/19/2021 Prep Dept: GM | Petrovic | | Balance: 46 Balance: NA | | |
| Samp Prep LabID Num Num | QC Dish Type No. | | Init Alq Fin Alq g g | Prep Basis | Geometry | Dish Weight (g) | Dry Weight + Dish Weight (g) | Standards | Prep Notes | |
| 1 1 2106442-1 | 1 SMP | 425.7 | 425.7 | As Received | 13 | 47.9 | 473.6 | | | |
| 2 1 2106442-1 | 1 DUP | 425.7 | 425.7 | As Received | 13 | 47.9 | 473.6 | | Count Duplicate | |
| 3 1 2106442-2 | 2 SMP | 443.8 | 443.8 | As Received | 13 | 49.2 | 493 | | | |
| 4 1 GS210619-1A | 1A MB | 500 | 500 | As Received | 13 | | | | | |
| Comments | | | | | | | | | | |
| Spiked By: N/A | | | Date: N/A | | | | | | | |
| Witnessed By: N/A | | | Date: N/A | | | | | | | |

| | | | Spike So | lution Inform | ation | 2 | | | |
|--------|---------|--------|----------|---------------|-------|-----------|---------------|-------|----------|
| Soln # | Nuclide | SolnID | Exp Date | Prep Conc | Units | Prep Date | Aliquot Units | Units | Pipet ID |
| S1 | Am-241 | 1098 | | 444.544 | DPM/g | 06/19/21 | 500 | 6 | AN |
| S1 | Cd-109 | 1098 | | 1,262.024 | DPM/g | 06/19/21 | 500 | 6 | ٨A |
| S. | Ce-139 | 1098 | | 0.899 | DPM/g | 06/19/21 | 500 | 5 | ٨A |
| S. | Co-57 | 1098 | | 8.934 | DPM/g | 06/19/21 | 500 | 6 | AN |
| S1 | Co-60 | 1098 | | 191.699 | DPM/g | 06/19/21 | 500 | 6 | NA |
| S1 | Cs-137 | 1098 | | 169.591 | DPM/g | 06/19/21 | 500 | 6 | ٨A |
| S1 | Hg-203 | 1098 | | 0.000 | DPM/g | 06/19/21 | 500 | 6 | ٨N |
| S1 | Sn-113 | 1098 | | 0.540 | DPM/g | 06/19/21 | 500 | 6 | AN |
| S | Y-88 | 1098 | | 0.527 | DPM/g | 06/19/21 | 500 | 6 | NA |

Page 2 of 2 Ra_226/228 Bench Sheet Date Printed: 6/19/2021 11:25

ALS -- Fort Collins LIMS Version: 7.536

Supersedes:

| ~ | | Sample | Condit | ion Form (Solid) |
|---------------------|---------------|-------------------|-----------------------|------------------------------------------------------|
| Analyst: | | | | |
| Analysis Date: | 9/2021 | | | Method: Spec |
| | | Sample | Condition (Vi | sual Appearance of Analysis Aliquot at Time of Prep) |
| Work | Sample ID | Dry/Wet/ Moist | Texture | Remarks |
| Order 21()(24442 | | | Súl) | Packed As Received |
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I:\Oprtns\RAD\FORMS\Tracking Sheets and Condition Forms and Pipette Sheet\Sample Condition Form (Solid)

Section 8

STANDARDS TRACEABILITY DOCUMENTS



Analytics

Eckert & Ziegler 🕉 🕨 🥵 Received 8/20/19 1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318 Tel 40-4-352-8677 Fax 404.352.2837 www.ezaq.com

CERTIFICATE OF CALIBRATION Standard Reference Source

SRS Number: 110301 Source Description: 500 Grams Sand in 16 Ounce PP MRP Jar Product Code: 8401-EG-SAN Customer: ALS Laboratory Group P.O. Number: FC001958, Item 1

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 01-July-2018 12:00 PM EST **MGS Mixture**

| La chairte | Gamma-Ray | | | | Uncertainty | | | Calibration |
|------------|-------------|------------------------|----------------------------------------------------------------------------------------------------------------|-----------|-------------|--------------------|-------|----------------------------|
| Isotope | Energy, keV | Half-Life, d | Activity, Bq | Flux, s⊐ | uA, % | u ₈ , % | U, %* | Method** |
| Am-241 | 69.6 | 1.580E+05 | 3.723E+03 | 1.336E+03 | 0.1 | 1.8 | 3.6 | 4π LS |
| Cd-109 | 88.0 | 4.614E+02 | 5.231E+04 | 1.936E+03 | 0.5 | 2.0 | 4.1 | HPGe |
| Co-57 | 122.1 | 2.717E+02 | 1.183E+03 | 1.012E+03 | 0.4 | 1.7 | 3.4 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.775E+03 | 1.420E+03 | 0.4 | 1.7 | 3.6 | HPGe |
| Hg-203 | 279.2 | 4.659E+01 | 3.778E+03 | 3.082E+03 | 0.3 | 1.7 | 3.5 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 3.081E+03 | 2.002E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.099E+04 | 1.514E+03 | 1.288E+03 | 0.7 | 1.9 | 4.1 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 5.064E+03 | 4.745E+03 | 0.7 | 1.7 | 3.7 | HPGe |
| Y-88 | 1836.1 | | ANNUALS OF CARE | 5.024E+03 | 0.7 | 1.7 | 3.7 | nrue nrue |
| Co-60 | 1173.2 | 1.925E+03 | 2.362E+03 | 2.359E+03 | 0.7 | 1.8 | 3.9 | HPGe |
| Co-60 | 1332.5 | Contract Berger Market | A DE LE CALEGO DE LE CALE DE LE C | 2.362E+03 | 0.7 | 1.8 | 3.9 | nrge Nie nie wester gew |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. *Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." **Calibration Methods: 411 LS - 411 Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Standard Re-Veritied 09/01/2020. New From. > 191

EZA Certificate Program Rev. 0, 07-DEC-2015

Corporate Office 24937 Avenue Tibbitts Valencia, California 91355

SRS Number: 110301



Comments:

500.00 grams of customer supplied sand. Approximate volume: 290 mL

Expiration Date: 17-August-2019

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: An Mony 1. (Wallor A. Chirillo, Radiochemist

QC Approved by:

J. Lahr, Spectroscopist

_____ Date: <u>16-406-18</u>

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION



Gamma Spectroscopy

Initial Calibration Standards Traceability

ALS Laboratory Group - Fort Collins

GammaScan Geo 1 / Water Sample ID: 082220-1 FWHM Cal (1119) Sampling Start: 01/01/2020 10:00:00 | Counting Start: 08/22/2020 13:03:17 Sampling Stop: 01/01/2020 10:00:00 | Decay Time. 5.62E+003 Hrs Buildup Time. 0.00E+000 Hrs | Live Time 7200 Sec Sample Size 1.00E+000 L | Real Time 7441 Sec Detector #: 1 (Detector 1) Energy $(\text{keV}) = -1.83 + 0.501 \text{*Ch} + 0.00\text{E} + 00 \text{*Ch}^2 + 0.00\text{E} + 00 \text{*Ch}^3 08/22/2020$ $FWHM(keV) = 0.68 + 0.018*En + 5.50E-04*En^2 + 0.00E+00*En^3 08/22/2019$ Where En = Sart(Energy in keV) _____ Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000 ______ PEAK SEARCH RESULTS PK. ENERGY ADDRESS NET/MDA UN-C.L. BKG FWHM COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG # (keV) CHANNEL 0.90 a HiResid 535 324 19398 59.44 122.21 32648 1 26469 0.92 a HiResid 178.99 138172 874 378 2 87.91 122.06 247.10 20235 1.07 a 3 89025 729 344 275.85 11614 441 317 17101 1.08 a 4 136.47 15640 1.12 a 334.41 75062 660 303 5 165.84 512.72 2070 293 229 9671 1.02 a 6 255.23 9829 1.19 a 11971 365 240 7 279.19 560.50 391.71 7682 1.29 a 8 784.94 48092 504 204 4915 1.22 a 509.78 1020.44 385 196 158 9 511.36 1023.60 1093 8426 1.93 b 298 239 10 5771 1.54 a 80243 608 182 11 661.70 1323.46 5025 1.56 a 813.95 1627.13 743 208 165 12 6170 1.77 a 898.10 1794.97 13 50727 505 187 2880 1.96 a HiResid 85525 604 125 14 1173.29 2343.85 15 1325.15 2646.76 1086 138 100 1585 2.59 a HiResid

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1288 2.08 b HiResid

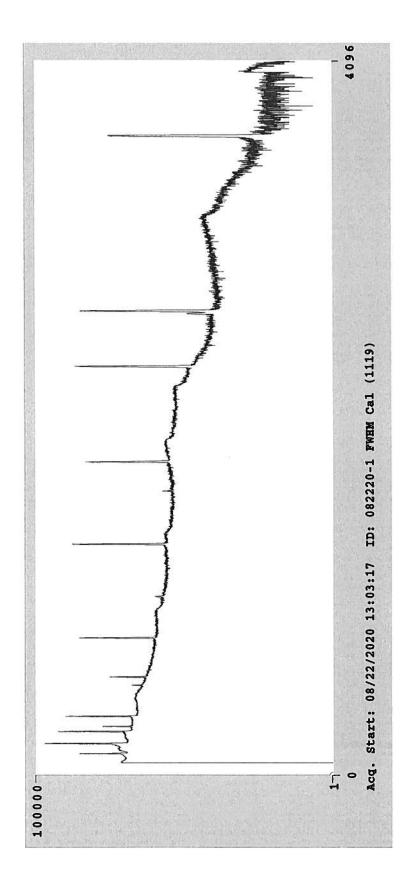
325 2.45 a HiResid

| | 201087 | D01.SPC An | alyzed | by | | | |
|---------|-----------------------------|----------------------|-----------------|--------------------|------------|---------------|-------|
| ***** | ****** | ******* | ***** | ****** | ******** | *********** | ***** |
| SEEKEI | R | CALI | BRA | TION | RESUL | T S Version | 2.0.4 |
| ***** | ****** | ****** | ***** | ***** | ******* | ***** | ***** |
| Stds. 1 | ID: 082220- Match Tolera | ance: 2.0 | 0 keV | | | | |
| Detecto | or Number: 0 |)1 Ca | librat | ion Date. | 08/22/ | 2020 13:03:17 | |
| | eV) = 0.74 (Where En = | + 0.020 SQR(Energ | *En + y in k | 4.70e-04*E eV)) | m^2 + 0.00 | | |
| Pk. | | leasured | | Calculat | | Prev.Calc. | |

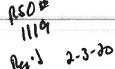
| Pk. | Energy | Measured | % | Calculated | % | Prev.Calc. |
|-----|---------|----------------|-------|------------------|-------|-----------------------------------------|
| # | (kev) | FWHM(keV) | Diff. | FWHM(keV) | Diff. | FWHM(kev) |
| | | ============== | | ================ | | ======================================= |
| 1 | 59.50 | 0.905 | 1.73 | 0.921 | -8.74 | 0.847 |
| 2 | 88.04 | 0.916 | 5.28 | 0.967 | -8.41 | 0.892 |
| 3 | 122.06 | 1.069 | -5.27 | 1.015 | -8.04 | 0.940 |
| 4 | 165.85 | 1.117 | -4.19 | 1.072 | -7.60 | 0.996 |
| 5 | 279.00 | 1.195 | 0.46 | 1.200 | -6.59 | 1.126 |
| 6 | 391.68 | 1.294 | 1.52 | 1.314 | -5.74 | 1.243 |
| 7 | 661.64 | 1.539 | 1.19 | 1.557 | -4.11 | 1.496 |
| 8 | 898.02 | 1.768 | -0.93 | 1.752 | -2.99 | 1.701 |
| 9 | 1173.21 | 1.962 | 0.17 | 1.965 | -1.94 | 1.928 |
| 10 | 1332.48 | 2.079 | 0.28 | 2.084 | -1.42 | 2.055 |
| 11 | 1836.01 | 2.451 | -0.23 | 2.446 | -0.06 | 2.444 |

Calibration Results Saved.

DK Metzztow



Eckert & Ziegler



1380 Seab oard Industrial Blvd. Atlanta, G eorgia 30318 Tel 404•3 52•8677 Fax 404•3 52•2837 www.ezag.com

Analytics

CERTIFICATE OF CALIBRATION Standard Reference Source

SRS Number: 114986 Source Description: 1.0 Liter Solid in 138G GA-MA Beaker Product Code: 8401-EG-SD Customer: ALS Laboratory Group (Paragon) P.O. Number: FC002657, Item 1

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Density of solid matrix: $1.17 \text{ g/cm}^3 \pm 3 \%$.

Reference Date: 01-January-2020 12:00 PM EST MGS Mixture

| | Gamma-Ray | | a === | | Uncertainty | | | Calibration |
|--------------|-------------|--------------|--------------|-----------------------|--------------------|--------------------|-------|-------------|
| lsotope | Energy, keV | Half-Life, d | Activity, Bq | Flux, s ⁻¹ | u _A , % | u _B , % | U, %* | Method** |
| Am-241 | 59.5 | 1.580E+05 | 3.812E+03 | 1.368E+03 | 0.1 | 1.8 | 3.7 | 4TT LS |
| Cd-109 | 88.0 | 4.614E+02 | 5.212E+04 | 1.928E+03 | 0.5 | 2.0 | 4.2 | HPGe |
| Co-57 | 122.1 | 2.717E+02 | 1.173E+03 | 1.004E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.778E+03 | 1.422E+03 | 0.4 | 1.8 | 3.7 | HPGe |
| Hg-203 | 279.2 | 4.659E+01 | 3.695E+03 | 3.014E+03 | 0.3 | 1.7 | 3,5 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 3.068E+03 | 1.994E+03 | 0.4 | 2.0 | 4.1 | HPGe |
| Cs-137 | 661.7 | 1.099E+04 | 1.502E+03 | 1,278E+03 | 0.7 | 1.9 | 4.1 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 5.104E+03 | 4.783E+03 | 0.7 | 1.7 | 3.7 | HPGe |
| Y-88 | 1836.1 | | | 5.063E+03 | 0.7 | 1.7 | 3.7 | |
| Co-60 | 1173.2 | 1.925E+03 | 2.383E+03 | 2.379E+03 | 0.7 | 1.8 | 3.9 | HPGe |
| Co-60 | 1332.5 | (| | 2.382E+03 | 0.7 | 1.8 | 3.9 | |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. ***Uncertainty:** U - Relative expanded uncertainty,

k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Page 1 of 2

SRS Number: 114986

Expiration Date: 31-January-2021

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by:

A. Herron, Radiochemist

QC Approved by:

ZECL

Date: 29 Jan 20

A. Chen, Spectroscopist

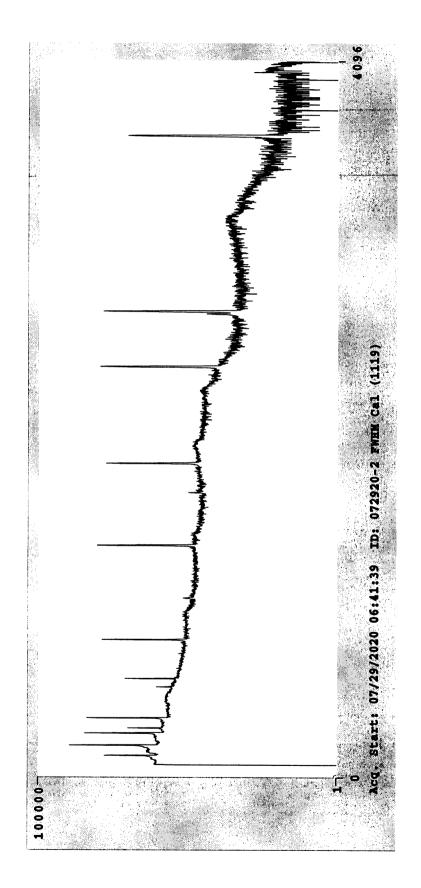
200210D02.SPC Analyzed by ********************************* ******** SEEKER GAMMA ANALYSIS RESULTS PS Version 1.8.4 ALS Laboratory Group - Fort Collins GammaScan Geo 1 / Water Sample ID: 072920-2 FWHM Cal (1119) _____ 01/01/2020 10:00:00 | Counting Start: 07/29/2020 06:41:39 Sampling Start: Sampling Stop: 01/01/2020 10:00:00 | Decay Time. 5.04E+003 Hrs Buildup Time. 0.00E+000 Hrs | Live Time 1800 Sec 1885 Sec Collection Efficiency Detector #: 2 (Detector 2) Energy $(keV) = -1.33 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 07/29/2020$ $FWHM(keV) = 0.41 + 0.047*En + 0.00E+00*En^2 + 0.00E+00*En^3 07/16/2020$ Where En = Sqrt(Energy in keV) Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000 PEAK SEARCH RESULTS PK. ENERGY ADDRESS NET/MDA UN-C.L. BKG FWHM # CHANNEL COUNTS CERTAINTY COUNTS (keV) COUNTS (keV) FLAG 1 59.49 121.41 13558 315 174 6117 0.79 a HiResid 72.97 148.31 0.41 a 2 162 124 100 2771 87.97 178.25 52402 3 513 191 7358 0.81 a HiResid 155 4 122.07 246.34 32161 405 4812 0.83 a HiResid 136.55 275.23 5 3999 215 144 4152 0.76 a HiResid 3788 6 165.84 333.70 29005 379 137 0.90 a HiResid 7 255.19 512.06 854 174 134 3342 0.91 a 559.98 8 279.19 6172 212 117 2895 1.03 a 391.70 9 784.57 20627 317 110 2384 1.14 a HiResid 0.75 a NET< CL 10 509.01 1018.73 37 92 75 1289 Wide Pk 11 511.34 1023.39 449 215 173 3866 2.40 Ъ 12 661.65 1323.45 31087 372 97 1.36 a HiResid 1924 13 813.84 1627.26 376 118 92 1.55 a 1634 14 875.37 1750.08 80 65 64 1025 0.90 a 15 898.04 1795.32 23406 329 100 1936 1.53 a HiResid 16 1173.19 2344.59 34610 76 1.74 a HiResid 383 1103 17 1325.14 2647.92 583 118 89 1032 3.62 a HiResid Wide Pk 18 1332.35 2662.30 31921 363 52 516 1.84 b HiResid 19 1835.75 3667.20 14403 243 30 165 2.16 a HiResid

| | 2002 | 210D02.SPC A | nalyzed | by | | | |
|---------|------------|--------------|----------|------------------|--------|-------------------------------|----------|
| ***** | ******* | ******* | ****** | ******** | ****** | ********** | ******** |
| SEEKE | R | CALI | BRAT | ION RE | SULT | S Version | 2.0.4 |
| ***** | | | | | | * * * * * * * * * * * * * * * | |
| Sample | ID: 07292 | 20-2 FWHM Ca | 1 (1119) | | | | |
| Stds. I | Match Tole | rance: 2. | 00 keV | | | | |
| Detecto | or Number: | | | on Date | | | |
| FWHM(ke | eV) = 0. | | | .08e-04*En^2 | | | |
| | - | n = SQR(Ener | | | | | |
| | | | | | | | |
| Pk. | Energy | Measured | % | Calculated | % | Prev.Calc. | |
| # | (kev) | FWHM(keV) | Diff. | FWHM(keV) | Diff. | FWHM(kev) | |
| | | | | | | | |
| 1 | 59.50 | 0.792 | -3.37 | 0.766 | 0.77 | 0.772 | |
| 2 | 88.04 | 0.810 | 0.04 | 0.810 | 4.79 | 0.851 | |
| 3 | 122.06 | 0.831 | 2.93 | 0.856 | 7.87 | 0.929 | |

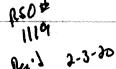
| - | | | | 0.010 | | | |
|----|---------|-------|-------|-------|-------|-------|--|
| 3 | 122.06 | 0.831 | 2.93 | 0.856 | 7.87 | 0.929 | |
| 4 | 165.85 | 0.897 | 1.23 | 0.908 | 10.45 | 1.015 | |
| 5 | 279.00 | 1.027 | 0.05 | 1.028 | 13.92 | 1.194 | |
| 6 | 391.68 | 1.136 | -0.32 | 1.133 | 15.38 | 1.339 | |
| 7 | 661.64 | 1.364 | -0.59 | 1.356 | 16.12 | 1.617 | |
| 8 | 898.02 | 1.529 | 0.31 | 1.533 | 15.53 | 1.815 | |
| 9 | 1173.21 | 1.738 | -0.61 | 1.728 | 14.32 | 2.016 | |
| 10 | 1332.48 | 1.836 | -0.00 | 1.836 | 13.49 | 2.122 | |
| 11 | 1836.01 | 2.156 | 0.28 | 2.162 | 10.62 | 2.419 | |
| | | | | | | | |

Calibration Results Saved.

Oh JP-7/29/2020



Eckert & Ziegler



1380 Seab oard Industrial Blvd. Atlanta, G eorgia 30318 Tel 404•3 52•8677 Fax 404•3 52•2837 www.ezag.com

Analytics

CERTIFICATE OF CALIBRATION Standard Reference Source

SRS Number: 114986 Source Description: 1.0 Liter Solid in 138G GA-MA Beaker Product Code: 8401-EG-SD Customer: ALS Laboratory Group (Paragon) P.O. Number: FC002657, Item 1

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Density of solid matrix: $1.17 \text{ g/cm}^3 \pm 3 \%$.

MG8 Mixture

Reference Date: 01-January-2020 12:00 PM EST

| | Gamma-Ray | | | | Ur | ncertair | Calibration | |
|--------------|-------------|--------------|--------------|-----------------------|--------------------|--------------------|-------------|----------|
| Isotope | Energy, keV | Half-Life, d | Activity, Bq | Flux, s ⁻¹ | u _A , % | u _B , % | U, %* | Method** |
| Am-241 | 59.5 | 1.580E+05 | 3.812E+03 | 1.368E+03 | 0.1 | 1.8 | 3.7 | 411 LS |
| Cd-109 | 88.0 | 4.614E+02 | 5.212E+04 | 1.928E+03 | 0.5 | 2.0 | 4.2 | HPGe |
| (⊘(a):37/ | 122.1 | 2.717E+02 | 1.173E+03 | 1.004E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.778E+03 | 1.422E+03 | 0.4 | 1.8 | 3.7 | HPGe |
| 162203 | 279.2 | 4.659E+01 | 3.695E+03 | 3.014E+03 | 0.3 | 1.7 | 3.5 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 3.068E+03 | 1.994E+03 | 0.4 | 2.0 | 4.1 | HPGe |
| -C-287. | 661.7 | 1.099E+04 | 1.502E+03 | 1.278E+03 | 0.7 | 1.9 | 4.1 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 5.104E+03 | 4.783E+03 | 0.7 | 1.7 | 3.7 | HPGe |
| 37-88 | 1836.1 | | | 5.063E+03 | 0.7 | 1.7 | 3.7 | |
| Co-60 | 1173.2 | 1.925E+03 | 2.383E+03 | 2.379E+03 | 0.7 | 1.8 | 3.9 | HPGe |
| Co-60 | 1332.5 | | 57 <u> </u> | 2.382E+03 | 07 | 18 | 39. | |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. ***Uncertainty:** U - Relative expanded uncertainty,

k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Page 1 of 2

SRS Number: 114986

Expiration Date: 31-January-2021

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: Pren

A. Herron, Radiochemist

QC Approved by:

A. Chen, Spectroscopist

Date: 29 Jan 20

210686D01.SPC Analyzed by ************ GAMMA ANALYSIS RESULTS SEEKER PS Version 1.8.4 ALS Laboratory Group - Fort Collins GammaScan Geo 13 / Solid Sample ID: 062521-1 Geo 13 Eff Cal (1130) 07/01/2020 10:00:00 | Counting Start: 06/25/2021 07:54:19 Sampling Start: Sampling Stop: 07/01/2020 10:00:00 | Decay Time. 8.61E+003 Hrs Buildup Time. 0.00E+000 Hrs | Live Time 4500 Sec Sample Size 5.00E+002 g | Real Time 4592 Sec Collection Efficiency Detector #: 1 (Detector 1) Energy(keV) = -2.00 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/25/2021 $FWHM(keV) = 0.74 + 0.020*En + 4.70E-04*En^2 + 0.00E+00*En^3 08/22/2020$ Where En = Sqrt(Energy in keV) Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000 PEAK SEARCH RESULTS PK. ENERGY ADDRESS NET/MDA UN-C.L. BKG FWHM # (keV) CHANNEL COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG 59.47 122.66 1 11609 310 183 6771 0.78 a HiResid 2 87.98 179.54 10647 0.93 a 57666 562 240 3 122.11 247.64 33418 447 212 8266 0.97 a 136.54 4 276.43 4434 268 191 6739 1.05 a 165.88 5 334.98 20601 363 183 6188 0.98 a HiResid 6 255.19 513.18 741 228 182 6114 1.28 a 279.33 7 561.35 1181 220 172 5479 1.23 a 8 310.63 623.79 155 143 116 3063 0.79 a 9 391.89 785.92 12836 292 151 4234 1.30 a 10 511.35 1024.29 393 3486 177 142 **1.47** a 11 661.97 1324.82 45397 455 131 3189 1.64 a HiResid

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898.48 1796.72

14 1173.80 2346.06

15 1333.06 2663.82

16 1836.73 3668.80

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41650

7266

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4793 3.00 a Wide Pk

1667 2.20 a HiResid

184 2.74 a HiResid

1.83 a HiResid

2.32 a HiResid

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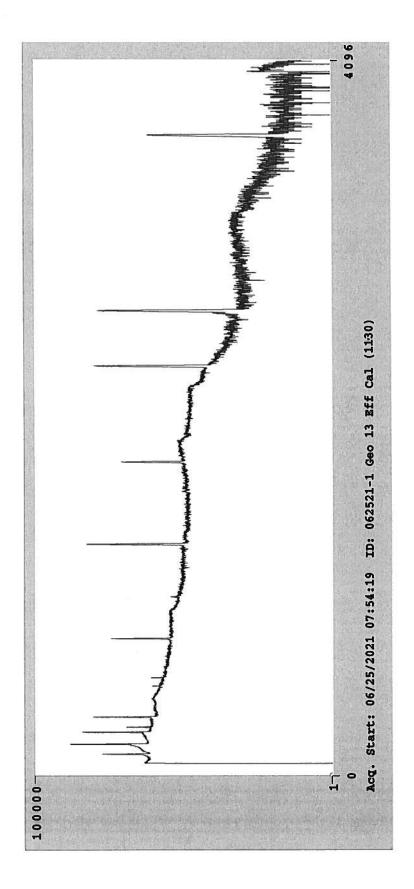
| | 210686D01.SPC Analyzed by | | | | | | | | | | |
|--------------------------------------------------------|---------------------------|------------------------|-------------|-------------|-----------|------------|-------------|-------|--|--|--|
| ***** | ****** | ****** | ******* | ****** | ****** | ******* | ******* | **** | | | |
| SEEK | ter b | ACKGR | OUND S | UBTRA | CT RE | SULTS | Version 1 | .8.2 | | | |
| | | | LS Laborato | GammaScan | 4 | | | | | | |
| *************************************** | | | | | | | | | | | |
| Background File: DET010623.BKG (062321-1 LONG BKG CAL) | | | | | | | | | | | |
| Bkg.F ===== | ile Dete | ctor #: 1 ========= | | | | | | | | | |
| | | | | IND SUBTRAC | T RESULTS | | | | | | |
| | | | | :========== | | 8828222222 | =========== | 88222 | | | |
| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | | | | |
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | | FLAG | | | |
| 10 | 511.35 | 393 | 177 | 142 | 283 | 178 | 144 | | | | |

210686D01.SPC Analyzed by SEEKER CALIBRATION RESULTS Version 2.0.4 Sample ID: 062521-1 Geo 13 Eff Cal (1130) Stds. Match Tolerance: 2.00 keV Detector Number: 01 Calibration Date. . . 06/25/2021 07:54:19 Geometry File (D01)(Sh13).EFF ID. Geo 13 Eff Cal Amount of Std. in Calib. Source: 500.000000 gm Crossover: 300.00 keV Below Crossover Efficiency Fit: Eff = 10 ^ [-1.10e+02 + 1.44e+02*En +-6.36e+01*En^2 + 9.33e+00*En^3] (Where En = LOG(Energy in keV)) (Polynomial) Above Knee Efficiency Fit: $Eff = exp \wedge [5.97e-01 + -8.38e-01*En + 0.00e+00*En^2]$ (Where En = Energy in keV) (Linear/Quad) - - - - - -_ = -----_ _

| Pk. | Energy | Measured | % | Calculated | % | Prev.Calc. |
|------|---------|-----------------|------------|-----------------|------------|-----------------|
| # | (kev) | Efficiency | Difference | Efficiency | Difference | Efficiency |
| ==== | | | | | | |
| 1 | 59.50 | 1.94e-03 | 0.36 | 1.95e-03 | 10.05 | 2.16e-03 |
| 2 | 88.04 | 1.14e-02 | -1.74 | 1.12e-02 | 1.36 | 1.14e-02 |
| 3 | 122.06 | 1.81e-02 | 2.68 | 1.86e-02 | 3.29 | 1.92e-02 |
| 4 | 165.85 | 1.94e-02 | -1.57 | 1.91e-02 | 4.73 | 2.01e-02 |
| 5 | 279.00 | 1.79e-02 | 0.21 | 1.79e-02 | -15.24 | 1.55e-02 |
| 6 | 391.68 | 1.20e-02 | 1.47 | 1.22e-02 | -0.10 | 1.22e-02 |
| 7 | 661.64 | 8.00e-03 | -1.84 | 7.86e-03 | 3.24 | 8.12e-03 |
| 8 | 898.02 | 6.02e-03 | 1.00 | 6.08e-03 | 4.88 | 6.40e-03 |
| 9 | 1173.21 | 4.97e-03 | -2.14 | 4.86e-03 | 6.13 | 5.18e-03 |
| 10 | 1332.48 | 4.40e-03 | -0.60 | 4.37e-03 | 6.67 | 4.68e-03 |
| 11 | 1836.01 | 3.27e-03 | 2.04 | 3.34e-03 | 7.89 | 3.63e-03 |

Calibration Results Saved.

Ohor (125/2121



Gamma Efficiency Calibration - Crossover energy efficiency difference

Calibration 6/25/2021 Detector 1 Geometry 13 Crossover energy=300 keV

| | | | MEETS ALS |
|------------------------|-----------------|----------------|----------------------|
| | EFF @ CROSSOVER | <u>% DIFF*</u> | ACCEPTANCE CRITERIA? |
| LOWER EFFICIENCY CURVE | 0.014917 | -2.20% | ОК |
| UPPER EFFICIENCY CURVE | 0.015252 | 2.25% | ОК |

*When a single calibration curve does not meet ALS acceptance criteria, a split-fit efficiency calibration may be employed. This entails the use of two separate energy range calibrations, a low energy efficiency curve and a high energy efficiency curve. A crossover energy must be specified that marks where the software will use either the low energy efficiency curve or the high energy efficiency curve. It should be noted that if a nuclide is specified that has a gamma photon energy that is equal to <u>OR</u> within 15 keV of the crossover energy, the potential exists for the calculated efficiencies at the crossover energy to be significantly different than the true detection efficiency of the detector. At times by as much as 20%. This is an artifact of the non-equivalency of the calibration equations specified for each energy range. This may result in an effective high or low bias to the analytical results. This bias is reflected in the above calculated % difference. ALS Environmental will not accept any calibration with an effective % difference of greater than 5% without supervisory approval. Results are submitted without further qualification.

Efficiency equations

| Polynomial | • | 10^(A+B*(LOG(En))+C*(LOG(En))^ | 2+D*(LOG(En))^3) | |
|--------------|---------------|-----------------------------------|------------------|--|
| A | -1.104310E+02 | | | |
| В | 1.440889E+02 | | | |
| С | -6.357339E+01 | Calculated efficiency | 0.014917 | |
| D | 9.327247E+00 | | | |
| En is energy | in keV | | | |
| Crossover e | nergy | 300 | | |
| Linear | | e^(A+(B*(In(En)))+(C*(In(En))^2)) | | |
| A | 5.971200E-01 | | | |
| В | -8.380697E-01 | | | |
| С | | Calculated efficiency | 0.015252 | |
| . | | | | |

En is energy in keV Crossover energy

300

Ono clastace

| Pk # | Nuclide | Energy | Halflife | Br.Ratio | dps/gm |
|------|---------|---------|-------------|-------------|--------|
| | ****** | | | | |
| 1 | Am-241 | 59.50 | 4.320E+02 y | rs 0.35900 | 7.43 |
| 2 | Cd-109 | 88.04 | 4.626E+02 d | ys 0.03610 | 106.21 |
| 3 | Co-57 | 122.06 | 2.718E+02 d | ys 0.85510 | 2.40 |
| 4 | Ce-139 | 165.85 | 1.376E+02 d | ys 0.80350 | 3.58 |
| 5 | Hg-203 | 279.00 | 4.661E+01 d | ув 0.77300 | 7.89 |
| 6 | Sn-113 | 391.68 | 1.151E+02 d | ys 0.64900 | 6.35 |
| 7 | Cs-137 | 661.64 | 3.007E+01 y | rs 0.85120 | 3.03 |
| 8 | Y-88 | 898.02 | 1.066E+02 d | ys 0.93400 | 10.29 |
| 9 | Co-60 | 1173.21 | 5.271E+00 y | rs 0.99980 | 4.78 |
| 10 | Co-60 | 1332.48 | 5.271E+00 y | rs 0.99990 | 4.79 |
| 11 | Y-88 | 1836.01 | 1.066E+02 d | lys 0.99380 | 10.24 |

Eckert & Ziegler

Analytics

(250 th 1130 flecid 7-30-00

1380 SeabOard Industrial Bivd. Atlanta, Georgia 30318 Tel 404-352-8677 Fax 404-352-2837 www.ezag.com

CERTIFICATE OF CALIBRATION Standard Reference Source

SRS Number: 116626 Source Description: 500 Grams Sand in PP MRP Jar Product Code: 8401-EG-SAN Customer: ALS Laboratory Group P.O. Number: FC002882, Item 1

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were addled gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.18, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 01-July-2020 12:00 PM EST MGS Mixture

| | Gamma-Ray | | | | Ur | ncertair | nty | Calibration |
|---------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------|--------------------|--------------------|-------|----------------------------------------|
| isotope | Energy, keV | Half-Life, d | Activity, Bq | Flux, s ⁻¹ | u _A , % | u ₈ , % | U, %* | Method** |
| Am-241 | 69.6 | 1.880E+05 | 3.714E+03 | 1.333E+03 | 0.1 | 1.8 | 3.7 | 4n LS |
| Cd-109 | 88.0 | 4.614E+02 | 5.180E+04 | 1.917E+03 | 0.8 | 2.0 | 4.2 | HPGe |
| Co-87 | 122,1 | 2.717E+02 | 1.197E+03 | 1.025E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.798E+03 | 1.438E+03 | 0.4 | 1.8 | 3.7 | HPGe |
| Hg-203 | 279,2 | 4.659E+01 | 3.741E+03 | 3.051E+03 | 0.3 | 1.7 | 3.8 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 3.171E+03 | 2.060E+03 | 0.4 | 2.0 | 4.1 | HPGe |
| Cs-137 | 661.7 | 1.099E+04 | 1.515E+03 | 1.289E+03 | 0.7 | 1.9 | 4.1 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 5.127E+03 | 4.804E+03 | 0.7 | 1.7 | 3.7 | HPGe |
| Y-88 | 1836.1 | | CONTRACTOR OF ST | 5.086E+03 | 0.7 | 1.7 | - 3.7 | ************************************** |
| Co-60 | 1173.2 | 1.925E+03 | 2.396E+03 | 2.392E+03 | 0.7 | 1.8 | 3.9 | HPGe |
| Co-60 | 1332.5 | Section and the section of the secti | SECTOR FOR | 2.398E+03 | 0.7 | 1.8 | 3.9 | 210.00 |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. ***Uncertainty:** U - Relative expanded uncertainty,

k = 2.5ee NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

EZACertificate Program Rev. 1, 01-FEB-2019

115 of 173

Corporate Office

Laboratory

SRS Number: 116626

Comments: 500.3 g of customer supplied sand. Approximate volume: 290 mL

Expiration Date: 28-July-2021

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

1. Source Prepared by:

M. Alfonso, Production Manager

QC Approved by:

J. Lahr, Spectroscopist

Date: 23-JI/L-20

Calibration verification

Geometry 13 Calibration Verification: Gamma Mixed Nuclide Source; Geometry 13 500-gram soil/solid geometry Detector 1

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| | | # of Half Lives | Expired | 0.01 | 2.36 | 4.01 | 7.92 | 23.39 | 9.47 | 0.10 | 10.22 | 0.57 | 0.57 | 10.22 |
|----------------------------|------------------------------|-----------------|--------------------|----------|---------|--------|------------|------------|------------|---------|--------------|--------|--------|------------|
| | | | Pass/Fail | Pass | Pass | Pass | >5 h-lives | >5 h-lives | >5 h-lives | Pass | >5 h-lives | Pass | Pass | >5 h-lives |
| Count Date: 6/25/2021 | | | Recovery | 105% | 101% | 96% | >5 h-lives | >5 h-lives | >5 h-lives | 101% | >5 h-lives | 101% | 103% | >5 h-lives |
| int Date: | | 3 | Activity | 212 | 2850 | 61.6 | 76.9 | S | S | 83.0 | S | 129 | 132 | NC |
| Cou | | | pCi/g | 201.2 | 2813.1 | 64.0 | 95.5 | 215.5 | 166.7 | 81.8 | 274.6 | 127.5 | 127.7 | 273.3 |
| | EXPECTED ACTIVITY | | DPS | 3721.4 | 52043.0 | 1183.5 | 1767.3 | 3987.1 | 3084.7 | 1513.2 | 5080.3 | 2359.5 | 2362.2 | 5055.3 |
| | EXPECTE | | | J Am-241 | Cd-109 | Co-57 | Ce-139 | Hg-203 | Sn-113 | Cs-137 | Y-88 | Co-60 | Co-60 | Y-88 |
| 7/1/2018 | | Mass of | Standard | 200 | | | | | | | | | | |
| REF DATE : 7/1/2018 | FROM ANALYTICS.LIB | | Gamma Fraction: | 0.3590 | 0.0372 | 0.8551 | 0.8035 | 0.7730 | 0.6490 | 0.8512 | 0.9340 | 0.9998 | 0.9999 | 0.9938 |
| | -ICATE | | Gammas/Sec. | 1336 | 1936 | 1012 | 1420 | 3082 | 2002 | 1288 | 4745 | 2359 | 2362 | 5024 |
| 1098 | FROM CALIBRATION CERTIFICATE | | KeV Half Life(y) | 432.0000 | 1.2666 | 0.7441 | 0.3768 | 0.1276 | 0.3151 | 30.0000 | 0.2919 | 5.2714 | 5.2714 | 0.2919 |
| VERIF. SOURCE : | VLIBRA | | | 59.5 | 88 | 122 | 166 | 279 | 392 | 662 | 898 | 1173 | 1332 | 1836 |
| VERIF. S | FROM CA | | Isotope | Am-241 | Cd-109 | Co-57 | Ce-139 | Hg-203 | Sn-113 | Cs-137 | <u> Ү-88</u> | Co-60 | Co-60 | Y-88 |

NC = NOT CALCULATED DUE TO THE ACTIVITY BEING LESS THAN THE MDCa

reelsen non

210687D01.SPC Analyzed by GAMMA ANALYS'IS RESULTS PS Version 1.8.4 SEEKER ALS Laboratory Group - Fort Collins GammaScan Geo 13 / Solid Sample ID: 062521-1A Geo 13 Cal Ver (1098) 07/01/2018 10:00:00 | Counting Start: 06/25/2021 09:35:19 Sampling Start: Sampling Stop: 07/01/2018 10:00:00 | Decay Time. 2.62E+004 Hrs Buildup Time. 0.00E+000 Hrs | Live Time 1800 Sec 1822 Sec Sample Size 5.00E+002 g | Real Time Detector #: 1 (Detector 1) Energy $(keV) = -2.00 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 06/25/2021$ $FWHM(keV) = 0.74 + 0.020*En + 4.70E-04*En^2 + 0.00E+00*En^3 08/22/2020$ Where En = Sqrt(Energy in keV) Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000 ______ PEAK SEARCH RESULTS UN-BKG FWHM NET/MDA C.L. PK. ENERGY ADDRESS COUNTS CERTAINTY COUNTS COUNTS (keV) FLAG # (keV) CHANNEL _ _ _ _ . 59.53 122.78 185 99 1811 0.93 a HiResid 4940 1 1792 0.95 a 88.00 179.59 7778 213 98 2 247.72 2005 143 92 1566 0.98 a 3 122.15 1819 1.08 a 310 130 103 4 136.48 276.32 165.91 335.04 163 99 79 1257 0.81 a 5 879 0.76 a 89 78 62 6 310.34 623.21 51 630 0.64 a NET< CL 7 349.73 701.81 50 63 974 1.43 a NET< CL 92 75 8 511.17 1023.92 60 17280 771 1.64 a HiResid 662.09 1325.06 274 65 9 51 462 2.19 a HiResid 10 1173.99 2346.44 14139 246 115 2.43 a HiResid 11 1333.24 2664.18 230 26 12972 12 1461.89 2920.87 30 17 10 23 1.52 a

| | 2: | L0687D01.S | PC Analyzed | by | | | | | | | | |
|-----------------------------------------|-----------|------------|-------------|-------------|-----------|-------------|--------------------------|--|--|--|--|--|
| **** | ******* | ******* | ******* | ******* | ******* | ******** | ***** | | | | | |
| SEEK | ER I | BACKG | ROUND | SUBTR | ACT R | ESULT | S Vers. 2.2.1 | | | | | |
| | | | | | | | | | | | | |
| | | А | LS Laborato | ry Group - | Fort Col | lins | | | | | | |
| | GammaScan | | | | | | | | | | | |
| *************************************** | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Back | ground Fi | le: | DET010 | 623.BKG (| 062321-1 | LONG BKG CA | L) | | | | | |
| | | | | | | | | | | | | |
| Bkg. | File Dete | ctor #: 1 | | | | | | | | | | |
| ==== | | | | | | | ************* | | | | | |
| | | | BACKGROU | IND SUBTRAC | T RESULTS | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | ENERGY | OLD NET | OLD UN- | OLD | NEW NET | NEW UN- | NEW | | | | | |
| PK# | (keV) | COUNTS | CERTAINTY | CR.LEVEL | COUNTS | CERTAINTY | CR.LEVEL FLAG | | | | | |
| | | | | | | | | | | | | |
| 8 | 511.17 | 60 | 92 | 75 | 16 | 93 | 76 NET <cl< th=""></cl<> | | | | | |
| 12 | 1461.89 | 30 | 17 | 10 | 11 | 17 | 13 NET <cl< th=""></cl<> | | | | | |

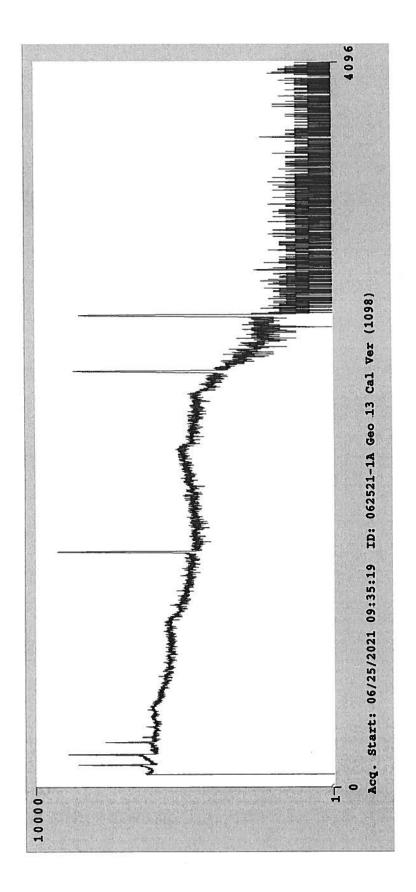
| * * * * * * * * * | 210687D01. | SPC Analy | zed by | ******* | ****** | ****** | * * * * * * * * * * * | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|-----------------------------------------------|----------------------------------------------------|----------------------|--------------------|--------------------------------------------------|--|--|--|
| SEEKER | FIN | JAL A | СТІVІ | TY RE | PORT | Versi | on 2.2.1 | | | |
| | | | - | | - 11 4 | | | | | |
| | | ALS Labor | atory Grou Gammas | ıp - Fort C Scan | ollins | | | | | |
| ***** | ****** | ****** | | | ****** | ****** | * * * * * * * * * | | | |
| | | | | | | | | | | |
| | | | Geo 13 / | / Solid | | | | | | |
| Sample II | D: 062521-1A | Geo 13 Ca | l Ver (10 9 | 98) | | | | | | |
| Sampling Buildup S Sample S Collection | Start: 07, Stop: 07, Fime ize on Efficiency L Confidence | /01/2018 1 . 0.00e+ 5.00 | 0:00:00 000 Hrs e+002 g 1.0000 | Decay Time Live Time Real Time Spectrum F | | 2.6 210 | 2e+004 Hrs 1800 Sec 1822 Sec 687D01.SPC | | | |
| | | | | | | | | | | |
| Detector #: 1 (Detector 1) Efficiency File: (D01)(Sh13).EFF (Geo 13 Eff Cal) Eff=10^[-1.10E+02 +1.44E+02*L +-6.36E+01*L^2 +9.33E+00*L^3] 06/25/2021 Eff.= EXP[5.97E-01 + -8.38E-01 * En + 0.00E+00 * En^2] Above 300.00 keV | | | | | | | | | | |
| Library 3 | File: | ANALYTICAL | .LIB (An | alytical) | | | | | | |
| = = = = = = = = = = = = = = = = = = = = | | | | CONCENTRAJ | | | | | | |
| | | | | | | =========== | | | | |
| | N | _ | | | Critical | **** | | | | |
| Nuclide | ENERGY E (kev) T (j | pCi/g |) | MDA | Level | | | | | |
| Am-241 | 59.54 2. | 12E+02 +- | | 8.63E+00 | 4.26E+00 | 3.79E+06 | 5 | | | |
| Cd-109 | | 85E+03 +- | | 7.30E+01 | 3.60E+01 | 1.11E+04 | ł | | | |
| Co-57 | 122.07 6. | 16E+01 +- | 4.40E+00 | 5.74E+00 | | 6.50E+03 | | | | |
| Ce-139 | | 69E+01 +- | | 7.59E+01 | | 3.30E+03 | | | | |
| Cs-137 | ••••• | 30E+01 +- | | 6.33E-01 | | 2.64E+05 | | | | |
| Co-60 | Average:x 1. | | | | | 4.62E+04 | | | | |
| | | 29E+02 +- | | | 4.66E-01 2.69E-01 | 4.62E+04 | | | | |
| Um 203 | 1332.48 1. 279.18 | 32E+02 +- MDA | | 5.00E-UI 3.99E+06 | | 1.12E+0 3 | | | | |
| Hg-203 Sn-113 | 391.68 | MDA | • • • • | 4.37E+02 | | 2.76E+03 | | | | |
| Y-88 | 898.02 | MDA | | 9.63E+02 | | 2.56E+03 | | | | |
| MEASUR | ED TOTAL: 3. | 41E+03 +- | 1.40E+02 | pCi/g | | | | | | |
| ******* | | | | | | | *======== | | | |
| | # = = # = = = = = = = = = = = = = = = = | | - | ESCAPE PE | | :2222222 | * 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | | | |
| PK. ENE | RGY ADDRESS | NET | UN- | C.L. | BKG | FWHM | | | | |
| | eV) CHANNEL | | CERTAINTY | | | (keV) | FLAG | | | |
| 4 13 | 6.48 276.32 Page 003 | 310 | 130 | 103 | 1819 | 1.08 | Unknown 120 of 173 | | | |

210687D01.SPC Analyzed by

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (kov) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|----------|
| 6 | 310.34 | 623.21 | 89 | 78 | 62 | 879 | 0.76 | 1333DEsc |
| 7 | 349.73 | 701.81 | 50 | 63 | 51 | 630 | 0.64 | Deleted |
| 8 | 511.17 | 1023.92 | 16 | 93 | 76 | 974 | 1.43 | Deleted |
| 12 | 1461.89 | 2920.87 | 11 | 17 | 13 | 23 | 1.52 | Deleted |

c:\SEEKER\BIN\210687d01.res Analysis Results Saved.



Analytics

1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318 Tel 404:352:8677 Fax 404:352:2837 www.ezag.com

CERTIFICATE OF CALIBRATION Standard Reference Source

Received 8/20/19.

K29

SRB Number: 110301 **Source Description:** 500 Grams Sand in 16 Ounce PP MRP Jar **Product Code:** 8401-EG-SAN **Customer:** ALS Laboratory Group P.O. Number: FC001958, Item 1

Eckert & Ziegler

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 01-july-2018 12:00 PM EST MGB Mixture

| W = 224 | Gamma-Ray | | | | Ur | certainty | Calibration |
|---------|-------------------|-----------------------------------------------------------------------------------------------------------------|--------------|-----------------------|-------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| lectope | Energy, keV | Half-Life, d | Activity, Bq | Flux, s ⁻¹ | u4. % | Hg. % U, % | |
| Am-241 | 1. A. C. BO.B. M. | 1.680E+08 | 3.723E+03 | 1.338E+03 | 0.1 | 1.8 3.6 | And the second se |
| Cd-109 | 88.0 | 4.614E+02 | 5.231E+04 | 1.936E+03 | 0.5 | 2.0 4.1 | HPGe |
| Co-87 | 128.1 | 2.717E+02 | 1.183B+03 | 1.012E+03 | 0.4 | 1.7 | |
| Ce-139 | 165.9 | 1.376E+02 | 1.778E+03 | 1.420E+03 | 0.4 | 1.7 3.6 | |
| Hg-203 | SEA. 101 | 4.6598+01 | 3.778E+03 | 3.082E+03 | 0.3 | 1.7 3.8 | HPCe |
| Sn-113 | 391.7 | 1.181E+02 | 3.081E+03 | 2.002E+03 | 0.4 | 1.9 3.9 | HPGa |
| Co-187 | 681.7 | 1.000 2404 | 1.814E+03 | 1.286E+03 | 0.7 | 1.9 4.1 | HPCe |
| Y-88 | 898.0 | 1.066E+02 | 8.064E+03 | 4.745E+03 | 0.7 | 1.7 3.7 | HPGe |
| Y 88 | 1030.1 | A STATE AND A S | | 8.024E+03 | 0.7 | 1.7 3.7 | CIP CE, Mr. C. |
| Co-80 | 1173.2 | 1.926E+03 | 2.362E+03 | 2.359E+03 | 0.7 | 1.8 3.9 | |
| Co-80 | 1352.8 | STREET BOOM | A PROPERTY I | 2,382E+03 | 0.7 | 1.8 3.9 | |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-87, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. *Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." **Calibration Methods: 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Standard Re-Verified 09/01/2020. New Exp. Date => 09/01 707, Bage 1 of 2

EZA Certificate Program Rev. 0, 07-DEC-2015

F-CA-12, Ray 0, 01 Nov

ž

24937 Avenue Tibbitts Valencia, California 91355

Laboratory 1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

SRS Number: 110301

Comments:

500.00 grams of customer supplied sand. Approximate volume: 290 mL

Expiration Date: 17-August-2019

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: A. Chirillo, Radiochemist

QC Approved by:

J. Lahr, Spectroscopist

Date: 16-404-18

EZA Certificate Program Rev. 0, 07-DEC-2015

Page 2 of 2

200484D02.SPC Analyzed by

****** SEEKER GAMMA ANALYSIS RESULTS PS Version 1.8.4

ALS Laboratory Group - Fort Collins

GammaScan

Geo 13 / Solid Sample ID: 101020-2 Geo 13 Eff Cal (1130) Sampling Start: 07/01/2020 10:00:00 | Counting Start: 10/10/2020 09:38:46 Sampling Stop: 07/01/2020 10:00:00 | Decay Time. 2.42E+003 Hrs Buildup Time. 0.00E+000 Hrs | Live Time 1800 Sec 1887 Sec _____ Detector #: 2 (Detector 2) Energy $(keV) = -1.28 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 10/10/2020$ $FWHM(keV) = 0.59 + 0.019*En + 4.08E-04*En^2 + 0.00E+00*En^3 07/29/2020$ Where En = Sqrt(Energy in keV) _____ Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000 _____ PEAK SEARCH RESULTS ________________________ PK. ENERGY ADDRESS NET/MDA UN-C.L. BKG FWHM # CHANNEL COUNTS CERTAINTY (keV) COUNTS COUNTS (keV) FLAG 202 0.78 a HiResid 1 59.51 121.32 13278 337 8250 2 70.78 143.83 586 304 247 11241 0.91 a 147.90 72.82 3 1232 271 216 9368 0.75 b 82.46 4 167.13 1880 410 329 16041 1.53 a HiResid Wide Pk 2.41 b HiResid 5 84.86 171.92 5380 629 503 26735 87.97 178.13 58943 10694 0.91 c HiResid 6 567 241 7 109.25 220.59 175 0.42 a 156 142 4972 120.74 243.53 1.72 a Wide Pk 8 1577 445 360 16887 122.09 246.22 36643 7676 0.84 Ъ 9 450 195 136.51 275.00 0.89 a 10 4808 263 183 6785 0.90 a HiResid 11 165.84 333.54 40939 471 199 7314 12 255.12 511.73 1184 183 140 3937 0.84 a 559.73 13 279.17 25610 367 147 4017 1.02 a HiResid 14 391.72 784.34 32928 400 139 3303 1.14 a HiResid 15 509.98 1020.36 230 120 96 1934 0.98 a Wide Pk 16 511.50 1023.39 759 217 173 4191 2.16 b 17 540.32 1080.92 81 115 93 1829 0.93 a NET< CL 18 661.69 1323.14 26326 356 121 2721 1.37 a HiResid 19 814.00 1627.11 527 135 104 1887 1.55 a 20 898.07 1794.90 39813 424 119 2595 1.57 a HiResid

Page 001

PEAK SEARCH RESULTS

| РК. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|-------------------|------------------|----------------|---------------|---------------|--------------------|
| 21 | 1173.23 | 2344.06 | 30450 | 366 | 92 | 1474 | 1.76 a | HiResid |
| 22 | 1325.30 | 2647.56 | 1097 | 174 | 132 | 1786 | 4.19 a | HiResid Wide Pk |
| 23 | 1332.42 | 2661.76 | 28087 | 346 | 70 | 824 | 1.89 b | HiResid |
| 24 | 1658.26 | 3312.07 | 62 | 74 | 60 | 656 | 2.00 a | |
| 25 | 1835.82 | 3666.44 | 25194 | 322 | 46 | 377 | 2.18 a | HiResid |

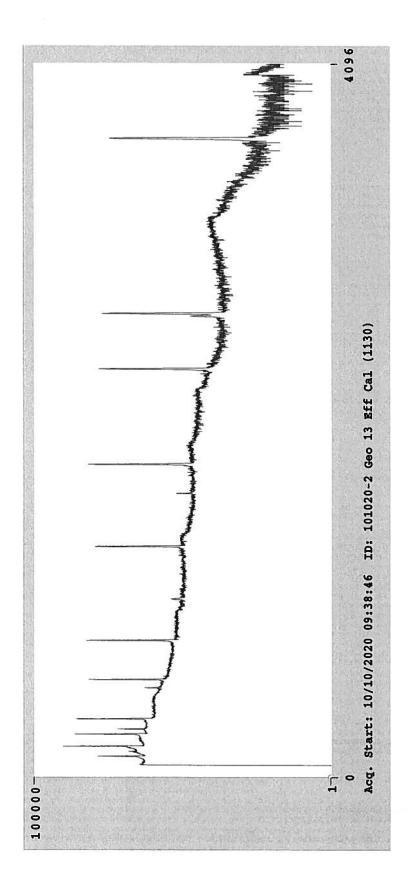
200484D02.SPC Analyzed by CALIBRATION RESULTS SEEKER Version 2.0.4 Sample ID: 101020-2 Geo 13 Eff Cal (1130) Stds. Match Tolerance: 2.00 keV _____ Detector Number: 02 Calibration Date. . . 10/10/2020 09:38:46 Geometry File (D02)(Sh13).EFF ID. Geo 13 Eff Cal Amount of Std. in Calib. Source: 500.000000 gm Crossover: 300.00 keV Below Crossover Efficiency Fit: Eff = 10 ^ [-8.02e+01 + 1.04e+02*En +-4.58e+01*En^2 + 6.67e+00*En^3] (Where En = LOG(Energy in keV)) (Polynomial) Above Knee Efficiency Fit: $Eff = exp ^ [-2.35e-01 + -5.84e-01*En + -1.09e-02*En^2]$ (Where En = Energy in keV) (Linear/Quad) ------_____

| Pk. # | Energy (kev) | Measured Efficiency | % Difference | Calculated Efficiency | % Difference | Prev.Calc. Efficiency |
|----------|-----------------|------------------------|-----------------|--------------------------|-----------------|-----------------------------------------|
| ==== | **** | | | | | * = = = = = = = = = = = = = = = = = = = |
| 1 | 59.50 | 5.54e-03 | 0.53 | 5.57e-03 | -228.36 🔼 | 1.70e-03 |
| 2 | 88.04 | 1.99e-02 | -2.59 | 1.94e-02 | -60.02 | 1.21e-02 |
| 3 | 122.06 | 2.57e-02 | 3.93 | 2.67e-02 | -20.35 | 2.22e-02 |
| 4 | 165.85 | 2.63e-02 | -2.33 | 2.57e-02 | -9.34 | 2.35e-02 |
| 5 | 279.00 | 2.09e-02 | 0.31 | 2.10e-02 | -8.89 | 1.93e-02 |
| 6 | 391.68 | 1.63e-02 | 0.41 | 1.64e-02 | -7.36 | 1.53e-02 |
| 7 | 661.64 | 1.14e-02 | -1.66 | 1.12e-02 | -6.72 | 1.05e-02 |
| 8 | 898.02 | 8.88e-03 | 1.25 | 8.99e-03 | -8.01 | 8.32e-03 |
| 9 | 1173.21 | 7.33e-03 | 0.70 | 7.39e-03 | -9.01 | 6.77e-03 |
| 10 | 1332.48 | 6.76e-03 | -0.52 | 6.72e-03 | -9.21 | 6.15e-03 |
| 11 | 1836.01 | 5.31e-03 | -0.20 | 5.30e-03 | -8.21 🎙 | 4.89e-03 |

Calibration Results Saved.

1 OK-1 New Delidar

) M (m 10/72/2020



Gamma Efficiency Calibration - Crossover energy efficiency difference

Calibration10/10/2020Detector2Geometry13Crossover energy=300 keV

| | | | MEETS ALS |
|------------------------|-----------------|----------------|----------------------|
| | EFF @ CROSSOVER | <u>% DIFF*</u> | ACCEPTANCE CRITERIA? |
| LOWER EFFICIENCY CURVE | 0.019964 | 0.83% | ОК |
| UPPER EFFICIENCY CURVE | 0.019800 | -0.82% | OK |

*When a single calibration curve does not meet ALS acceptance criteria, a split-fit efficiency calibration may be employed. This entails the use of two separate energy range calibrations, a low energy efficiency curve and a high energy efficiency curve. A crossover energy must be specified that marks where the software will use either the low energy efficiency curve or the high energy efficiency curve. It should be noted that if a nuclide is specified that has a gamma photon energy that is equal to <u>OR</u> within 15 keV of the crossover energy, the potential exists for the calculated efficiencies at the crossover energy to be significantly different than the true detection efficiency of the detector. At times by as much as 20%. This is an artifact of the non-equivalency of the calibration equations specified for each energy range. This may result in an effective high or low bias to the analytical results. This bias is reflected in the above calculated % difference. ALS Environmental will not accept any calibration with an effective % difference of greater than 5% without supervisory approval. Results are submitted without further qualification.

Efficiency equations

| Polynomial | - | 10^(A+B*(LOG(En))+C*(LOG(En))^ | 2+D*(LOG(En))^3) |
|--------------|---------------|-----------------------------------|------------------|
| A | -8.021020E+01 | | |
| В | 1.041242E+02 | | |
| С | -4.576472E+01 | Calculated efficiency | 0.019964 |
| D | 6.671109E+00 | | |
| En is energy | ∕ in keV | | |
| Crossover e | nergy | 300 | |
| Linear | | e^(A+(B*(In(En)))+(C*(In(En))^2)) | |
| A | -2.352143E-01 | | |
| В | -5.844166E-01 | | |
| С | -1.086439E-02 | Calculated efficiency | 0.019800 |

En is energy in keV Crossover energy

300

ON MIDIZDOZU

Standards File. Gsstd13.std Assay Date 07/01/2020 10:00 ID.: Geo 13 Std#1130 500-g. mixed gamma

| Pk # | Nuclide | Energy | Halflife | Br.Ratio | dps/gm |
|------|---------|---------|---------------|-------------------|--------|
| ==== | | | | ================= | |
| 1 | Am-241 | 59.50 | 4.320E+02 yr: | s 0.35900 | 7.43 |
| 2 | Cā-109 | 88.04 | 4.626E+02 dy | s 0.03610 | 106.21 |
| 3 | Co-57 | 122.06 | 2.718E+02 dy | s 0.85510 | 2.40 |
| 4 | Ce-139 | 165.85 | 1.376E+02 dy | s 0.80350 | 3.58 |
| 5 | Hg-203 | 279.00 | 4.661E+01 dy | s 0.77300 | 7.89 |
| 6 | Sn-113 | 391.68 | 1.151E+02 dy | s 0.64900 | 6.35 |
| 7 | Cs-137 | 661.64 | 3.007E+01 yr | s 0.85120 | 3.03 |
| 8 | Y-88 | 898.02 | 1.066E+02 dy | s 0.93400 | 10.29 |
| 9 | Co-60 | 1173.21 | 5.271E+00 yr | s 0.99980 | 4.78 |
| 10 | Co-60 | 1332.48 | 5.271E+00 yr | s 0.99990 | 4.79 |
| 11 | Y-88 | 1836.01 | 1.066E+02 dy | s 0.99380 | 10.24 |

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1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318 Tel 404·352·8677 Fax 404·352·2837 www.ezag.com

Analytics

CERTIFICATE OF CALIBRATION Standard Reference Source

SRS Number: 116626 Source Description: 500 Grams Sand in PP MRP Jar Product Code: 8401-EG-SAN Customer: ALS Laboratory Group P.O. Number: FC002882, Item 1

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 01-July-2020 12:00 PM EST

MGS Mixture

| | Gamma-Ray | | | | Ur | ncertair | nty | Calibratior |
|---------|-------------|--------------|--------------|-----------|--------------------|--------------------|-------|-------------|
| Isotope | Energy, keV | Half-Life, d | Activity, Bq | Flux, s⁻¹ | u _A , % | u _B , % | U, %* | Method** |
| Am-241 | 59.5 | 1.580E+05 | 3.714E+03 | 1.333E+03 | 0.1 | 1.8 | 3.7 | 4π LS |
| Cd-109 | 88.0 | 4.614E+02 | 5.180E+04 | 1.917E+03 | 0.5 | 2.0 | 4.2 | HPGe |
| Co-57 | 122.1 | 2.717E+02 | 1.197E+03 | 1.025E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.798E+03 | 1.438E+03 | 0.4 | 1.8 | 3.7 | HPGe |
| Hg-203 | 279.2 | 4.659E+01 | 3.741E+03 | 3.051E+03 | 0.3 | 1.7 | 3.5 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 3.171E+03 | 2.060E+03 | 0.4 | 2.0 | 4.1 | HPGe |
| Cs-137 | 661.7 | 1.099E+04 | 1.515E+03 | 1.289E+03 | 0.7 | 1.9 | 4.1 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 5.127E+03 | 4.804E+03 | 0.7 | 1.7 | 3.7 | HPGe |
| Y-88 | 1836.1 | | 21 | 5.086E+03 | 0.7 | 1.7 | 3.7 | |
| Co-60 | 1173.2 | 1.925E+03 | 2.396E+03 | 2.392E+03 | 0.7 | 1.8 | 3.9 | HPGe |
| Co-60 | 1332.5 | | | 2.395E+03 | 0.7 | 1.8 | 3.9 | |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. ***Uncertainty:** U - Relative expanded uncertainty,

k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

EZA Certificate Program Rev. 1, 01-FEB-2019

SRS Number: 116626

Comments:

500.3 g of customer supplied sand. Approximate volume: 290 mL

Expiration Date: 28-July-2021

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

1. Ca _____ Source Prepared by: /

/ M. Alfonso, Production Manager

QC Approved by:

J. Lahr, Spectroscopist

Date: 23-JI/L-20

Calibration verification

Geometry 13 Calibration Verification: Gamma Mixed Nuclide Source; Geometry 13 500-gram soil/solid geometry Detector 2

| | | # of Half Lives | Expired | 0.01 | 1.80 | 3.06 | 6.05 | | | | | | | 7.80 |
|----------------------------|------------------------------|-----------------|----------------------------------|---------------|-------------|-------------|-------------|------------|--------|---------|-------------|--------|-------------|-------------|
| | | | Pass/Fail | Pass | Pass | Pass | Pass | >5 h-lives | Pass | Pass | >5 h-lives | Pass | Pass | >5 h-lives |
| Count Date: 10/10/2020 | | | Recovery | 102% | 67% | 67% | 106% | >5 h-lives | 91% | 103% | >5 h-lives | 100% | 102% | >5 h-lives |
| int Date: | | | Activity | 205 | 2740 | 61.9 | 101.0 | S | 151 | 83.9 | S | 128 | 130 | NC |
| Cot | | | pCi/g | 201.2 | 2813.1 | 64.0 | 95.5 | 215.5 | 166.7 | 81.8 | 274.6 | 127.5 | 127.7 | 273.3 |
| | EXPECTED ACTIVITY | | DPS | 3721.4 | 52043.0 | 1183.5 | 1767.3 | 3987.1 | 3084.7 | 1513.2 | 5080.3 | 2359.5 | 2362.2 | 5055.3 |
| | EXPECTE | | | j Am-241 | Cd-109 | Co-57 | Ce-139 | Hg-203 | Sn-113 | Cs-137 | Y-88 | Co-60 | Co-60 | Y-88 |
| 7/1/2018 | | Mass of | Standard | 3 200 | | | | | | | | | | |
| REF DATE : 7/1/2018 | FROM ANALYTICS.LIB | | Gamma Fraction: | 0.3590 | 0.0372 | 0.8551 | 0.8035 | 0.7730 | 0.6490 | 0.8512 | 0.9340 | 0.9998 | 0.9999 | 0.9938 |
| | 1 | | | | | | | | | | | | | |
| | | | | 1336 | 1936 | 1012 | 1420 | 3082 | 2002 | 1288 | 4745 | 2359 | 2362 | 5024 |
| 1098 | | | | 432.0000 1336 | 1.2666 1936 | 0.7441 1012 | 0.3768 1420 | | | | 0.2919 4745 | | 5.2714 2362 | 0.2919 5024 |
| VERIF. SOURCE : 1098 | FROM CALIBRATION CERTIFICATE | | KeV Half Life(y) Gammas/Sec. | | | | | 0.1276 | | 30.0000 | | | | |

NC = NOT CALCULATED DUE TO THE ACTIVITY BEING LESS THAN THE MDCa

ON OP Ididear

INOprins/RAD/INST/GAMMA/Calibration/Efficiency/GEO13_CAL VER_(1098)_Det2_10.10.12

200485D02.SPC Analyzed by

ALS Laboratory Group - Fort Collins

GammaScan

Geo 13 / Solid

Sample ID: 101020-2A Geo 13 Cal Ver (1098)

Sampling Start: 07/01/2018 10:00:00 | Counting Start: 10/10/2020 10:16:28 Sampling Stop: 07/01/2018 10:00:00 | Decay Time. 2.00E+004 Hrs Buildup Time. 0.00E+000 Hrs | Live Time 1800 Sec 1839 Sec Collection Efficiency Detector #: 2 (Detector 2) Energy $(keV) = -1.28 + 0.501*Ch + 0.00E+00*Ch^2 + 0.00E+00*Ch^3 10/10/2020$ $FWHM(keV) = 0.59 + 0.019*En + 4.08E-04*En^2 + 0.00E+00*En^3 07/29/2020$ Where En = Sqrt(Energy in keV) ____ Search Sensitivity: 1.00 | Sigma Multiplier: 2.00 | Search Start/End: 80/4000

PEAK SEARCH RESULTS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|-------------------|------------------|----------------|---------------|---------------|-----------|
| | | | | | | | | |
| 1 | 59.51 | 121.33 | 13639 | 281 | 128 | 3306 | 0.77 | a |
| 2 | 87.96 | 178.11 | 18972 | 307 | 112 | 2535 | 0.82 | a |
| 3 | 122.07 | 246.18 | 5614 | 190 | 96 | 1865 | 0.85 | a |
| 4 | 136.50 | 274.99 | 725 | 123 | 91 | 1669 | 0.79 | a |
| 5 | 165.80 | 333.46 | 1056 | 125 | 88 | 1569 | 0.89 | a |
| 6 | 271.39 | 544.20 | 72 | 85 | 68 | 1031 | 0.65 | a |
| 7 | 391.67 | 784.24 | 356 | 106 | 81 | 1222 | 0.96 | a |
| 8 | 471.54 | 943.65 | 63 | 103 | 84 | 1389 | 1.20 | a NET< CL |
| 9 | 507.53 | 1015.47 | 44 | 61 | 49 | 599 | 0.62 | a NET< CL |
| 10 | 534.10 | 1068.50 | 56 | 84 | 68 | 907 | 1.15 | a NET< CL |
| 11 | 661.59 | 1322.94 | 25369 | 330 | 71 | 940 | 1.32 | a HiResid |
| 12 | 774.27 | 1547.83 | 58 | 71 | 57 | 649 | 1.09 | a |
| 13 | 897.94 | 1794.65 | 375 | 120 | 93 | 1460 | 1.93 | a |
| 14 | 1173.09 | 2343.78 | 23326 | 313 | 57 | 569 | 1.75 | a |
| 15 | 1332.26 | 2661.45 | 21500 | 296 | 34 | 202 | 1.85 | a HiResid |
| 16 | 1835.74 | 3666.28 | 197 | 34 | 15 | 40 | 2.25 | a |

| | 20 | 0485D02.5 | PC Analyzed | by | | | | | | |
|-------|--------------------------------------------------------|-----------|--------------------------------|------------|-----------|----------------------|-----------------|------|--|--|
| **** | ******** | ******* | ******* | ******* | ******* | ***** | ****** | **** | | |
| SEEKI | ER I | BACKG | ROUND | SUBTR | ACTR | ESULT | S Vers. 2 | .2.1 | | |
| | ALS Laboratory Group - Fort Collins GammaScan | | | | | | | | | |
| **** | ** *** *** *** *** *** *** ************ | | | | | | | | | |
| Backg | Background File: DET020930.BKG (093020-2 LONG BKG CAL) | | | | | | | | | |
| Bkg.H | File Detec | tor #: 2 | | | | | | | | |
| | | | BACKGROU | ND SUBTRAC | T RESULTS | ; | | | | |
| | | | # 6 8 8 8 8 8 8 8 8 8 8 | | | | ========== | ==== | | |
| PK# | | | OLD UN- CERTAINTY | | | NEW UN- CERTAINTY | NEW CR.LEVEL | FLAG | | |
| 2 | | 18972 | 307 | 112 | | 307 | 112 | | | |

| 200485D02.SPC Analyzed by | | | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|----------------------|--|--|--|--|--|--|--|--|
| SEEKER FINAL ACT | IVITY RE | PORT | Version 2.2.1 | | | | | | | | |
| ALS Laborator | y Group - Fort | Collins | | | | | | | | | |
| | GammaScan | | | | | | | | | | |
| ** ** * * * * * * * * * * * * * * * * * | *********** | ******* | ***** | | | | | | | | |
| Ge | o 13 / Solid | | | | | | | | | | |
| Sample ID: 101020-2A Geo 13 Cal Ve | er (1098) | | | | | | | | | | |
| Sampling Start: 07/01/2018 10:00 | • | | | | | | | | | | |
| Sampling Stop: 07/01/2018 10:00 | | | 2.00e+004 Hrs | | | | | | | | |
| Buildup Time. . 0.00e+000 Hrs Live Time 1800 Sec Sample Size . . 5.00e+002 g Real Time 1839 Sec | | | | | | | | | | | |
| Collection Efficiency 1.0000 Spectrum File | | | | | | | | | | | |
| Cr. Level Confidence Interval: 95 % Det. Limit Confidence Interval: 95 % | | | | | | | | | | | |
| | #: 2 (Detector | | | | | | | | | | |
| Efficiency File: (D02)(Sh13).EFF ((| | | | | | | | | | | |
| Eff=10^[-8.02E+01 +1.04E+02*L +-4. Eff.= EXP[-2.35E-01 + -5.84E-01 * P | | — | | | | | | | | | |
| | | | | | | | | | | | |
| Library File: ANALYTICAL.LI | · • | | | | | | | | | | |
| EESESSEESESSEESESSEESESSEESESESESESESE | r MDA CONCENTRA | | ============ | | | | | | | | |
| | | | =========== | | | | | | | | |
| N ENERGY E Concentration | | | Walflife | | | | | | | | |
| Nuclide (keV) T (pCi/g | | | | | | | | | | | |
| | | | | | | | | | | | |
| Am-24159.542.05E+02+-4.22Cd-10988.022.74E+03+-4.44 | | | 3.79E+06 1.11E+04 | | | | | | | | |
| Cd-109 88.02 2.74E+03 +- 4.44 Co-57 122.07 6.19E+01 +- 2.10 | | | 6.50E+03 | | | | | | | | |
| Ce-139 165.85 1.01E+02 +- 1.20 | | | 3.30E+03 | | | | | | | | |
| Sn-113 391.68 1.51E+02 +- 4.48 | | | 2.76E+03 | | | | | | | | |
| Cs-137661.628.39E+01 +- 1.09Y-88Average:x 2.60E+02 +- 3.93 | | | 2.64E+05 2.56E+03 | | | | | | | | |
| 898.02 3.00E+02 +- 9.5 | | | 2.56E+03 | | | | | | | | |
| 1836.01 2.52E+02 +- 4.24 | | | 2.56E+03 | | | | | | | | |
| Co-60 Average:x 1.29E+02 +- 1.24 1173.21 1.28E+02 +- 1.72 | | | 4.62E+04 4.62E+04 | | | | | | | | |
| 1332.48 1.30E+02 +- 1.79 | | | 4.62E+04 | | | | | | | | |
| | 7.99E+04 | | 1.12E+03 | | | | | | | | |
| | | | | | | | | | | | |

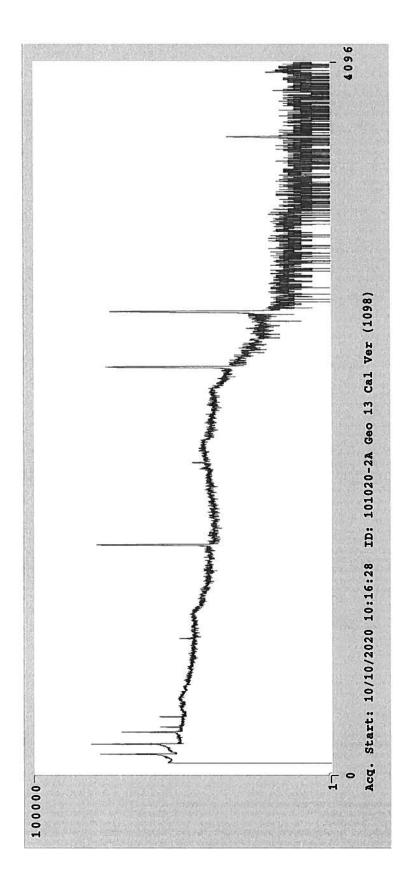
MEASURED TOTAL: 3.73E+03 +- 1.49E+02 pCi/g

200485D02.SPC Analyzed by

UNKNOWN, SUM or ESCAPE PEAKS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|---------------|------------------|----------------|---------------|---------------|---------|
| 4 | 136.50 | 274.99 | 725 | 123 | 91 | 1669 | 0.79 | Unknown |
| 6 | 271.39 | 544.20 | 72 | 85 | 68 | 1031 | 0.65 | Unknown |
| 8 | 471.54 | 943.65 | 63 | 103 | 84 | 1389 | 1.20 | Deleted |
| 9 | 507.53 | 1015.47 | 44 | 61 | 49 | 599 | 0.62 | Deleted |
| 10 | 534.10 | 1068.50 | 56 | 84 | 68 | 907 | 1.15 | Deleted |
| 12 | 774.27 | 1547.83 | 58 | 71 | 57 | 649 | 1.09 | Unknown |

c:\SEEKER\BIN\200485d02.res Analysis Results Saved.



💽 Eckert & Ziegler 🕉 🕨 🕈 Received 8/20/19

1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318 Tel 40-4-352-8677 Fax 404+352+2837 www.ezag.com

Analytics

CERTIFICATE OF CALIBRATION Standard Reference Source

SRS Number: 110301 Source Description: 500 Grams Sand in 16 Ounce PP MRP Jar Product Code: 8401-EG-SAN Customer: ALS Laboratory Group P.O. Number: FC001958, Item 1

This standard radionuclide source was prepared from an aliquot measured gravimetrically from a master radionuclide solution calibrated with a germanium gamma-ray spectrometer system. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using germanium gamma-ray spectrometry. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 01-July-2018 12:00 PM EST MGS Mixture

| | Gamma-Ray | Half-Life, d | Activity, Bq | Flux, s ⁻¹ | Uncertainty | | | Calibration |
|---------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|-------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Isotope | Energy, keV | | | | uA, % | ug, % | U, %* | Method** |
| Am-241 | 89.5 | 1.580E+05 | 3.723E+03 | 1.336E+03 | 0.1 | 1.8 | 3.6 | 411 LS |
| Cd-109 | 88.0 | 4.614E+02 | 5.231E+04 | 1.936E+03 | 0.5 | 2.0 | 4.1 | HPGe |
| Co-87 | 122.1 | 2.717E+02 | 1.183E+03 | 1.012E+03 | 0.4 | 1.7 | 3.4 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.775E+03 | 1.420E+03 | 0.4 | 1.7 | 3.6 | HPGe |
| Hg-203 | <u>279.2</u> | 4.659E+01 | 3.778E+03 | 3.082E+03 | 0.3 | 1.7 | 3.5 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 3.081E+03 | 2.002E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.099E+04 | 1.514E+03 | 1.288E+03 | 0.7 | 1.9 | 4.1 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 5.064E+03 | 4.745E+03 | 0.7 | 1.7 | 3.7 | HPGe |
| Y-88 | 1836.1 | | | 5.024E+03 | 0.7 | 1.7 | 3.7 | STATISTICS ST |
| Co-60 | 1173.2 | 1.925E+03 | 2.362E+03 | 2.359E+03 | 0.7 | 1.8 | 3.9 | HPGe |
| Co-60 | 1332.5 | A CONTRACTOR OF A CONTRACT | A DESCRIPTION OF A DESC | 2.362E+03 | 0.7 | 1.8 | 3.9 | NAME OF THE PARTY |

Mixed Gamma (MGS) master solution is EZA's eight isotope mixture which is calibrated quarterly and consists of Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Cs-137, Y-88, and Co-60. "Uncertainty: U - Relative expanded uncertainty. k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." **Calibration Methods: 411 LS - 411 Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Standard Re-Veritied 09/01/2020. > 09/01 10 4 202 Bage 1 of 2 Laboratory

F-CR-32, Rev 0, 01 Nov z

EZA Certificate Program Rev. 0, 07-DEC-2015

1380 Seaboard Industrial Blvd. Atlanta, Georgia 아래 173

SRS Number: 110301

Comments:

500.00 grams of customer supplied sand. Approximate volume: 290 mL

Expiration Date: 17-August-2019

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: Theallort

A. Chirillo, Radiochemist

QC Approved by:

hr, Spectroscopist

Date: 16-404-18

Gamma Spectroscopy

Quality Control Data

Weekly Background Calibrations

Gamma Spectrometer Calibration Log

Date: $\frac{7}{7}$

Reviewed By/Date: TS 7/7/2L

| | | Backg | round | Source Check | | | Repeat Source Check | | | | | |
|-------------|-------------------|---------|-------|--------------|----|------------------------|---------------------|------------------------|-------------------------------|-------------------------|--|--|
| Det. No. | Out Of Service | Started | ОК | Started | OK | Failed Parameter(s) | ОК | Failed Parameter(s) | Corrective Action Taken ** | Removed from Service | | |
| 1. | | TS | TS | TS | 73 | | | | | | | |
| 2. | | 75 | TS | TS | TS | | | | | | | |
| 3. | | TS | TS | TS | TS | | | | | | | |
| 4. | | TS | TSA | ts | TS | | | | | | | |
| 5. | | 75 | TS | TS | TS | | | | | | | |
| 6. | TS | | 2 | / | / | | | | | | | |
| 7. | | TS | TS | TS | TS | | | | | | | |
| 8. | T3 | / | 1 | / | | | | | | | | |
| 9. | TS | | / | // | / | | | | | | | |
| 10. | | TS | TS | TJ | 75 | | | | | | | |

.** Corrective Action:

A RE- FAN BKG

*** Due to detector ______ failing two different QC parameters on the first and second daily check, a the daily check was performed. All QC parameters passed for the third daily check. Detector ______ is only for the date of ______



Form 754r16a.doc (10/42000

| | | | | m | | | | | | | | | |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| | 2 | 10770D01.S | PC Analyze | d by | | | | | | | | | |
| SEEP | KER | GAMM | A ANA | LYSIS | RESUI | LTS P | S Versio | on 1.8.4 | | | | | |
| | | А | LS Laborat | ory Group · | - Fort Coll | lins | | | | | | | |
| | GammaScan | | | | | | | | | | | | |
| **** | *************************************** | | | | | | | | | | | | |
| | Long Background Calibration | | | | | | | | | | | | |
| Sampl | le ID: 21 | 0707-1 LON | GBKGCAL | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Sampl | ling Star | t: 07/0 | 7/2021 13: | :00:00 Cor | unting Star | rt: 07 | /07/202 | 1 13:53:06 | | | | | |
| | | | | :00:00 De | | | | | | | | | |
| | - | | |)0 Hrs Liv | | | | | | | | | |
| | | | | 000 L Re | | | | | | | | | |
| Colle | action Ef | ficiency . | 1 | L.0000 Sp | c. File . | | 210 | 770D01.SPC | | | | | |
| | | | | | | | | | | | | | |
| ¥8 | | 1 00 - 0 | | or $#: 1 (D)$ | • | ₽⊥∩∩≠ぺ⊾ょっ | 07/07/ | 2021 | | | | | |
| | | | | 0.00E+00*C | | | | | | | | | |
| FWHM | (Kev) = | 0.74 + 0 | | $a.70E=0a^{\circ}E$ En = Sgrt(E | | | 00/22/ | 2020 | | | | | |
| See | | ivitv, 1 0 | 0 Sime | Multiplier | 2.00 ga | earch Ste | rt/End: | 80/4000 | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | ======== | | | | | | |
| | | | PE | AK SEARCH R | esults | | | | | | | | |
| | ========= | | | | ============= | | | ********* | | | | | |
| PK. | The day | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | | | | | | |
| # | (keV) | | • | 011- | U • H • | | * ****** | | | | | | |
| | (1101) | CHANNEL | COUNTS (| CERTAINTY | COUNTS | COUNTS | (keV) | FLAG | | | | | |
| 1 | | CHANNEL | COUNTS (| CERTAINTY | COUNTS | | (keV) | FLAG | | | | | |
| | 66.40 | 136.54 | COUNTS (135 | CERTAINTY 60 | COUNTS | | | | | | | | |
| 2 | 66.40 74.97 | 136.54 | 135 123 | 60 70 | 45 54 | COUNTS 504 657 | 0.53 | a. | | | | | |
| 3 | 7 4.97 77.25 | 136.54 153.64 158.19 | 135 123 45 | 60 70 90 | 45 54 73 | COUNTS 504 657 986 | 0.53 | a a b NET< CL | | | | | |
| 3 4 | 74.97 77.25 92.59 | 136.54 153.64 158.19 188.82 | 135 123 45 147 | 60 70 90 75 | 45 54 73 58 | COUNTS 504 657 986 679 | 0.53 0.66 0.97 0.76 | a a b NET< CL a | | | | | |
| 3 4 5 | 74.97 77.25 92.59 122.29 | 136.54 153.64 158.19 188.82 248.11 | 135 123 45 147 22 | 60 70 90 75 50 | 45 54 73 58 40 | COUNTS 504 657 986 679 403 | 0.53 0.66 0.97 0.76 0.51 | a b NET< CL a a NET< CL | | | | | |
| 3 4 5 6 | 74.97 77.25 92.59 122.29 139.96 | 136.54 153.64 158.19 188.82 248.11 283.39 | 135 123 45 147 22 80 | 60 70 90 75 50 53 | 45 54 73 58 40 41 | COUNTS 504 657 986 679 403 424 | 0.53 0.66 0.97 0.76 0.51 0.51 | a a b NET < CL a a NET < CL a | | | | | |
| 3 4 5 6 7 | 74.97 77.25 92.59 122.29 139.96 154.62 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 | 135 123 45 147 22 80 42 | 60 70 90 75 50 53 51 | 45 54 73 58 40 41 40 | COUNTS 504 657 986 679 403 424 400 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 | a a b NET < CL a a NET < CL a a a | | | | | |
| 3 4 5 6 7 8 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 | 135 123 45 147 22 80 42 98 | 60 70 90 75 50 53 51 83 | 45 54 73 58 40 41 40 66 | COUNTS 504 657 986 679 403 424 400 806 | 0.53 0.66 0.97 0.76 0.51 0.55 0.53 0.99 | a a b NET < CL a a NET < CL a a a a | | | | | |
| 3 4 5 6 7 8 9 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 | 135 123 45 147 22 80 42 98 173 | 60 70 90 75 50 53 51 83 83 82 | 45 54 73 58 40 41 40 66 64 | COUNTS 504 657 986 679 403 424 400 806 747 | 0.53 0.66 0.97 0.76 0.51 0.55 0.53 0.99 1.03 | a a b NET < CL a a NET < CL a a a a | | | | | |
| 3 4 5 6 7 8 9 10 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 | 135 123 45 147 22 80 42 98 173 58 | 60 70 90 75 50 53 51 83 82 66 | 45 54 73 58 40 41 40 66 64 53 | COUNTS 504 657 986 679 403 424 400 806 747 559 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 | a a b NET < CL a a NET < CL a a a a a | | | | | |
| 3 4 5 7 8 9 10 11 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 | 135 123 45 147 22 80 42 98 173 | 60 70 90 75 50 53 51 83 83 82 | 45 54 73 58 40 41 40 66 64 | COUNTS 504 657 986 679 403 424 400 806 747 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 0.88 | a a b NET < CL a a NET < CL a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 | 135 123 45 147 22 80 42 98 173 58 93 | 60 70 90 75 50 53 51 83 83 82 66 68 | 45 54 73 58 40 41 40 66 64 53 54 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 0.88 | a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 | 135 123 45 147 22 80 42 98 173 58 93 44 | 60 70 90 75 50 53 51 83 82 66 68 74 | 45 54 73 58 40 41 40 66 64 53 54 60 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 0.88 1.15 0.74 | a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 | 135 123 45 147 22 80 42 98 173 58 93 44 102 | 60 70 90 75 50 53 51 83 82 66 68 74 48 | 45 54 73 58 40 41 40 66 64 53 54 60 36 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 | a a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 14 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 391.62 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 1023.01 | 135 123 45 147 22 80 42 98 173 58 93 44 102 34 | 60 70 90 75 50 53 51 83 82 66 68 74 48 59 | 45 54 73 58 40 41 40 66 64 53 54 60 36 48 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 452 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 | a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 14 15 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 391.62 510.46 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 1023.01 1025.32 | 135 123 45 147 22 80 42 98 173 58 93 44 102 34 407 | 60 70 90 75 50 53 51 83 82 66 68 74 48 59 88 | 45 54 73 58 40 41 40 66 64 53 54 60 36 48 64 77 43 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 452 609 761 340 | 0.53 0.66 0.97 0.76 0.51 0.56 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 1.98 2.52 1.38 | a a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 391.62 510.46 511.62 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 1023.01 1025.32 1118.98 1168.00 | 135 123 45 147 22 80 42 98 173 58 93 44 102 34 407 992 183 81 | 60 70 90 75 50 53 51 83 82 66 68 74 48 59 88 113 59 88 113 59 55 | 45 54 73 58 40 41 40 66 64 53 54 60 36 48 64 77 43 43 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 452 609 761 340 345 | 0.53 0.66 0.97 0.76 0.51 0.55 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 1.98 2.52 1.38 1.37 | a a b NET < CL a n NET < CL a a a a a a a a a n NET < CL a a NET < CL a a Wide Pk b a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 391.62 510.46 511.62 558.53 583.09 609.70 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 1023.01 1025.32 1118.98 1168.00 1221.11 | 135 123 45 147 22 80 42 98 173 58 93 44 102 34 407 992 183 81 125 | 60 70 90 75 50 53 51 83 82 66 68 74 48 59 88 113 59 88 113 59 55 69 | 45 54 73 58 40 41 40 66 64 53 54 60 36 48 64 77 43 43 54 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 452 609 761 340 345 538 | 0.53 0.66 0.97 0.76 0.51 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 1.98 2.52 1.38 1.37 1.61 | a a b NET < CL a n NET < CL a a a a a a a a a a a a a a nET < CL a a NET < CL a a Wide Pk b a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 391.62 510.46 511.62 558.53 583.09 609.70 693.46 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 1023.01 1025.32 1118.98 1168.00 1221.11 1388.33 | 135 123 45 147 22 80 42 98 173 58 93 44 102 34 407 992 183 81 125 70 | 60 70 90 75 53 51 83 82 66 68 74 48 59 88 113 59 88 113 59 55 69 74 | 45 54 73 58 40 41 40 66 64 53 54 60 36 48 64 77 43 43 54 59 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 452 609 761 340 345 538 538 559 | 0.53 0.66 0.97 0.76 0.51 0.55 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 1.98 2.52 1.38 1.37 1.61 2.12 | a a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a a | | | | | |
| 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 | 74.97 77.25 92.59 122.29 139.96 154.62 185.70 198.51 222.40 238.81 295.21 352.02 391.62 510.46 511.62 558.53 583.09 609.70 693.46 803.34 | 136.54 153.64 158.19 188.82 248.11 283.39 312.65 374.70 400.26 447.96 480.71 593.31 706.72 785.77 1023.01 1025.32 1118.98 1168.00 1221.11 1388.33 | 135 123 45 147 22 80 42 98 173 58 93 44 102 34 407 992 183 81 125 | 60 70 90 75 50 53 51 83 82 66 68 74 48 59 88 113 59 88 113 59 55 69 | 45 54 73 58 40 41 40 66 64 53 54 60 36 48 64 77 43 43 54 | COUNTS 504 657 986 679 403 424 400 806 747 559 583 710 319 452 609 761 340 345 538 | 0.53 0.66 0.97 0.76 0.51 0.53 0.99 1.03 0.76 0.88 1.15 0.74 1.18 1.98 2.52 1.38 1.37 1.61 | a a b NET < CL a a NET < CL a a a a a a a a a a a a a a a a a a a | | | | | |

210770D01.SPC Analyzed by

PEAK SEARCH RESULTS

| PK. # | ENERGY (keV) | ADDRESS CHANNEL | NET/MDA COUNTS | UN- CERTAINTY | C.L. COUNTS | BKG COUNTS | FWHM (keV) | FLAG |
|----------|-----------------|--------------------|-------------------|------------------|----------------|---------------|---------------|------------|
| 22 | 898.82 | 1798.29 | 51 | 51 | 41 | 276 | 1.96 a | 2 |
| 23 | 911.78 | 1824.16 | 69 | 39 | 29 | 176 | 1.26 a | 1 |
| 24 | 969.96 | 1940.31 | 41 | 47 | 38 | 236 | 1.89 8 | a . |
| 25 | 1120.69 | 2241.21 | 27 | 27 | 21 | 108 | 0.97 a | A |
| 26 | 1238.59 | 2476.57 | 38 | 40 | 31 | 171 | 2.12 | a |
| 27 | 1461.29 | 2921.14 | 646 | 60 | 26 | 114 | 2.30 | a |
| 28 | 1764.53 | 3526.49 | 65 | 38 | 28 | 114 | 3.07 | a |

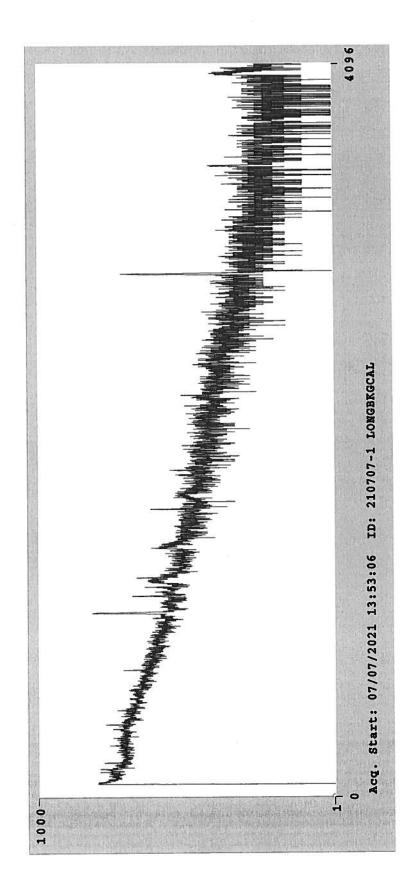
| | | | | | | | | | | | ed | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|-------|-----|-----|-----|----|----|----|----|-----|-----|-------|-------|----|-------|-----|-----|-----|----|----|----|-----|-------|-----|------|-----|---|
| ***** | ** | *1 | * * : | * * | *** | k * | ** | ** | ** | ** | *** | *** | * * * | ***** | ** | * * : | **: | **: | **: | ** | ** | ** | **1 | ***** | *** | **** | *** | * |
| SEEKER *********** | _ | _ | - | - | | - | | - | - | | | - | | | | | | | | | | | | Vers: | | | | * |

ID: 210707-1 LONGBKGCAL

Detector # 1 Background Q.C. Analysis for 07/07/2021 13:53:06

| | | | n Sigma | Bounds | т- |
|----|--------------------|--------|---------|--------|------|
| # | Parameter | Value | Test | Test | Test |
| 10 | 40-> 50 keV Bkg | 3.810 | N.A. | Pass | N.A. |
| 11 | 50-> 150 keV Bkg | 29.460 | N.A. | Pass | N.A. |
| 12 | 250-> 500 keV Bkg | 36.901 | N.A. | Pass | N.A. |
| 13 | 500->1000 keV Bkg | 34.652 | N.A. | Pass | N.A. |
| 14 | 1000->2000 keV Bkg | 19.162 | N.A. | Pass | N.A. |
| 15 | 150-> 250 keV Bkg | 25.232 | N.A. | Pass | N.A. |

Q.C. Results Saved.



| | 210776D02.SPC Analyzed by | | | | | | | | | | | | |
|----------------------|---------------------------------------------------|--------------------------------------|------------------------|-----------------------------|----------------------|-------------------|------------------------------|--------------------------|--|--|--|--|--|
| **** | SEEKER GAMMA ANALYSIS RESULTS PS Version 1.8.4 | | | | | | | | | | | | |
| SEEI | KER | GAMM | A ANA | LYSIS | RESUL | TS P | S Versic | on 1.8.4 | | | | | |
| | ALS Laboratory Group - Fort Collins GammaScan | | | | | | | | | | | | |
| **** | Gammascan ************************************ | | | | | | | | | | | | |
| | | | | | - 14 1 | | | | | | | | |
| | | | Long Ba | ckground Ca | alibration | | | | | | | | |
| Samp: | le ID: 21 | 0707-2 LON | GBKGCAL | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | 00:00 Cou | | | | | | | | | |
| | | | | 00:00 Dec | | | | | | | | | |
| | | | | 0 Hrs Liv | | | | 60000 Sec | | | | | |
| - | | | | •000 L Rea | | | | | | | | | |
| Colle | ection Ef | ficiency . | 1 | 0000 Spo | c. File | • • • • | 210 | 76D02.SPC | | | | | |
| | | | | | | | | | | | | | |
| _ | | 1 40 - 0 | | or #: 2 (De 0.00E+00*Cl | · · · · · | +00±05×3 | 07/07/ | 2021 | | | | | |
| | | | | | | | | | | | | | |
| FWHM | (Kev) = | 0.59 + 0 | | 4.08E-04*En En = Sgrt(En | | | 0//23/2 | 6020 | | | | | |
| | | initar. 1 0 | | Multiplier | • 2.00 Se | arch Sta | rt/End: | 80/4000 | | | | | |
| Sear | SII Sensic | | | | | | | | | | | | |
| ==== | | | | | | | | | | | | | |
| | | | PE | K SEARCH RI | esults | | | | | | | | |
| ==== | | | | | | | ======= | | | | | | |
| | | | | | | | | | | | | | |
| PK. | ENERGY | ADDRESS | NET/MDA | UN- | C.L. | BKG | FWHM | | | | | | |
| # | (keV) | CHANNEL | COUNTS (| CERTAINTY | COUNTS | COUNTS | (keV) | FLAG | | | | | |
| | 46.69 | 96.05 | 89 | 57 | 45 | 490 | 0.54 | A | | | | | |
| 2 | 63.25 | 129.10 | 179 | 92 | 72 | 967 | 0.95 | a HiResid | | | | | |
| 3 | 66.53 | 135.64 | 262 | 94 | 72 | 967 | 0.92 1 | b HiResid | | | | | |
| 4 | 69.24 | 141.05 | 22 | 42 | 34 | 322 | 0.39 | C NET< CL | | | | | |
| | | | | | | | | HiResid | | | | | |
| 5 | 75.02 | 152.60 | 123 | 70 | 55 | 662 | 0.65 | | | | | | |
| 6 | 77.18 | 156.92 | 125 | 81 | 64 | 828 | 0.78 | | | | | | |
| 7 | 84.41 | 171.35 | 92 | 82 | 66 | 801 | 1.02 | | | | | | |
| 8 | 87.17 | | 37 | 71 | 58 | 668 | | b NET< CL | | | | | |
| 9 | 92.74 | 187.97 | 421 | 87 | 63 | 731 | | a HiResid | | | | | |
| 10 | 94.64 | 191.76 | 65 | 69 | 55 | 609 | | b HiResid | | | | | |
| 11 | 98.43 | 199.33 | 39 | 96 | 78 | 975 | 1.24 | C NET< CL | | | | | |
| | | | | | | ~~~ | A A 4 | HiResid | | | | | |
| 12 | 140.00 | 282.31 | 181 | 73 | 56 | 632 | 0.84 | | | | | | |
| 13 | 144.11 | 290.53 | 55 | 50 | 39 | 379 | 0.45 | | | | | | |
| 14 | | | | 67 | 54 | 598 | 0.81 a | a NET< CL | | | | | |
| | 163.52 | 329.27 | 35 | | | | | | | | | | |
| 15 | 185.88 | 373.91 | 272 | 74 | 54 | 598 | 0.77 | a . | | | | | |
| 15 16 | 185.88 19 4 .79 | 373.91 391.69 | 272 47 | 74 47 | 54 37 | 338 | 0.77 a 0.47 a | a. | | | | | |
| 15 16 17 | 185.88 194.79 198.46 | 373.91 391.69 399.03 | 272 47 317 | 74 47 73 | 54 37 53 | 338 563 | 0.77 0.47 0.78 | a a b | | | | | |
| 15 16 17 18 | 185.88 194.79 198.46 205.96 | 373.91 391.69 399.03 414.00 | 272 47 317 14 | 74 47 73 47 | 54 37 53 38 | 338 563 352 | 0.77 0.47 0.78 0.48 | a a b a NET< CL | | | | | |
| 15 16 17 | 185.88 194.79 198.46 205.96 229.71 | 373.91 391.69 399.03 414.00 | 272 47 317 | 74 47 73 | 54 37 53 | 338 563 | 0.77 0.47 0.78 | a a b a NET< CL | | | | | |

210776D02.SPC Analyzed by

PEAK SEARCH RESULTS

| РК. # | ENERGY (keV) | | COUNTS | UN- CERTAINTY | - | BKG COUNTS | FWHM (keV) | FLAG |
|--------------|-----------------|---------|--------|------------------|-----|---------------|---------------|---------|
| 20 | 238.68 | 479.31 | 252 | 62 | 44 | 425 | 0.70 a | L |
| 21 | 242.21 | 486.36 | 97 | 57 | 44 | 425 | 0.70 E | • |
| 22 | 295.24 | 592.23 | 64 | 61 | 48 | 472 | 0.88 a | L |
| 23 | 351.84 | 705.22 | 195 | 73 | 55 | 524 | 1.14 a | L |
| 24 | 365.31 | 732.10 | 57 | 79 | 64 | 600 | 1.47 a | NET< CL |
| 25 | 507.58 | 1016.12 | 2 | 129 | 106 | 1150 | 3.51 a | NET< CL |
| | | | | | | | | Wide Pk |
| 26 | 511.10 | 1023.15 | 2106 | 138 | 84 | 876 | 2.68 E | |
| 27 | 558.62 | 1118.02 | 320 | 59 | 38 | 291 | 1.20 a | L |
| 28 | 569.93 | 1140.59 | 74 | 44 | 34 | 256 | 0.86 a | L |
| 29 | 583.30 | 1167.29 | 101 | 44 | 32 | 239 | 0.88 a | L |
| 30 | 596.43 | 1193.49 | 22 | 39 | 31 | 240 | 0.66 a | NET< CL |
| 31 | 598.08 | 1196.80 | 128 | 77 | 60 | 600 | 1.67 E | |
| 32 | 609.37 | 1219.33 | 169 | 70 | 54 | 533 | 1.32 a | L |
| 33 | 669.79 | 1339.95 | 45 | 41 | 32 | 219 | 0.90 a | L |
| 34 | 803.31 | 1606.49 | 163 | 55 | 40 | 281 | 1.45 a | L |
| 35 | 843.76 | 1687.24 | 36 | 42 | 33 | 230 | 1.00 a | L |
| 36 | 881.02 | 1761.63 | 22 | 28 | 22 | 117 | 0.77 a | L |
| 37 | 898.63 | 1796.78 | 59 | 54 | 42 | 300 | 1.90 a | L |
| 38 | 911.46 | 1822.39 | 87 | 55 | 43 | 293 | 2.10 a | L |
| 39 | 962.07 | 1923.43 | 66 | 46 | 35 | 218 | 1.82 a | L |
| 40 | 1120.47 | 2239.64 | 43 | 28 | 21 | 107 | 0.85 a | L |
| 41 | 1378.19 | 2754.14 | 30 | 28 | 21 | 93 | 1.54 a | L |
| 42 | 1461.01 | 2919.47 | 242 | 43 | 24 | 114 | 1.88 a | L |
| 43 | 1765.01 | 3526.34 | 49 | 28 | 20 | 77 | 1.80 a | L |

210776D02.SPC Analyzed by

| ******** | ******** | ****** | ********************************** | |
|----------|----------|-----------|------------------------------------|--|
| SEEKER | BACKG | ROUND Q.C | C. ANALYSIS Version 2.2.2 | |

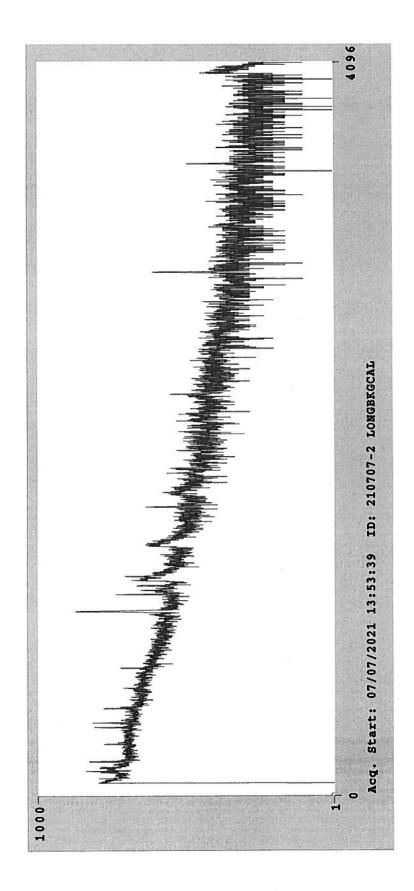
| ********** | ********* | ******** | ******* | * * * * * * * * * * * * * * * * * * * | ****** |
|------------|-----------|----------|---------|---------------------------------------|--------|

ID: 210707-2 LONGBKGCAL

Detector # 2 Background Q.C. Analysis for 07/07/2021 13:53:39

| | | | n Sigma | Bounds | Т- |
|----|--------------------|--------|---------|--------|----------|
| # | Parameter | Value | Test | Test | Test |
| 10 | 50-> 150 keV Bkg | 28.039 | N.A. | Pass | N.A. |
| 11 | 150-> 250 keV Bkg | 23.354 | N.A. | Pass | N.A. |
| 12 | 250-> 500 keV Bkg | 35.311 | N.A. | Pass | N.A. |
| 13 | 500->1000 keV Bkg | 38.858 | N.A. | Pass | N.A. |
| 14 | 1000->2000 keV Bkg | 22.571 | N.A. | Pass | N.A. |
| 15 | 40-> 50 keV Bkg | 3.633 | N.A. | Pass | N.A. |

Q.C. Results Saved.



Gamma Spectroscopy

Quality Control Data

Daily Instrument Performance Checks

New Gamma Standards RSO 967-976 Detectors 1-10

| | RSO# | Am241 Act Bq | Eu152 Act Bq | Am241 Act DPS | Eu152 Act DPS |
|---------|------|--------------|--------------|---------------|---------------|
| | 967 | 36860 | 30240 | 36860 | 30240 |
| | 968 | 36490 | 29930 | 36490 | 29930 |
| | 969 | 36500 | 29940 | 36500 | 29940 |
| | 970 | 36590 | 30010 | 36590 | 30010 |
| | 971 | 36670 | 30080 | 36670 | 30080 |
| | 972 | 36430 | 29890 | 36430 | 29890 |
| | 973 | 36570 | 30000 | 36570 | 30000 |
| | 974 | 37470 | 30740 | 37470 | 30740 |
| | 975 | 37280 | 30580 | 37280 | 30580 |
| | 976 | 37230 | 30540 | 37230 | 30540 |
| Average | | 36809 | 30195 | 36809 | 30195 |

Standards File. GSSTD99.STD Assay Date 06/22/2012 12:00 ID.: Daily Check Sources Det 1-10

| | Nuclide | Energy | Halflife | Br.Ratio | d ps/g m |
|---|---------|---------|---------------|------------------|-----------------|
| | | | | | |
| 1 | Am-241 | 59.54 | 4.331E+02 yrs | 3 0.35900 | 13214.43 |
| 2 | Eu-152 | 778.90 | 1.333E+01 yrs | 3 0.12940 | 3907.23 |
| 3 | Eu-152 | 1408.08 | 1.333E+01 yr: | s 0.21000 | 6340.95 |

Rec 6-26-12 RSO# 967

1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318 Tel 404.352.8677 Fax 404.352.2837 www.analyticsinc.com

Analytics

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

91091

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: **ALS** Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4,15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | | | | ` | | | |
|---------|--------------------|------------------|--------------|----------------------|----------------------|-----|------------------------|
| Isotope | Half-Life, Days | Activity (Bq) | <u>1</u> 9 1 | Ty u _A | pe u _B | υ | Calibration Method* |
| Eu-152 | 4.938E+03 | 3.024E+04 | | 0.1 | 1.7 | 3.5 | IC |
| Am-241 | 1.580E+05 | 3.686E+04 | | 0.1 | 1.7 | 3.5 | 4n LS |

Calibration Methods: 411 LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

chemist

QA Approved:

ANA Form005 Rev. ---

J.D. McCorvey, Counting Room Manager

Date:



Multi-Isotope Certificate, Rev 2 04-08-2010

Analytics

Rec 6-26-12 2 RSO # ~

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CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91092

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Uncertainty*, % | | | | | | | | |
|---------|--------------------|------------------|----------------|-----|-----|------------------------|--|--|--|
| Isotope | Half-Life, Davs | Activity (Bq) | Ту | - | 77 | Calibration Method* | | | |
| | | | u _A | uB | 0 | Metilod. | | | |
| Eu-152 | 4.938E+03 | 2.993E+04 | 0.1 | 1.7 | 3.5 | IC | | | |
| Am-241 | 1.580E+05 | 3.649E+04 | 0.1 | 1.7 | 3.5 | 4π LS | | | |

Calibration Methods: 4 II LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1207, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

QA Approved:

ANA Form005 Rev.

ardley, Radiochemist J.D. McCorvey, Counting Room Manager

18 JUN 12 Date:

OUNCE CALIBRATON LABORATON

Multi-Isotope Certificate, Rev 2 04-08-2010

Eckert & Ziegler

Rec 6-24-12

RYO# 969

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Analytics

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91093

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Reference Date: | 6/22/2012 | 12:00 PM EST | | | | | |
|------------------|------------------|--------------|--------------------|------------------------------|---------------------------------|------------|------------------------|
| Isotope | Half-L Day | | Activity (Bq) | Unce Ty u _A | rtainty pe u _B | v*,% U | Calibration Method* |
| Eu-152 Am-241 | 4.938E 1.580E | | 994E+04 650E+04 | 0.1 0.1 | 1.7 1.7 | 3.5 3.5 | IC 4π LS |

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

ANA Form005 Rev.

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by: K. Eardley, Radiochemist QA Approved: J.D. McCorvey, Counting Room Manager Date: 18 JUN IL



Multi-Isotope Certificate, Rev 2 04-08-2010

Rec le-26-13

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Atlanta, Georgia 30318 Tel 404•352•8677 Fax 404•352•2837

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CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91094

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

| Customer: | ALS Laboratory Group |
|-----------|----------------------|
| P.O. No.: | CEP12NAALS339, Item1 |

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Uncertainty* , % | | | | | | | | |
|---------|--------------------|------------------|----------------------|----------------------|-----|------------------------|---|--|--|
| Isotope | Half-Life, Days | Activity (Bq) | Ty u _A | pe u _B | U | Calibration Method* | | | |
| Eu-152 | 4.938E+03 | 3.001E+04 | 0.1 | 1.7 | 3.5 | IC | × | | |
| Am-241 | 1.580E+05 | 3.659E+04 | 0.1 | 1.7 | 3.5 | 4π LS | | | |

Calibration Methods: 411 LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

ANA Form005 Rev.

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by: K Eardley, Radiochemist QA Approved: J.D. McCorvey, Counting Room Manager Date: <u>18 JUN 12</u>



Multi-Isotope Certificate, Rev 2 04-08-2010

Rec 6-26-12

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Analytics

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91095

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| Isotope | Half-Life, Days | Activity (Bq) | Ty u _A | pe u _B | U | Calibration Method* |
|---------|--------------------|------------------|----------------------|----------------------|-----|------------------------|
| Eu-152 | 4.938E+03 | 3.008E+04 | 0.1 | 1.7 | 3.5 | IC |
| Am-241 | 1.580E+05 | 3.667E+04 | 0.1 | 1.7 | 3.5 | 4π LS |

Calibration Methods: 4n LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

dley, Radiochemist

QA Approved:

J.D. McCorvey, Counting Room Manager

Date: 18 JUN 12

CONCECTION

Multi-Isotope Certificate, Rev 2 04-08-2010

fre la-26-12

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Analytics

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91096

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Uncertainty*, % | | | | | | | |
|---------|-----------------|-----------|----------------|-----|-----|-------------|--|--|
| | Half-Life, | Activity | Туре | | | Calibration | | |
| Isotope | Days | (Bq) | u _A | uB | U | Method* | | |
| Eu-152 | 4.938E+03 | 2.989E+04 | 0.1 | 1.7 | 3.5 | IC | | |
| Am-241 | 1.580E+05 | 3.643E+04 | 0.1 | 1.7 | 3.5 | 4π LS | | |

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

ANA Form005 Rev

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by: ardley, Radiochemist JUNIO QA Approved: Date: J.D. McCorvey, Counting Room Manager



Multi-Isotope Certificate, Rev 2 04-08-2010

Rec 6-26-12 RUO# 973

1380 Seaboard Industrial Blvd.

Atlanta, Georgia 30318

www.analyticsinc.com

Tel 404·352·8677 Fax 404·352·2837

Analytics

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91097

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Half-Life. | *,% | Calibration | | | |
|---------|------------|------------------|-----------------------|-----|-----|---------|
| Isotope | Days | Activity (Bq) | Tyj u _A | uB | U | Method* |
| Eu-152 | 4.938E+03 | 3.000E+04 | 0.1 | 1.7 | 3.5 | IC |
| Am-241 | 1.580E+05 | 3.657E+04 | 0.1 | 1.7 | 3.5 | 4π LS |

Calibration Methods: 4π IS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

QA Approved:

ANA Form005 Rev.

J.D. McCorvey, Counting Room Manager

Date: 18JUN17



Multi-Isotope Certificate, Rev 2 04-08-2010



Rec 6-26-12 Rue 974

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Analytics

CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91098

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Uncertainty* , % | | | | | | | | |
|---------|--------------------|------------------|----------------------|----------------------|-----|------------------------|--|--|--|
| Isotope | Half-Life, Days | Activity (Bq) | Ty u _A | pe u _B | U | Calibration Method* | | | |
| Eu-152 | 4.938E+03 | 3.074E+04 | 0.1 | 1.7 | 3.5 | IC | | | |
| Am-241 | 1.580E+05 | 3.747E+04 | 0.1 | 1.7 | 3.5 | 4π LS | | | |

Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

K. Eardley, Radiochemist

Date:



Multi-Isotope Certificate, Rev 2 04-08-2010

QA Approved:

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Analytics

CERTIFICATE OF CALIBRATION

Rec 6-26-12

R50# 975

Standard Radionuclide Source

91099

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Half-Life, | Activity | Unce: Ty | rtainty pe | *,% | Calibration | |
|---------|------------|-----------|----------------|---------------|-----|-------------|--|
| Isotope | Days | (Bq) | u _A | uB | U | Method* | |
| Eu-152 | 4.938E+03 | 3.058E+04 | 0.1 | 1.7 | 3.5 | IC | |
| Am-241 | 1.580E+05 | 3.728E+04 | 0.1 | 1.7 | 3.5 | 4π LS | |

Calibration Methods: 4n LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1207, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities< 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

QA Approved:

ardley, Radiochemist J.D. McCorvey, Counting Room Manager

Date:



Multi-Isotope Certificate, Rev 2 04-08-2010

JUNIZ

Rec 6-26-12

Analytics

R50# 976

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CERTIFICATE OF CALIBRATION Standard Radionuclide Source

91100

Eu-152 + Am-241 25.4 mm Diameter x 6 mm Thick Button

Customer: ALS Laboratory Group P.O. No.: CEP12NAALS339, Item1

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Reference Date: 6/22/2012 12:00 PM EST

| | Half-Life, | Activity | Unce Ty | - | *,% | Calibration |
|---------|------------|-----------|------------|-----|-----|-------------|
| Isotope | Days | (Bq) | uA | uB | U | Method* |
| Eu-152 | 4.938E+03 | 3.054E+04 | 0.1 | 1.7 | 3.5 | IC |
| Am-241 | 1.580E+05 | 3.723E+04 | 0.1 | 1.7 | 3.5 | 4π LS |

Calibration Methods: 411 LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC -Ionization Chamber. Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:

Impurities: γ -impurities < 0.1%. Diameter of active area: 5 mm.

Source Prepared by:

dlev. Radiochemist

QA Approved:

J.D. McCorvey, Counting Room Manager

18 JUN17 Date:



Multi-Isotope Certificate, Rev 2 04-08-2010

Gamma Spectrometer Calibration Log

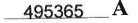
Date: 710200

Reviewed By/Date:

| | | Backg | round | | Source (| Check | Repeat Source Check | | | |
|-------------|-------------------|---------|-------|-----------------|---------------|------------------------|---------------------|------------------------|-------------------------------|-------------------------|
| Det. No. | Out Of Service | Started | ОК | Started | OK | Failed Parameter(s) | ОК | Failed Parameter(s) | Corrective Action Taken ** | Removed from Service |
| 1. | | | | (\mathcal{M}) | (n) | , | | | | |
| 2. | | | | (Ti- | | 409 Cont | [M | | log-Ad | |
| 3. | | | | (n) | \mathcal{D} | | | | | |
| 4. | | | | 10- | | 1408Cart | () | | Can top | |
| 5. | | | | () | TP | | | | | |
| 6. | R | | | 1 | | | | | | |
| 7. | U. | | | 100 | TR | | | | | |
| 8. | m | | | | | | | | | |
| 9. | 1 Ch | 1 | | | | | | | | |
| 10. | | | | P | T | | | | | |

.** Corrective Action:

*** Due to detector ______ failing two different QC parameters on the first and second daily check, a third daily check was performed. All QC parameters passed for the third daily check. Detector ______ is online for the date of ______



Form 754r16a.doc (10/27/11)

ID: DAILY CHECK

Detector # 1 Detector Q.C. Analysis for 07/10/2021 08:01:27 Standards File #: 99 (Daily Check Sources Det 1-10)

| | | n | Sigma | Bounds | T - |
|------|---------------------|------------------|-------|--------|------------|
| # | Parameter | Value | Test | Test | Test |
| 1 | 60 keV Centroid | 122.798 | N.A. | Pass | N.A. |
| 2 | 60 kev FWHM | 9.344E-01 | N.A. | Pass | N.A. |
| 3 | 60 keV Efficiency | 1.921E-03 | N.A. | Pass | N.A. |
| 16 | 779 keV Centroid | 1558.562 | N.A. | Pass | N.A. |
| 17 | 779 kev FWHM | 1.687 | N.A. | Pass | N.A. |
| 18 - | 779 keV Efficiency | 1.696E-02 | N.A. | Pass | N.A. |
| 19 | 1408 keV Centroid | 2813.982 | N.A. | Pass | N.A. |
| 20 | 1408 keV FWHM | 2.342 | N.A. | Pass | N.A. |
| 21 | 1408 keV Efficiency | 7.058E-03 | N.A. | Pass | N.A. |

210791D02.SPC Analyzed by

ID: DAILY CHECK

Detector # 2 Detector Q.C. Analysis for 07/10/2021 08:01:37 Standards File #: 99 (Daily Check Sources Det 1-10)

| # | Parameter | n Value | Sigma Test | Bounds Test | T- Test |
|----|---------------------|------------------|---------------|----------------|------------|
| 1 | 60 keV Centroid | 121.667 | N.A. | Pass | N.A. |
| 2 | 60 kev FWHM | 7.588E-01 | N.A. | Pass | N.A. |
| 3 | 60 keV Efficiency | 4.304E-03 | N.A. | Pass | N.A. |
| 17 | 779 keV Centroid | 1556.963 | N.A. | Pass | N.A. |
| 19 | 779 kev FWHM | 1.457 | N.A. | Pass | N.A. |
| 20 | 779 keV Efficiency | 2.701E-02 | N.A. | Pass | N.A. |
| 21 | 1408 keV Centroid | 2811.987 | N.A. | <fail></fail> | N.A. |
| 22 | 1408 keV FWHM | 1.980 | N.A. | Pass | N.A. |
| 23 | 1408 keV Efficiency | 1.156E-02 | N.A. | Pass | N.A. |

| 21 | 2D02.SPC Analyzed by | |
|---------|-----------------------------------------|------|
| SEEKER | DETECTOR Q.C. ANALYSIS Version 2.2.2 | |
| ******* | *************************************** | **** |

ID: DAILY CHECK

Detector # 2 Detector Q.C. Analysis for 07/10/2021 08:10:22 Standards File #: 99 (Daily Check Sources Det 1-10)

| # | Parameter | n Value | Sigma Test | Bounds Test | T- Test | |
|----|---------------------|------------|---------------|----------------|------------|--|
| 1 | 60 keV Centroid | 121.692 | N.A. | Pass | N.A. | |
| 2 | 60 kev FWHM | 7.578E-01 | N.A. | Pass | N.A. | |
| 3 | 60 keV Efficiency | 4.350E-03 | N.A. | Pass | N.A. | |
| 17 | 779 keV Centroid | 1557.658 | N.A. | Pass | N.A. | |
| 19 | 779 kev FWHM | 1.401 | N.A. | Pass | N.A. | |
| 20 | 779 keV Efficiency | 2.592E-02 | N.A. | Pass | N.A. | |
| 21 | 1408 keV Centroid | 2813.363 | N.A. | Pass | N.A. | |
| 22 | 1408 kev FWHM | 1.940 | N.A. | Pass | N.A. | |
| 23 | 1408 keV Efficiency | 1.076E-02 | N.A. | Pass | N.A. | |

Gamma Spectrometer Calibration Log

Date: 711 M

Reviewed By/Date: P7111201

| | | Background | | Source Check | | Repeat Source Check | | | | |
|-------------|-------------------|------------|----|--------------|-----------|------------------------|-----------------|------------------------|-------------------------------|-------------------------|
| Det. No. | Out Of Service | Started | ок | Started | ОК | Failed Parameter(s) | ОК | Failed Parameter(s) | Corrective Action Taken ** | Removed from Service |
| 1. | | | | \Box | (p) | | | 1 | | |
| 2. | * . | 2 | | D | M | | | | | |
| 3. | | - A | | | VI | | | | | |
| 4. | н т., 1 | | | R | 2 | 1408 Cent | (\mathcal{D}) | | Cannola, | |
| 5. | | - | | Uh | JP | | | | | |
| 6. | | | | 6 | 0 | | | | | |
| 7. | | | | K/h | K | | | | | |
| 8. | | 2 | | \square | | | | | · · | |
| 9. | | | , | \square | | | | | | |
| 10. | ۵. | 4 | | M | | | | | | |

.** Corrective Action:

*** Due to detector ______ failing two different QC parameters on the first and second daily check, a third daily check was performed. All QC parameters passed for the third daily check. Detector ______ is online for the date of ______



Form 754r16a.doc (10/27/11)

210797D01.SPC Analyzed by SEEKER DETECTOR Q.C. ANALYSIS Version 2.2.2

ID: DAILY CHECK

Detector # 1 Detector Q.C. Analysis for 07/11/2021 12:01:59 Standards File #: 99 (Daily Check Sources Det 1-10)

| | | n | Sigma | Bounds | Т- |
|----|---------------------|------------------|-------|--------|------|
| # | Parameter | Value | Test | Test | Test |
| 1 | 60 keV Centroid | 122.759 | N.A. | Pass | N.A. |
| 2 | 60 kev FWHM | 8.159E-01 | N.A. | Pass | N.A. |
| 3 | 60 keV Efficiency | 1.895E-03 | N.A. | Pass | N.A. |
| 16 | 779 keV Centroid | 1558.813 | N.A. | Pass | N.A. |
| 17 | 779 kev FWHM | 1.798 | N.A. | Pass | N.A. |
| 18 | 779 keV Efficiency | 1.846E-02 | N.A. | Pass | N.A. |
| 19 | 1408 keV Centroid | 2814.500 | N.A. | Pass | N.A. |
| 20 | 1408 keV FWHM | 2.459 | N.A. | Pass | N.A. |
| 21 | 1408 keV Efficiency | 7.078E-03 | N.A. | Pass | N.A. |

210803D02.SPC Analyzed by

ID: DAILY CHECK

Detector # 2 Detector Q.C. Analysis for 07/11/2021 12:08:06 Standards File #: 99 (Daily Check Sources Det 1-10)

| # | Parameter | n Value | Sigma Test | Bounds Test | T- Test |
|----|---------------------|------------------|---------------|----------------|------------|
| 1 | 60 keV Centroid | 121.756 | N.A. | Pass | N.A. |
| 2 | 60 keV FWHM | 7.289E-01 | N.A. | Pass | N.A. |
| 3 | 60 keV Efficiency | 4.307E-03 | N.A. | Pass | N.A. |
| 17 | 779 keV Centroid | 1558.200 | N.A. | Pass | N.A. |
| 19 | 779 kev FWHM | 1.433 | N.A. | Pass | N.A. |
| 20 | 779 keV Efficiency | 2.662E-02 | N.A. | Pass | N.A. |
| 21 | 1408 keV Centroid | 2814.362 | N.A. | Pass | N.A. |
| 22 | 1408 keV FWHM | 1.946 | N.A. | Pass | N.A. |
| 23 | 1408 keV Efficiency | 1.118E-02 | N.A. | Pass | N.A. |

Gamma Spectrometer Calibration Log

Date: 7/12/2(

Reviewed By/Date: TS 7/12/21

| | | Backg | round | Source Check | | | Repeat Source Check | | | |
|-------------|-------------------|---------|-------|--------------|----|------------------------|---------------------|------------------------|-------------------------------|-------------------------|
| Det. No. | Out Of Service | Started | ОК | Started | ок | Failed Parameter(s) | ОК | Failed Parameter(s) | Corrective Action Taken ** | Removed from Service |
| . 1. | | | | 13 | TS | | | | | |
| 2. | | | | TS | 15 | | | | | |
| 3. | Y | 1 | | TS | TS | - | | | | |
| 4. | | | | 15 | / | 1908 Cent | TS | | Gain Adi | |
| 5. | | | | 15 | TS | | | | | |
| 6. | -15 | | | | / | | | | | |
| 7. | | | | TS | TS | | | | | |
| 8. | TS | | | / | | | | | | |
| 9. | 73 | | | 1 | / | | | | | |
| 10. | л. — "Д | | | TS | | - | | | | 1 |

.** Corrective Action:

*** Due to detector _____ failing two different QC parameters on the first and second daily check, a third daily check was performed. All QC parameters passed for the third daily check. Detector _____ is only for the date of ______

495368 A

Form 754r16a.doc (10/2//11)

171 of 173

210800D01.SPC Analyzed by

ID: DAILY CHECK

Detector # 1 Detector Q.C. Analysis for 07/12/2021 07:28:46 Standards File #: 99 (Daily Check Sources Det 1-10)

| # | Parameter | n Value | Sigma Test | Bounds Test | T- Test |
|----|---------------------|------------|---------------|----------------|------------|
| 1 | 60 keV Centroid | 122.669 | N.A. | Pass | N.A. |
| 2 | 60 keV FWHM | 8.789E-01 | N.A. | Pass | N.A. |
| 3 | 60 keV Efficiency | 1.911E-03 | N.A. | Pass | N.A. |
| 16 | 779 keV Centroid | 1558.729 | N.A. | Pass | N.A. |
| 17 | 779 kev FWHM | 1.733 | N.A. | Pass | N.A. |
| 18 | 779 keV Efficiency | 1.733E-02 | N.A. | Pass | N.A. |
| 19 | 1408 keV Centroid | 2814.337 | N.A. | Pass | N.A. |
| 20 | 1408 kev FWHM | 2.474 | N.A. | Pass | N.A. |
| 21 | 1408 keV Efficiency | 7.310E-03 | N.A. | Pass | N.A. |

Q.C. Results Saved.

210806D02.SPC Analyzed by

ID: DAILY CHECK

Detector # 2 Detector Q.C. Analysis for 07/12/2021 07:28:54 Standards File #: 99 (Daily Check Sources Det 1-10)

| # | Parameter | n Value | Sigma Test | Bounds Test | T- Test |
|----|---------------------|------------------|---------------|----------------|------------|
| 1 | 60 keV Centroid | 121.626 | N.A. | Pass | N.A. |
| 2 | 60 kev FWHM | 7.749E-01 | N.A. | Pass | N.A. |
| 3 | 60 keV Efficiency | 4.407E-03 | N.A. | Pass | N.A. |
| 17 | 779 keV Centroid | 1558.178 | N.A. | Pass | N.A. |
| 19 | 779 kev FWHM | 1.437 | N.A. | Pass | N.A. |
| 20 | 779 keV Efficiency | 2.676E-02 | N.A. | Pass | N.A. |
| 21 | 1408 keV Centroid | 2814.270 | N.A. | Pass | N.A. |
| 22 | 1408 keV FWHM | 1.988 | N.A. | Pass | N.A. |
| 23 | 1408 keV Efficiency | 1.129E-02 | N.A. | Pass | N.A. |

Q.C. Results Saved.