FINAL
SURVEY UNIT PROJECT REPORT - ZONE O
PARCEL D-1 PHASE II SANITARY SEWER AND STORM DRAIN REMOVAL
Hunters Point Shipyard
San Francisco, California

Contract Number N62473-10-D-0808
Delivery Order Number CTO-0004

Prepared for:

U.S. DEPARTMENT OF THE NAVY
BRAC Program Management Office West
33000 Nixie Way
San Diego, California 92147

Under contract to:

U.S. DEPARTMENT OF THE NAVY
Naval Facilities Engineering Command Southwest
1220 Pacific Highway
San Diego, California 92132

Prepared by:

GILBANE
1655 Grant Street, 12th Floor
Concord, California 94520

Jerry Cooper
Gilbane Radiation Safety Officer

January 2016

This page left intentionally blank.

TABLE OF CONTENTS

List of Tables i
List of Figures ii
List of Attachments (On CD) ii
Acronyms and Abbreviations iii
1.0 Introduction 1
1.1 Purpose 1
1.2 Background 1
2.0 Release Criteria 2
3.0 Final Status Survey 3
3.1 Survey Units 3
3.2 Survey and Sampling 3
3.2.1 GWS Data 4
3.2.2 Gamma Static Measurements 4
3.2.3 Soil Sample Collection 4
3.3 Trench Backfill 5
3.4 Import Fill Material 5
3.5 Reference Area 6
4.0 Laboratory Analysis 7
5.0 Statistical Tests 9
6.0 Dose Modeling 10
6.1 Soil Concentration Modeling Parameters 10
6.2 Dose and Risk Modeling Results 11
7.0 Recommendation of Final Unrestricted Release 12
7.1 Radionuclide-Specific Release Criteria 12
7.2 Dose and Health Risk Modeling 12
7.3 Recommendations 12
8.0 References 14

LIST OF TABLES

Table 1 Survey Unit Summary
Table 2 GWS Data Summary
Table 3 Gamma Static Measurement Data Summary
Table 4 Sample Collection Summary
Table 5 Summary of Sample Analytical Results
Table 6 Soil Concentration Modeling Parameters
Table 7 Dose and Risk Modeling Results

LIST OF FIGURES

Figure 1 Sanitary Sewer and Storm Drain Removal Zone O

LIST OF ATTACHMENTS

Attachment 1 Radiation Instrumentation Data
Attachment 2 Trench 04-PDT-015 Data
Attachment 3 Excavated Soil 04-PD-D0034 Data
Attachment 4 Excavated Soil 04-PD-D0035 Data
Attachment 5 Backfill Radiological Survey
Attachment 6 Sr-90 Sample Analytical Data
Attachment 7 Backfill RESRAD Reports
Attachment 8 Trench RESRAD Reports
Attachment 9 Final Data Summary
Attachment 10 Response to Comments

ACRONYMS AND ABBREVIATIONS

µR/hr	microroentgens per hour
ALARA	as low as reasonably achievable
cpm	counts per minute
cps	counts per second
Cs-137	cesium-137
DoD	U. S. Department of Defense
HPNS	Hunters Point Naval Shipyard
LLRW	low-level radioactive waste
m	meter
m^2	square meter
m^3	cubic meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
mrem/y	millirem per year
pCi/g	picocuries per gram
Ra-226	radium-226
Sr-90	strontium-90
SUPR	survey unit project report

1.0 INTRODUCTION

1.1 PURPOSE

This Survey Unit Project Report (SUPR) documents the work performed in Zone O (inclusive of the trench and the associated excavated soil and import fill material used as backfill). The work was conducted under the *Execution Plan, Radiological Remediation and Support, Parcel D-1 Phase II Execution Plan, Hunters Point Shipyard, San Francisco, California* (ITSI Gilbane, 2013). This SUPR summarizes the scope, approach, and radiological surveys performed as part of the Parcel D-1 Phase II sanitary sewer and storm drain removal at the Hunters Point Naval Shipyard (HPNS) located in San Francisco, California.

Information that was provided in the *Survey Unit Project Reports Abstract, Parcel D-1 Phase II Sanitary Sewer and Storm Drain Removal, Hunters Point Shipyard, San Francisco, California* (SUPRs Abstract; Gilbane, 2014) is repeated only if there are exceptions to the information specific to Zone O.

This report was prepared under Contract No. N62473-10-D-0808, Contract Task Order 0004.

1.2 BACKGROUND

Zone O, shown in Figure 1, consists of trenches where storm drain lines were removed. There are no Installation Restoration sites associated with Zone O. Remedial activities are discussed in the *Parcel D-1 Phase II Remedial Action Completion Report, Hunters Point Naval Shipyard, San Francisco, California* (Gilbane, 2016).

2.0 RELEASE CRITERIA

Release criteria information is presented in Section 2.0 of the SUPRs Abstract (Gilbane, 2014). No additions or exceptions to the radionuclides of concern, which are radium-226 (Ra-226), cesium-137 (Cs-137), and strontium-90 (Sr-90), were identified, or to the implementation of the 'as low as reasonably achievable' (ALARA) concept to operational and environmental activities. As there are no Installation Restoration sites associated with Zone O, there are no chemicals of concern.

3.0 FINAL STATUS SURVEY

The objective of the final status survey was to demonstrate that identified residual radioactivity levels inside the excavated trench, within the excavated soil, and import fill material used as backfill meet the release criteria.

3.1 SURVEY UNITS

Zone O consists of a single trench survey unit (floor and walls) and two excavated soil survey units. Survey unit information is provided in Table 1. Approximately 157 linear meters (m) of trench were excavated to depths averaging 1.8 m. The width of the excavated trench width was based on the pipe diameter. A minimum of 0.3 m of soil was excavated around and below the pipe. Both the interior and exterior surfaces of the removed piping were surveyed. The soil beneath the pipe was sampled at pipe joints or where there were indications of pipe breaks and/or contamination in the pipe. The total surface area of the exposed trench (floor and walls) was approximately 1,000 square meters (m^2). Approximately 251 cubic meters (m^3) of soil were removed from the trench and radiologically screened.

Table 1 – Survey Unit Summary

Parameter	Trench 04-PDT-015 (floor/walls)	Soil Units 04-PD-Dxxxx	
		0034	0035
Surface area (m^2)	1,000	1,000	670
Excavated soil (m^3)	--	150	101

3.2 SURVEY AND SAMPLING

Information concerning survey and sampling is presented in Section 3.2 of the SUPRs Abstract (Gilbane, 2014). Radiation instrumentation data are found in Attachment 1. Survey and sampling data collected from the trench and excavated soil survey units are found in Attachments 2 through 4. Each data set contains:

- GWS coverage map with speed histogram for excavated soil units
- GWS summary statistics, including frequency diagrams
- Sample locations overlaid on contour map(s)
- Static gamma readings collected at sample locations
- Photo(s) of salient features

- Sample chain of custody record
- Laboratory gamma spectroscopy results

3.2.1 GWS Data

GWS data were collected using the RS-700 gamma-ray detection system. GWS data are summarized in Table 2. Count rate data are given in units of counts per second (cps). The GWS data were contoured and mapped as described in Section 3.2.1 of the SUPRs Abstract (Gilbane, 2014) and used to identify biased sample locations.

Table 2 – GWS Data Summary

Parameter	Trench 04-PDT-015		Soil Units 04-PD-Dxxxx	
	Floor	Wall	0034	0035
Scan coverage (%)	100	100	100	100
Number of data points	15,040	9,370	3,316	3,812
Low gross count (cps)	399	381	1,048	1,080
High gross count (cps)	1,070	1,013	1,784	1,793
Range	671	632	736	713
Mean count (cps)	647	646	1,412	1,405
Median count (cps)	640	645	1,412	1,381
Standard deviation (cps)	90	78	117	125

A cumulative frequency diagram was used to examine the general shape of the GWS data distribution for each survey unit. When plotted, the data appear as a straight line indicating a normally distributed data population. Outliers that suggest the presence of contamination are not present in the data set.

3.2.2 Gamma Static Measurements

A gamma static measurement was taken at each systematic and biased soil sample location using a Ludlum Model 44-10 2-inch by 2-inch gamma scintillation detector with a Ludlum 2221 ratemeter/scaler. Gamma static measurements are summarized in Table 3. Count rate data are given in units of counts per minute (cpm). The sample analytical results discussed in Section 4.0 provide additional data on those locations that exceeded the investigation level.

3.2.3 Soil Sample Collection

Sample collection is summarized in Table 4. Sample locations are shown on survey unit maps included in Attachments 2 through 4.

Table 3 – Gamma Static Measurement Data Summary

Parameter	Trench 04-PDT-015 (floor/walls)	Soil Units 04-PD-Dxxxx	
		0034	0035
Total (soil sample locations)	39	24	24
Lowest gross count (cpm)	3,196	5,211	4,836
Highest gross count (cpm)	7,961	6,690	6,604
3-sigma investigation level (cpm)	5,413	5,413	5,413
Locations > investigation level[a]	14	22	16

Note:
[a] Sample analytical results discussed in Section 4.0 provide additional data on those locations that exceeded the investigation level.

Twenty soil samples were collected at systematically-spaced locations across each survey unit. Biased samples were also collected from each survey unit at locations identified using the process described in Section 3.2.1 of the SUPRs Abstract (Gilbane, 2014). Other samples collected include 9 samples collected along the pipe footprint in the trench based on contamination found on the removed sanitary sewer and storm drain piping.

Table 4 – Sample Collection Summary

Parameter	Trench 04-PDT-015		Soil Units 04-PD-Dxxxx	
	Floor	Wall	0034	0035
Total samples collected	39		24	24
Systematic	20		20	20
Biased (based on GWS results)	10		4	4
Pipe footprint/bounding	9		0	0

3.3 TRENCH BACKFILL

The trench was backfilled with screened soil from Soil Units 04-PD-D0034 and -D0035. Exposure rates measured at 1-foot (0.3 m) lifts as the soil was placed into the trenches ranged from 5 to 7 microroentgens per hour (µR/hr) at 1 m above the surface (see Attachment 5). Exposure rates were taken using a hand-held Ludlum Model 19.

3.4 IMPORT FILL MATERIAL

Approximately 25 m^3 of import fill material were required to complete backfilling activities. Import fill sample information is presented in Section 3.4 of the SUPRs Abstract (Gilbane, 2014).

3.5 REFERENCE AREA

Reference area sample information is presented in Section 3.5 of the SUPRs Abstract (Gilbane, 2014).

4.0 LABORATORY ANALYSIS

Information concerning laboratory analysis is presented in Section 4.0 of the SUPRs Abstract (Gilbane, 2014). The sample analytical results for Zone O are summarized in Table 5 below. The number of samples whose concentrations were detected above the minimum detectable concentration (MDC) are identified. Concentrations are given in units of picocuries per gram (pCi/g). Samples were analyzed by gamma spectroscopy for Ra-226 and Cs-137. Gamma spectroscopy results are found in Attachments 2 through 4. A minimum of 10% of the samples was randomly selected to be analyzed for Sr-90. Sr-90 results are found in Attachment 6.

Table 5 – Summary of Sample Analytical Results

Parameter	Trench 04-PDT-015 (floor/walls)	Soil Units 04-PD-Dxxxx	
		0034	0035
Ra-226 Analytical Results			
Samples analyzed	39	24	24
Samples w/conc > MDC	39	24	24
Samples exceedances	0	0	0
Minimum concentration (pCi/g)	0.0883	0.181	0.203
Maximum concentration (pCi/g)	0.919	0.445	0.420
Cs-137 Analytical Results			
Samples analyzed	39	24	24
Samples w/conc > MDC	0	1	1
Samples exceedances	0	0	0
Minimum concentration (pCi/g)	---	0.0346	0.0356
Maximum concentration (pCi/g)	---	0.0346	0.0356
Lowest MDC (pCi/g)	0.0142	0.0171	0.0126
Highest MDC (pCi/g)	0.0258	0.0240	0.0246
Sr-90 Analytical Results			
Samples analyzed	4	3	3
Samples w/conc > MDC	0	0	0
Samples exceedances	0	0	0
Lowest MDC (pCi/g)	0.105	0.0975	0.0661
Highest MDC (pCi/g)	0.157	0.151	0.139

Ra-226 was detected above the MDC in all but one of the 87 samples. Ra-226 concentrations ranged from 0.0883 to 0.919 pCi/g; this range is below the release criterion of 1.488 pCi/g and largely consistent with background levels (0.488 ± 0.218 pCi/g; see Section 3.5 of the SUPRs Abstract [Gilbane, 2014]).

The MDC for Cs-137 ranged from 0.0126 to 0.0258 pCi/g. Cs-137 was detected above the MDC in 2 samples, though the reported concentrations were less than the Cs-137 release criterion of 0.113 pCi/g. The highest reported a Cs-137 concentration was 0.0356 pCi/g.

A total of 10 samples were also analyzed for Sr-90. None of the samples reported Sr-90 above the MDC. The MDC for Sr-90 ranged from 0.0661 to 0.157 pCi/g, which is below the Sr-90 release criterion of 0.331 pCi/g.

5.0 STATISTICAL TESTS

Because all post-remediation sample results in Table 5 were less than the release criteria, there is no basis for performing statistical tests for the trench or excavated soil survey units per Section 8.2.2.1 of the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM; DoD et al. 2000). The statistical test does not need to be performed when the sample results clearly show that the survey unit meets the release criteria, such as when every measurement in the survey unit is less than the release criteria.

6.0 DOSE MODELING

Information concerning dose modeling is presented in Section 6.0 of the SUPRs Abstract (Gilbane, 2014).

6.1 SOIL CONCENTRATION MODELING PARAMETERS

Table 6 shows the soil concentration modeling parameters. The left side of the table lists the Ra-226, Cs-137, and Sr-90 mean soil concentrations for the reference area, the trench and excavated soil survey units, and the imported fill material. The mean soil concentrations were calculated using the reported sample concentrations or the MDC values if the reported sample concentration was less than the MDC. The left side of the table lists the weighted contributions of the three radionuclides of concern based on amount used to backfill the trench. The Ra-226 soil concentrations were modeled based on the net concentration with the reference area Ra-226 concentration subtracted. If the reference area Ra-226 concentration was greater than the survey unit mean concentration, no Ra-226 contribution was included in the model. No reference area concentration is subtracted from the Cs-137 or Sr-90 values as these radionuclides are not naturally occurring or are expected at drain piping depths from global fallout from nuclear weapons testing.

Table 6 – Soil Concentration Modeling Parameters

Survey Unit (or Source)	Mean Conc (pCi/g)			Excavated Soil (m^3)	Fill Percent	Weighted Conc (pCi/g)		
	Ra-226	Cs-137	Sr-90			Ra-226	Cs-137	Sr-90
Reference Area (Building 813)								
Parking Lot	0.488	0.021	0.194	--	--	--	--	--
Trench								
04-PDT-015	0.315	0.020	0.129	--	**Net**	**0.000**	**0.020**	**0.129**
Backfill								
04-PD-D0034	0.316	0.021	0.117	150	54.3%	0.172	0.011	0.063
04-PD-D0035	0.338	0.021	0.113	101	36.6%	0.124	0.008	0.041
Imported Fill	0.347	0.020	0.152	25	9.1%	0.031	0.002	0.014
					Weighted	0.327	0.021	0.118
					Net	**0.000**	**0.021**	**0.118**

Using the data provided in Table 6, the average net concentrations of material used as backfill in Zone O were 0.021 pCi/g Cs-137 and 0.118 pCi/g Sr-90; and 0.020 pCi/g Cs-137 and 0.129 pCi/g Sr-90 for the trench. No Ra-226 contribution was modeled for either the backfill or the trench.

6.2 DOSE AND RISK MODELING RESULTS

The RESRAD reports are found in Attachments 7 and 8. Dose and risk modeling results for the backfill and the trench are summarized in Table 7. Modeling resulted in a net residual dose of 0.5198 millirem per year (mrem/y) with an increased cancer risk of 6.724×10^{-6} for the backfill, and 0.5624 mrem/y with an increased cancer risk of 7.255×10^{-6} for the trench. Based on these results, no further dose modeling is determined to be reasonable or prudent.

Table 7 – Dose and Risk Modeling Results

Model	Net Soil Concentration (pCi/g)			Dose (mrem/y)	Cancer Risk
	Ra-226	Cs-137	Sr-90		
Backfill	0.000	0.021	0.118	5.198E-01	6.724E-06
Trench	0.000	0.020	0.129	5.624E-01	7.255E-06

7.0 RECOMMENDATION OF FINAL UNRESTRICTED RELEASE

Two specific considerations were examined to determine acceptability for unrestricted release. They are: (1) radionuclide-specific release criteria and (2) dose and health risk modeling.

7.1 RADIONUCLIDE-SPECIFIC RELEASE CRITERIA

Three radionuclides of concern for Zone O were identified: Ra-226, Cs-137, and Sr-90. A total of 87 samples were collected from the single trench and two excavated soil survey units. Sample results (see Table 5) were compared to the soil release criteria defined in Table 2-2 of the SUPRs Abstract (Gilbane, 2014). The reported soil concentrations are below the Table 2-2 values.

As stated in Section 2.5 of the SUPRs Abstract (Gilbane, 2014), survey units for the sanitary sewer and storm drain removal project are considered acceptable when the radionuclide concentrations meet the Table 2-2 values.

7.2 DOSE AND HEALTH RISK MODELING

RESRAD Version 6.5 was used to model external, inhalation, and ingestion exposures to a member of the critical group based on the residential farmer scenario. The results of the model (see Table 7) indicate a net residual dose of 0.5198 mrem/y with an increased cancer risk of 6.724×10^{-6} for the backfill, and 0.5624 mrem/y with an increased cancer risk of 7.255×10^{-6} for the trench.

As stated in Section 6.0 of the SUPRs Abstract (Gilbane, 2014), demonstration of both a net residual dose of less than 25 mrem/y and a net increased health risk in the range of 10^{-4} to 10^{-6} to the average member of the critical group (or member of the public) will be considered sufficient for unrestricted release of the survey unit.

7.3 RECOMMENDATIONS

Based on the samples collected and analyzed from the trench and excavated soil survey units, the soil concentrations of the radionuclides of concern are less than the release criteria. The dose and risks based on the RESRAD model are less than the U. S. Nuclear Regulatory Commission criterion of 25 mrem/y with an increased cancer risk that falls within the U. S. Environmental Protection Agency's risk management range of 10^{-4} to 10^{-6}, which support free release. See also the *Final Basewide Radiological Removal Action, Action Memorandum–Revision 2006, Hunters*

Point Shipyard, San Francisco, California (Navy, 2006). Therefore, no further action is recommended for Zone O.

8.0 REFERENCES

DoD (U. S. Department of Defense), U. S. Department of Energy, U. S. Nuclear Regulatory Commission, and U. S. Environmental Protection Agency. 2000. *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM). NUREG-1575. August.

Gilbane, 2016. *Remedial Action Completion Report, Parcel D-1 Phase II Hunters Point Naval Shipyard, San Francisco, California* (to be drafted).

Gilbane, 2014. *Survey Unit Project Reports Abstract, Parcel D-1 Phase II Sanitary Sewer and Storm Drain Removal, Hunters Point Shipyard, San Francisco, California*. October.

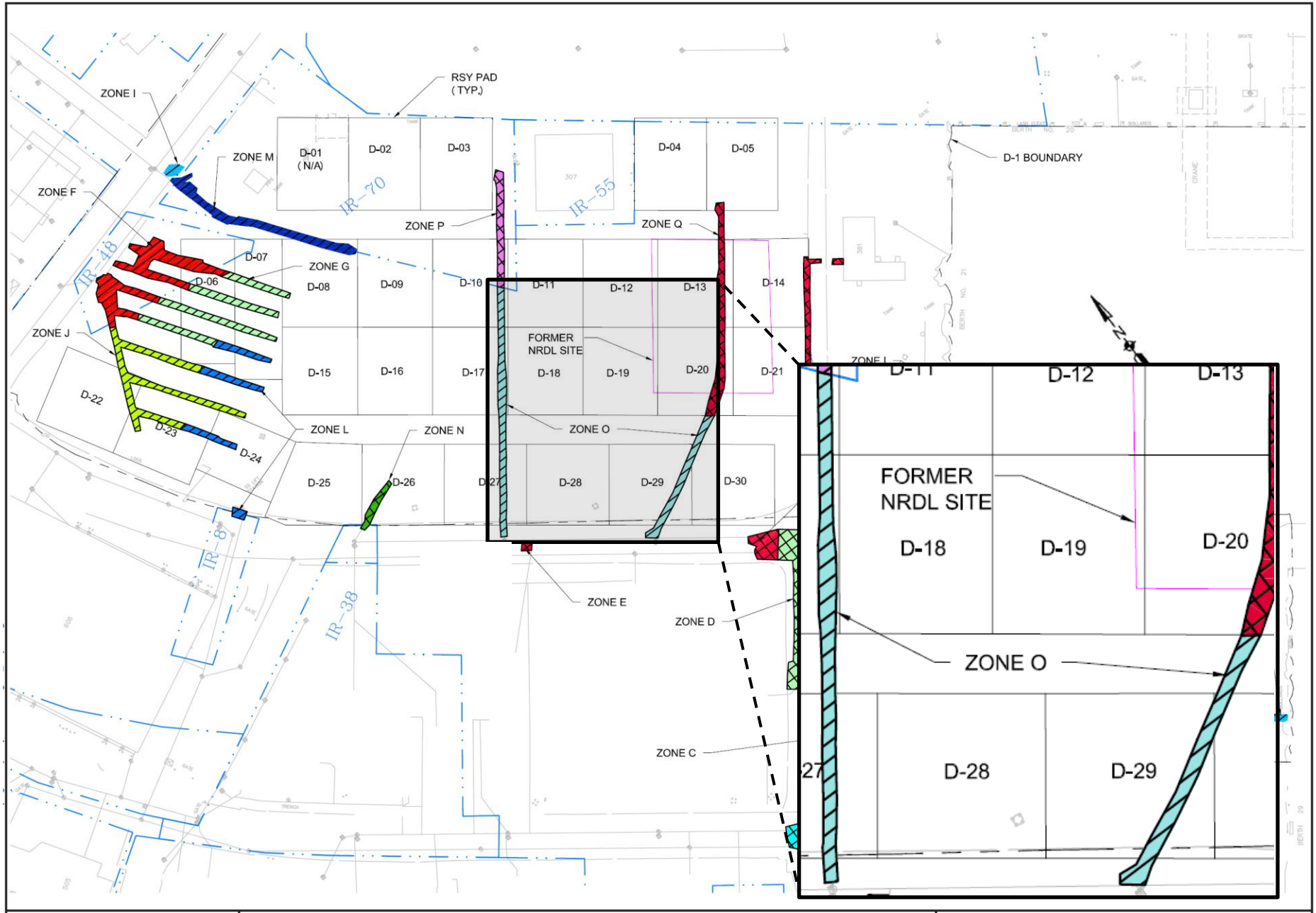
ITSI Gilbane, 2013. *Execution Plan, Radiological Remediation and Support, Parcel D-1 Phase II Execution Plan, Hunters Point Shipyard, San Francisco, California*. July.

Navy, 2006. *Final Basewide Radiological Removal Action, Action Memorandum–Revision 2006, Hunters Point Shipyard, San Francisco, California*. April.

This page left intentionally blank.

FIGURES

This page left intentionally blank.



Gilbane

Radiological Remediation and Support
Parcel D-1, Phase II
Hunters Point Naval Shipyard
San Francisco, California

Figure 1
Sanitary Sewer and Storm Drain Removal
Zone O

This page left intentionally blank.

ATTACHMENTS

This page left intentionally blank.

ATTACHMENT 3

EXCAVATED SOIL 04-PD-D0034 DATA

This page left intentionally blank.

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

Gilbane

207004 PS 1/15/14

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag,

2514494 12-9-13 sealed 12/30/13 bin#21

mgrowth bin# 21

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
1	04-PD-D0034-01 CA	SO	11/29/2013	1344	KLM	X	X	04-PD-D0034-01	N1	0.00	0.00
2	04-PD-D0034-02 CA	SO	11/29/2013	1346	KLM	X	X	04-PD-D0034-02	N1	0.00	0.00
3	04-PD-D0034-03 CA	SO	11/29/2013	1349	KLM	X	X	04-PD-D0034-03	N1	0.00	0.00
4	04-PD-D0034-04 CA	SO	11/29/2013	1351	KLM	X	X	04-PD-D0034-04	N1	0.00	0.00
5	04-PD-D0034-05 CA	SO	11/29/2013	1353	KLM	X	X	04-PD-D0034-05	N1	0.00	0.00
6	04-PD-D0034-06 CA	SO	11/29/2013	1355	KLM	X	X	04-PD-D0034-06	N1	0.00	0.00
7	04-PD-D0034-07 CA	SO	11/29/2013	1357	KLM	X	X	04-PD-D0034-07	N1	0.00	0.00
8	04-PD-D0034-08 CA	SO	11/29/2013	1359	KLM	X	X	04-PD-D0034-08	N1	0.00	0.00
9	04-PD-D0034-09 CA	SO	11/29/2013	1401	KLM	X	X	04-PD-D0034-09	N1	0.00	0.00
10	04-PD-D0034-10 CA	SO	11/29/2013	1403	KLM	X	X	04-PD-D0034-10	N1	0.00	0.00
Cooler # 8		**Turnaround Time: 0 Days**									

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Date	Time
[signature]	12-9-13	0800	[signature]	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

[signature] CT 12-9-13 0950 OK

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

207004 PS 1/15/14

Gilbane

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag.

251449 12-9-13

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
11	04-PD-D0034-11 CA	SO	11/29/2013	1406	KLM	X	X	04-PD-D0034-11	N1	0.00	0.00
12	04-PD-D0034-12 CA	SO	11/29/2013	1408	KLM	X	X	04-PD-D0034-12	N1	0.00	0.00
13	04-PD-D0034-13 CA	SO	11/29/2013	1411	KLM	X	X	04-PD-D0034-13	N1	0.00	0.00
14	04-PD-D0034-14 CA	SO	11/29/2013	1413	KLM	X	X	04-PD-D0034-14	N1	0.00	0.00
15	04-PD-D0034-15 CA	SO	11/29/2013	1415	KLM	X	X	04-PD-D0034-15	N1	0.00	0.00
16	04-PD-D0034-16 CA	SO	11/29/2013	1418	KLM	X	X	04-PD-D0034-16	N1	0.00	0.00
17	04-PD-D0034-17 CA	SO	11/29/2013	1420	KLM	X	X	04-PD-D0034-17	N1	0.00	0.00
18	04-PD-D0034-18 CA	SO	11/29/2013	1423	KLM	X	X	04-PD-D0034-18	N1	0.00	0.00
19	04-PD-D0034-19 CA	SO	11/29/2013	1425	KLM	X	X	04-PD-D0034-19	N1	0.00	0.00
20	04-PD-D0034-20 CA	SO	11/29/2013	1427	KLM	X	X	04-PD-D0034-20	N1	0.00	0.00
Cooler # 8		**Turnaround Time: 0 Days**									

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Date	Time
[signature]	12/9/13	0800	[signature]	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

C. Eldt @ 12-9-13 0950 OK

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

207008 PS 1/15/14

Gilbane

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag,

251449 12-9-13

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
21	04-PD-D0034-21	SO	12/8/2013	1026		X	X	04-PD-D0034-21	N1	0.00	0.00
22	04-PD-D0034-22	SO	12/8/2013	1029		X	X	04-PD-D0034-22	N1	0.00	0.00
23	04-PD-D0034-23	SO	12/8/2013	1032		X	X	04-PD-D0034-23	N1	0.00	0.00
24	04-PD-D0034-24	SO	12/8/2013	1035		X	X	04-PD-D0034-24	N1	0.00	0.00
Cooler # 8		Turnaround Time: 0 Days									

Relinquished by: *(Signature)*	Date	Time
	12/9/13	0800

Received by: *(Signature)*	Date	Time
	12-09-13	0800

Shipping Date / Carrier / Airbill Number
Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* & condition
12-9-13 0950 OK

Data Review Summary for 251449
Hunters Point Naval Shipyard Parcel D-1
Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013

Facility:	Hunters Point Naval Shipyard Parcel D-1
Event:	Sewer Line Removal
Guidance Document:	Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013
Contract Laboratory:	Curtis & Tompkins, Berkeley, CA
Field Contractor:	Innovative Technical Solutions, Inc., Walnut Creek, CA
Data Review Contractor:	Synectics, Sacramento, CA
SDG:	251449, Certify Error by jgoyette
QC Level:	Level3
Project Manager:	Richard Flynn
Data Reviewer:	James Parker
Data Reviewer Title:	Senior Scientist
Date of Review Report:	February 23, 2014
Second Reviewer:	Evin McKinney
Completion Date of Second Reviewer:	March 17, 2014

Analytical Method/ Leach Method	Normal Soil Samples	Field QC Soil Samples
E901.1/NONE	24	
GS186/NONE	24	

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013 to the extent possible. Where definitive guidance is not provided, data has been evaluated in a conservative manner using professional judgment. In cases where two qualifiers are listed as an action, such as 'J/UJ', the first qualifier applies to positive results, and the second to non-detect results.

Samples were collected by Innovative Technical Solutions, Inc., Walnut Creek, CA; analyses were performed by Curtis & Tompkins, Berkeley, CA and were reported under sample delivery group (SDG) 251449. Results have been evaluated electronically using electronic data deliverables (EDDs) provided by the laboratory. The laboratory data summary forms (hard copy) have been reviewed during this effort and compared to the automated review output. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative.

The following quality control elements were supported by the electronic deliverable and were evaluated during this review effort:

Blank
Blank - Negative
Lab Replicate RPD
LCS Recovery
Prep Hold Time
Test Hold Time

The following quality control elements were either not applicable to the deliverable, or were not supported by the electronic deliverable, and were therefore not included in the automated data review. Those elements required for the project were reviewed manually, as narrated in the Comment section below.

Ambient Blank
Calibration Blank
Calibration Blank - Negative
Continuing Calibration Verification
Equipment Blank
Field Blank
Field Duplicate RPD
Initial Calibration Verification
Material Blank
MS Recovery
MS RPD
Negative Blank
Surrogate
Trip Blank

A representative sampling or ten percent of sample and QC results were manually evaluated for compliance with project specific requirements and consistency with hard copy results. The following summaries were generated during the evaluation of this data set and are included in this report as applicable.

Batch – The analytical batch report is reviewed for completeness and compliance with project specific requirements. Incomplete or non-compliant run sequences are identified and their impact on data quality are discussed in the narrative.

QC Outlier – Results exceeding the evaluation criteria are reviewed for compliance with project requirements and a minimum of ten percent of the non-compliant QC values reported electronically are verified for consistency with hard-copy values.

Qualified Results – Qualified results are evaluated for compliance with project requirements and ten percent of qualified results are verified for consistency with the QC Outliers.

Rejected Results – All rejected results are evaluated for compliance with project requirements. The reason for rejection of the data is verified against hard copy data.

Field Duplicates – Field duplicate comparison results are evaluated for compliance with project requirements and ten percent of values reported are verified for consistency with the hard-copy data.

Data Submission Warnings – Warnings encountered during the data submission process are evaluated and their affect on data quality is discussed in the narrative below.

Analytical deficiencies, project non-compliance issues and inconsistencies with hard copy results observed during ADR evaluation process and their impact on data quality are summarized in the narrative below.

A total of 2 results (0.26%) out of the 768 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected. Trace values are not counted as qualified results in the above count. The qualified results are detailed in the following tables and discussed in the narrative below, where appropriate.

Narrative Comments

E901.1 was reviewed for CS-137 and RA-226 only.

Analytical Method	Comment
E901.1	

Reviewed by James Parker, Senior Scientist

February 23, 2014

Reviewed by Evin McKinney

March 17, 2014

Qualified Results

Test Method: GS186	Extraction Method: METHOD		Leach Method: NONE		Matrix: SO			
FieldSample ID	Type	Analyte	RL	Lab Result	Qualified Result	Bias	Units	Reason
04-PD-D0034-07	N	Cesium 137	0.021	0.017 U	0.021 UJ		PCI/G	D1
04-PD-D0034-07	N	THORIUM-232DA	0.080	0.33	0.33 J		PCI/G	D1

Reason Code Definitions

Code	Definition
D1	Lab Replicate RPD

Flag Code and Definitions

Flag	Definition
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
J	Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.

Automated Data Review Detail Report for 251449
Hunters Point Naval Shipyard Parcel D-1
Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013

synectics
connecting people and data

Batch Report

Test Method: E901.1 Analysis Batch: 207004

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	QC723787		1/1	12/30/2013 14:40	12/30/2013 14:40	1/24/2014 11:49	207004/	LB
LABQC	SQ	LABQC	QC723788		1/1	12/30/2013 14:35	12/30/2013 14:35	1/24/2014 14:28	207004/	BS
04-PD-D0034-05	SO	04-PD-D0034-05	251449-005		2/1	11/29/2013 13:53	12/30/2013 16:56	1/24/2014 17:01	207004/	N
04-PD-D0034-04	SO	04-PD-D0034-04	251449-004		2/1	11/29/2013 13:51	12/30/2013 16:53	1/24/2014 17:02	207004/	N
04-PD-D0034-01	SO	04-PD-D0034-01	251449-001		2/1	11/29/2013 13:44	12/30/2013 16:45	1/24/2014 17:04	207004/	N
04-PD-D0034-02	SO	04-PD-D0034-02	251449-002		2/1	11/29/2013 13:46	12/30/2013 16:47	1/24/2014 17:04	207004/	N
04-PD-D0034-03	SO	04-PD-D0034-03	251449-003		2/1	11/29/2013 13:49	12/30/2013 16:49	1/24/2014 17:05	207004/	N
04-PD-D0034-07	SO	04-PD-D0034-07	251449-007		2/1	11/29/2013 13:57	12/30/2013 17:01	1/24/2014 17:52	207004/	N
04-PD-D0034-08	SO	04-PD-D0034-08	251449-008		2/1	11/29/2013 13:59	12/30/2013 17:05	1/24/2014 17:52	207004/	N
04-PD-D0034-06	SO	04-PD-D0034-06	251449-006		2/1	11/29/2013 13:55	12/30/2013 16:59	1/24/2014 17:53	207004/	N
04-PD-D0034-09	SO	04-PD-D0034-09	251449-009		2/1	11/29/2013 14:01	12/30/2013 17:09	1/24/2014 17:53	207004/	N
04-PD-D0034-10	SO	04-PD-D0034-10	251449-010		2/1	11/29/2013 14:03	12/30/2013 17:12	1/24/2014 18:44	207004/	N
04-PD-D0034-14	SO	04-PD-D0034-14	251449-014		2/1	11/29/2013 14:13	12/30/2013 17:22	1/24/2014 18:44	207004/	N
04-PD-D0034-13	SO	04-PD-D0034-13	251449-013		2/1	11/29/2013 14:11	12/30/2013 17:20	1/24/2014 18:46	207004/	N
04-PD-D0034-11	SO	04-PD-D0034-11	251449-011		2/1	11/29/2013 14:06	12/30/2013 17:14	1/24/2014 18:47	207004/	N
04-PD-D0034-12	SO	04-PD-D0034-12	251449-012		2/1	11/29/2013 14:08	12/30/2013 17:17	1/24/2014 18:47	207004/	N
04-PD-D0034-07	SO	04-PD-D0034-07	QC723789		1/1	11/29/2013 13:57	12/30/2013 17:01	1/24/2014 19:35	207004/	LR
04-PD-D0034-16	SO	04-PD-D0034-16	251449-016		2/1	11/29/2013 14:18	12/30/2013 17:28	1/24/2014 19:35	207004/	N
04-PD-D0034-15	SO	04-PD-D0034-15	251449-015		2/1	11/29/2013 14:15	12/30/2013 17:25	1/24/2014 19:36	207004/	N
04-PD-D0034-17	SO	04-PD-D0034-17	251449-017		2/1	11/29/2013 14:20	12/30/2013 17:31	1/24/2014 19:37	207004/	N
04-PD-D0034-18	SO	04-PD-D0034-18	251449-018		2/1	11/29/2013 14:23	12/30/2013 17:34	1/24/2014 19:37	207004/	N
04-PD-D0034-19	SO	04-PD-D0034-19	251449-019		2/1	11/29/2013 14:25	12/30/2013 17:36	1/24/2014 20:27	207004/	N
04-PD-D0034-20	SO	04-PD-D0034-20	251449-020		2/1	11/29/2013 14:27	12/30/2013 17:38	1/24/2014 20:28	207004/	N

Automated Data Review Detail Report for 251449
Hunters Point Naval Shipyard Parcel D-1
Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013

synectics
connecting people and data

Batch Report

Test Method: E901.1 Analysis Batch: 207008

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	QC723802		1/1	12/30/2013 14:35	12/30/2013 14:35	1/24/2014 10:56	207008/	BS
LABQC	SQ	LABQC	QC723801		1/1	12/30/2013 14:40	12/30/2013 14:40	1/24/2014 15:21	207008/	LB
04-PD-D0034-21	SO	04-PD-D0034-21	251449-021		2/1	12/8/2013 10:26	12/30/2013 17:41	1/24/2014 20:26	207008/	N
04-PD-D0034-22	SO	04-PD-D0034-22	251449-022		2/1	12/8/2013 10:29	12/30/2013 17:47	1/24/2014 20:26	207008/	N
04-PD-D0034-23	SO	04-PD-D0034-23	251449-023		2/1	12/8/2013 10:32	12/30/2013 17:50	1/24/2014 20:28	207008/	N
04-PD-D0034-24	SO	04-PD-D0034-24	251449-024		2/1	12/8/2013 10:35	12/30/2013 17:55	1/24/2014 21:18	207008/	N

Test Method: GS186 Analysis Batch: 206637

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
LABQC	SQ	LABQC	QC722414		1/1	12/30/2013 14:35	12/30/2013 14:35	1/6/2014 16:27	206637/	BS
LABQC	SQ	LABQC	QC722413		1/1	12/30/2013 14:40	12/30/2013 14:40	1/6/2014 16:28	206637/	LB
04-PD-D0034-01	SO	04-PD-D0034-01	251449-001		1/1	11/29/2013 13:44	12/30/2013 16:45	1/8/2014 16:58	206637/	N
04-PD-D0034-02	SO	04-PD-D0034-02	251449-002		1/1	11/29/2013 13:46	12/30/2013 16:47	1/8/2014 17:00	206637/	N
04-PD-D0034-03	SO	04-PD-D0034-03	251449-003		1/1	11/29/2013 13:49	12/30/2013 16:49	1/8/2014 17:01	206637/	N
04-PD-D0034-04	SO	04-PD-D0034-04	251449-004		1/1	11/29/2013 13:51	12/30/2013 16:53	1/8/2014 17:02	206637/	N
04-PD-D0034-05	SO	04-PD-D0034-05	251449-005		1/1	11/29/2013 13:53	12/30/2013 16:56	1/8/2014 17:03	206637/	N
04-PD-D0034-08	SO	04-PD-D0034-08	251449-008		1/1	11/29/2013 13:59	12/30/2013 17:05	1/8/2014 17:51	206637/	N
04-PD-D0034-07	SO	04-PD-D0034-07	251449-007		1/1	11/29/2013 13:57	12/30/2013 17:01	1/8/2014 17:52	206637/	N
04-PD-D0034-06	SO	04-PD-D0034-06	251449-006		1/1	11/29/2013 13:55	12/30/2013 16:59	1/8/2014 17:53	206637/	N
04-PD-D0034-09	SO	04-PD-D0034-09	251449-009		1/1	11/29/2013 14:01	12/30/2013 17:09	1/8/2014 17:53	206637/	N
04-PD-D0034-10	SO	04-PD-D0034-10	251449-010		1/1	11/29/2013 14:03	12/30/2013 17:12	1/8/2014 17:54	206637/	N
04-PD-D0034-11	SO	04-PD-D0034-11	251449-011		1/1	11/29/2013 14:06	12/30/2013 17:14	1/8/2014 17:56	206637/	N
04-PD-D0034-12	SO	04-PD-D0034-12	251449-012		1/1	11/29/2013 14:08	12/30/2013 17:17	1/8/2014 17:56	206637/	N
04-PD-D0034-14	SO	04-PD-D0034-14	251449-014		1/1	11/29/2013 14:13	12/30/2013 17:22	1/8/2014 18:44	206637/	N
04-PD-D0034-07	SO	04-PD-D0034-07	QC722417		1/1	11/29/2013 13:57	12/30/2013 17:01	1/8/2014 18:45	206637/	LR
04-PD-D0034-13	SO	04-PD-D0034-13	251449-013		1/1	11/29/2013 14:11	12/30/2013 17:20	1/8/2014 18:45	206637/	N

Automated Data Review Detail Report for 251449
Hunters Point Naval Shipyard Parcel D-1
Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013

synectics
connecting people and data

Batch Report

Test Method: GS186 Analysis Batch: 206637

Location	Matrix	Field Sample ID	Lab Sample ID	Calibration Ref	Run#/ Dil'n	Collection Date/Time	Extraction Date/Time	Analysis Date/Time	Prep/Leach Batch	Sample Type
04-PD-D0034-15	SO	04-PD-D0034-15	251449-015		1/1	11/29/2013 14:15	12/30/2013 17:25	1/8/2014 18:47	206637/	N
04-PD-D0034-16	SO	04-PD-D0034-16	251449-016		1/1	11/29/2013 14:18	12/30/2013 17:28	1/8/2014 18:48	206637/	N
04-PD-D0034-17	SO	04-PD-D0034-17	251449-017		1/1	11/29/2013 14:20	12/30/2013 17:31	1/8/2014 18:49	206637/	N
04-PD-D0034-18	SO	04-PD-D0034-18	251449-018		1/1	11/29/2013 14:23	12/30/2013 17:34	1/8/2014 18:50	206637/	N
04-PD-D0034-19	SO	04-PD-D0034-19	251449-019		1/1	11/29/2013 14:25	12/30/2013 17:36	1/8/2014 19:37	206637/	N
04-PD-D0034-20	SO	04-PD-D0034-20	251449-020		1/1	11/29/2013 14:27	12/30/2013 17:38	1/8/2014 19:38	206637/	N
04-PD-D0034-22	SO	04-PD-D0034-22	251449-022		1/1	12/8/2013 10:29	12/30/2013 17:47	1/8/2014 19:39	206637/	N
04-PD-D0034-23	SO	04-PD-D0034-23	251449-023		1/1	12/8/2013 10:32	12/30/2013 17:50	1/8/2014 19:40	206637/	N
04-PD-D0034-24	SO	04-PD-D0034-24	251449-024		1/1	12/8/2013 10:35	12/30/2013 17:55	1/8/2014 19:41	206637/	N
04-PD-D0034-21	SO	04-PD-D0034-21	251449-021		1/1	12/8/2013 10:26	12/30/2013 17:41	1/8/2014 19:44	206637/	N

Field Batch Report

--No Records Found--

Automated Data Review Detail Report for 251449
Hunters Point Naval Shipyard Parcel D-1
Hunters Point Naval Shipyard Parcel D-1 SAP, July 2013

synectics
connecting people and data

QC Outlier Report

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

QC Element	Sample ID/ Lab Sample ID	Run#/ Dil'n	Analyte	Result (Units)	Qualifier	Warning Limits	Control Limits	Reason	Comment	Rule	Action Level
Lab Replicate RPD	QC722417 (LR) / QC722417	1 / 1.00	Cesium 137	41.8 (RPD)	J/UJ	< 20	< 20	D1			
Lab Replicate RPD	QC722417 (LR) / QC722417	1 / 1.00	THORIUM-232DA	47.7 (RPD)	J/UJ	< 40	< 80	D1			

Rule is the multiplier used when blank contamination occurs to determine action level.

Qualified Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Bias	Units	Reason
04-PD-D0034-07	251449-007	SO	N	Cesium 137	0.021	0.017 U	0.021 UJ		PCI/G	D1
04-PD-D0034-07	251449-007	SO	N	THORIUM-232DA	0.080	0.33	0.33 J		PCI/G	D1

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-01	251449-001	SO	N	Bismuth 214	0.037	0.26	0.26	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Lead 212	0.035	0.27	0.27	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Lead 214	0.038	0.28	0.28	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Potassium 40	0.21	18.3	18.3	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Radium 226	0.037	0.26	0.26	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Thallium 208	0.017	0.093	0.093	PCI/G	
04-PD-D0034-01	251449-001	SO	N	THORIUM-232DA	0.056	0.39	0.39	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Bismuth 214	0.042	0.22	0.22	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Lead 212	0.035	0.28	0.28	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Lead 214	0.045	0.33	0.33	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Potassium 40	0.24	21.4	21.4	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Radium 226	0.042	0.22	0.22	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Thallium 208	0.018	0.11	0.11	PCI/G	
04-PD-D0034-02	251449-002	SO	N	THORIUM-232DA	0.052	0.37	0.37	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Bismuth 212	0.23	0.45	0.45	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Bismuth 214	0.048	0.18	0.18	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Lead 212	0.041	0.27	0.27	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Lead 214	0.039	0.32	0.32	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Potassium 40	0.20	22.4	22.4	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Radium 226	0.048	0.18	0.18	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Thallium 208	0.018	0.11	0.11	PCI/G	
04-PD-D0034-03	251449-003	SO	N	THORIUM-232DA	0.088	0.30	0.30	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Uranium 235	0.14	0.17	0.17	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Bismuth 214	0.047	0.37	0.37	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Lead 212	0.037	0.30	0.30	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Lead 214	0.041	0.39	0.39	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Potassium 40	0.32	15.2	15.2	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Radium 226	0.047	0.37	0.37	PCI/G	

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-04	251449-004	SO	N	Thallium 208	0.020	0.14	0.14	PCI/G	
04-PD-D0034-04	251449-004	SO	N	THORIUM-232DA	0.058	0.38	0.38	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Bismuth 212	0.25	0.53	0.53	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Bismuth 214	0.045	0.37	0.37	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Lead 212	0.036	0.38	0.38	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Lead 214	0.047	0.42	0.42	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Potassium 40	0.25	16.5	16.5	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Radium 226	0.045	0.37	0.37	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Thallium 208	0.017	0.091	0.091	PCI/G	
04-PD-D0034-05	251449-005	SO	N	THORIUM-232DA	0.061	0.38	0.38	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Bismuth 214	0.038	0.29	0.29	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Lead 212	0.036	0.27	0.27	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Lead 214	0.041	0.34	0.34	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Potassium 40	0.23	15.8	15.8	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Radium 226	0.038	0.29	0.29	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Thallium 208	0.020	0.097	0.097	PCI/G	
04-PD-D0034-06	251449-006	SO	N	THORIUM-232DA	0.064	0.53	0.53	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Bismuth 212	0.28	0.36	0.36	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Bismuth 214	0.036	0.39	0.39	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Cesium 137	0.017	0.035	0.035	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Lead 212	0.035	0.36	0.36	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Lead 214	0.043	0.38	0.38	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Potassium 40	0.31	17.3	17.3	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Radium 226	0.036	0.39	0.39	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Thallium 208	0.021	0.14	0.14	PCI/G	
04-PD-D0034-07	251449-007	SO	N	THORIUM-232DA	0.065	0.47	0.47	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Bismuth 212	0.24	0.33	0.33	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Bismuth 214	0.044	0.36	0.36	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Lead 212	0.034	0.37	0.37	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-08	251449-008	SO	N	Lead 214	0.040	0.39	0.39	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Potassium 40	0.28	16.5	16.5	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Radium 226	0.044	0.36	0.36	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Thallium 208	0.014	0.15	0.15	PCI/G	
04-PD-D0034-08	251449-008	SO	N	THORIUM-232DA	0.082	0.33	0.33	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Bismuth 212	0.24	0.39	0.39	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Bismuth 214	0.042	0.27	0.27	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Lead 212	0.036	0.26	0.26	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Lead 214	0.039	0.31	0.31	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Potassium 40	0.23	19.9	19.9	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Radium 226	0.042	0.27	0.27	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Thallium 208	0.019	0.085	0.085	PCI/G	
04-PD-D0034-09	251449-009	SO	N	THORIUM-232DA	0.055	0.40	0.40	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Bismuth 214	0.038	0.32	0.32	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Lead 212	0.038	0.34	0.34	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Lead 214	0.048	0.39	0.39	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Potassium 40	0.35	16.9	16.9	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Radium 226	0.038	0.32	0.32	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Thallium 208	0.021	0.14	0.14	PCI/G	
04-PD-D0034-10	251449-010	SO	N	THORIUM-232DA	0.059	0.48	0.48	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Bismuth 212	0.22	0.45	0.45	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Bismuth 214	0.046	0.38	0.38	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Lead 212	0.035	0.31	0.31	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Lead 214	0.037	0.44	0.44	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Potassium 40	0.18	18.8	18.8	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Radium 226	0.046	0.38	0.38	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Thallium 208	0.021	0.13	0.13	PCI/G	
04-PD-D0034-11	251449-011	SO	N	THORIUM-232DA	0.051	0.33	0.33	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Bismuth 212	0.19	0.56	0.56	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-12	251449-012	SO	N	Bismuth 214	0.039	0.29	0.29	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Lead 212	0.040	0.26	0.26	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Lead 214	0.037	0.36	0.36	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Potassium 40	0.21	16.6	16.6	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Radium 226	0.039	0.29	0.29	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Thallium 208	0.014	0.12	0.12	PCI/G	
04-PD-D0034-12	251449-012	SO	N	THORIUM-232DA	0.076	0.30	0.30	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Bismuth 212	0.27	0.41	0.41	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Bismuth 214	0.044	0.28	0.28	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Lead 212	0.037	0.29	0.29	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Lead 214	0.045	0.31	0.31	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Potassium 40	0.32	20.3	20.3	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Radium 226	0.044	0.28	0.28	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Thallium 208	0.016	0.11	0.11	PCI/G	
04-PD-D0034-13	251449-013	SO	N	THORIUM-232DA	0.055	0.35	0.35	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Bismuth 212	0.30	0.37	0.37	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Bismuth 214	0.043	0.33	0.33	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Lead 212	0.030	0.28	0.28	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Lead 214	0.044	0.31	0.31	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Potassium 40	0.29	18.0	18.0	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Radium 226	0.043	0.33	0.33	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Thallium 208	0.020	0.077	0.077	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Thorium 234	0.93	1.1	1.1	PCI/G	
04-PD-D0034-14	251449-014	SO	N	THORIUM-232DA	0.084	0.23	0.23	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Bismuth 212	0.23	0.38	0.38	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Bismuth 214	0.038	0.29	0.29	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Lead 212	0.039	0.29	0.29	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Lead 214	0.045	0.42	0.42	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Potassium 40	0.26	17.5	17.5	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-15	251449-015	SO	N	Radium 226	0.038	0.29	0.29	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Thallium 208	0.016	0.12	0.12	PCI/G	
04-PD-D0034-15	251449-015	SO	N	THORIUM-232DA	0.065	0.44	0.44	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Uranium 235	0.13	0.17	0.17	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Bismuth 212	0.27	0.35	0.35	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Bismuth 214	0.046	0.36	0.36	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Lead 212	0.037	0.30	0.30	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Lead 214	0.048	0.38	0.38	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Potassium 40	0.29	16.0	16.0	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Radium 226	0.046	0.36	0.36	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Thallium 208	0.017	0.11	0.11	PCI/G	
04-PD-D0034-16	251449-016	SO	N	THORIUM-232DA	0.049	0.36	0.36	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Bismuth 212	0.25	0.40	0.40	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Bismuth 214	0.044	0.31	0.31	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Lead 212	0.037	0.30	0.30	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Lead 214	0.040	0.34	0.34	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Potassium 40	0.21	19.1	19.1	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Radium 226	0.044	0.31	0.31	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Thallium 208	0.016	0.12	0.12	PCI/G	
04-PD-D0034-17	251449-017	SO	N	THORIUM-232DA	0.075	0.36	0.36	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Americium 241	0.11	0.17	0.17	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Bismuth 214	0.044	0.33	0.33	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Lead 212	0.030	0.27	0.27	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Lead 214	0.038	0.36	0.36	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Potassium 40	0.21	15.9	15.9	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Radium 226	0.044	0.33	0.33	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Thallium 208	0.019	0.093	0.093	PCI/G	
04-PD-D0034-18	251449-018	SO	N	THORIUM-232DA	0.050	0.43	0.43	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Bismuth 212	0.24	0.36	0.36	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-19	251449-019	SO	N	Bismuth 214	0.046	0.25	0.25	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Lead 212	0.032	0.33	0.33	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Lead 214	0.037	0.33	0.33	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Potassium 40	0.30	17.6	17.6	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Radium 226	0.046	0.25	0.25	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Thallium 208	0.018	0.12	0.12	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Thorium 234	0.85	0.87	0.87	PCI/G	
04-PD-D0034-19	251449-019	SO	N	THORIUM-232DA	0.032	0.46	0.46	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Bismuth 212	0.27	0.34	0.34	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Bismuth 214	0.036	0.42	0.42	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Lead 212	0.038	0.46	0.46	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Lead 214	0.046	0.50	0.50	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Potassium 40	0.37	14.7	14.7	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Protactinium 234	0.069	0.078	0.078	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Radium 226	0.036	0.42	0.42	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Thallium 208	0.021	0.11	0.11	PCI/G	
04-PD-D0034-20	251449-020	SO	N	THORIUM-232DA	0.080	0.41	0.41	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Bismuth 212	0.11	0.80	0.80	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Bismuth 214	0.036	0.25	0.25	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Lead 212	0.037	0.29	0.29	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Lead 214	0.043	0.29	0.29	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Potassium 40	0.22	23.3	23.3	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Radium 226	0.036	0.25	0.25	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Thallium 208	0.020	0.093	0.093	PCI/G	
04-PD-D0034-21	251449-021	SO	N	THORIUM-232DA	0.090	0.24	0.24	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Bismuth 214	0.048	0.25	0.25	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Lead 212	0.037	0.31	0.31	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Lead 214	0.042	0.31	0.31	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Potassium 40	0.24	22.1	22.1	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: E901.1 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-22	251449-022	SO	N	Radium 226	0.048	0.25	0.25	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Thallium 208	0.023	0.099	0.099	PCI/G	
04-PD-D0034-22	251449-022	SO	N	THORIUM-232DA	0.085	0.29	0.29	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Bismuth 214	0.034	0.39	0.39	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Lead 212	0.039	0.34	0.34	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Lead 214	0.042	0.41	0.41	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Potassium 40	0.28	14.5	14.5	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Radium 226	0.034	0.39	0.39	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Thallium 208	0.020	0.099	0.099	PCI/G	
04-PD-D0034-23	251449-023	SO	N	THORIUM-232DA	0.074	0.42	0.42	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Bismuth 212	0.26	0.40	0.40	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Bismuth 214	0.046	0.45	0.45	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Europium 152	0.050	0.056	0.056	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Lead 212	0.041	0.42	0.42	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Lead 214	0.044	0.57	0.57	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Potassium 40	0.20	17.2	17.2	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Radium 226	0.046	0.45	0.45	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Thallium 208	0.021	0.17	0.17	PCI/G	
04-PD-D0034-24	251449-024	SO	N	THORIUM-232DA	0.073	0.59	0.59	PCI/G	

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-01	251449-001	SO	N	Bismuth 214	0.034	0.34	0.34	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Lead 212	0.034	0.38	0.38	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Lead 214	0.041	0.28	0.28	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Potassium 40	0.25	17.6	17.6	PCI/G	
04-PD-D0034-01	251449-001	SO	N	Thallium 208	0.013	0.11	0.11	PCI/G	
04-PD-D0034-01	251449-001	SO	N	THORIUM-232DA	0.061	0.28	0.28	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-02	251449-002	SO	N	Bismuth 214	0.034	0.37	0.37	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Lead 212	0.034	0.22	0.22	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Lead 214	0.039	0.34	0.34	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Potassium 40	0.22	20.9	20.9	PCI/G	
04-PD-D0034-02	251449-002	SO	N	Thallium 208	0.011	0.15	0.15	PCI/G	
04-PD-D0034-02	251449-002	SO	N	THORIUM-232DA	0.071	0.18	0.18	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Bismuth 214	0.040	0.16	0.16	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Lead 212	0.033	0.30	0.30	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Lead 214	0.028	0.26	0.26	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Potassium 40	0.31	21.2	21.2	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Radium 226	0.39	0.65	0.65	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Thallium 208	0.014	0.15	0.15	PCI/G	
04-PD-D0034-03	251449-003	SO	N	THORIUM-232DA	0.081	0.16	0.16	PCI/G	
04-PD-D0034-03	251449-003	SO	N	Uranium 235	0.025	0.046	0.046	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Bismuth 214	0.031	0.41	0.41	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Lead 212	0.030	0.33	0.33	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Lead 214	0.036	0.30	0.30	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Potassium 40	0.28	15.7	15.7	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Thallium 208	0.017	0.12	0.12	PCI/G	
04-PD-D0034-04	251449-004	SO	N	THORIUM-232DA	0.084	0.21	0.21	PCI/G	
04-PD-D0034-04	251449-004	SO	N	Uranium 235	0.030	0.035	0.035	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Bismuth 214	0.049	0.24	0.24	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Lead 212	0.036	0.30	0.30	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Lead 214	0.048	0.32	0.32	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Potassium 40	0.26	18.5	18.5	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Radium 226	0.47	0.57	0.57	PCI/G	
04-PD-D0034-05	251449-005	SO	N	Thallium 208	0.015	0.14	0.14	PCI/G	
04-PD-D0034-05	251449-005	SO	N	THORIUM-232DA	0.083	0.14	0.14	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Bismuth 214	0.032	0.32	0.32	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-06	251449-006	SO	N	Lead 212	0.028	0.38	0.38	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Lead 214	0.035	0.37	0.37	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Potassium 40	0.29	14.4	14.4	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Radium 226	0.41	0.46	0.46	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Thallium 208	0.013	0.11	0.11	PCI/G	
04-PD-D0034-06	251449-006	SO	N	THORIUM-232DA	0.014	0.51	0.51	PCI/G	
04-PD-D0034-06	251449-006	SO	N	Uranium 235	0.026	0.033	0.033	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Bismuth 214	0.046	0.23	0.23	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Lead 212	0.030	0.36	0.36	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Lead 214	0.036	0.36	0.36	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Potassium 40	0.29	18.2	18.2	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Thallium 208	0.024	0.060	0.060	PCI/G	
04-PD-D0034-07	251449-007	SO	N	Thorium 234	0.41	0.46	0.46	PCI/G	
04-PD-D0034-07	251449-007	SO	N	THORIUM-232DA	0.080	0.33	0.33 J	PCI/G	D1
04-PD-D0034-07	251449-007	SO	N	Uranium 235	0.028	0.031	0.031	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Bismuth 214	0.036	0.32	0.32	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Lead 212	0.033	0.33	0.33	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Lead 214	0.042	0.35	0.35	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Potassium 40	0.22	17.0	17.0	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Thallium 208	0.023	0.058	0.058	PCI/G	
04-PD-D0034-08	251449-008	SO	N	THORIUM-232DA	0.081	0.21	0.21	PCI/G	
04-PD-D0034-08	251449-008	SO	N	Uranium 235	0.024	0.038	0.038	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Bismuth 214	0.034	0.31	0.31	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Lead 212	0.029	0.28	0.28	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Lead 214	0.034	0.35	0.35	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Potassium 40	0.22	19.5	19.5	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Radium 226	0.37	0.57	0.57	PCI/G	
04-PD-D0034-09	251449-009	SO	N	Thallium 208	0.018	0.074	0.074	PCI/G	
04-PD-D0034-09	251449-009	SO	N	THORIUM-232DA	0.075	0.15	0.15	PCI/G	

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-09	251449-009	SO	N	Uranium 235	0.024	0.038	0.038	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Americium 241	0.23	0.65	0.65	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Bismuth 212	0.18	0.18	0.18	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Bismuth 214	0.047	0.24	0.24	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Lead 212	0.040	0.41	0.41	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Lead 214	0.032	0.39	0.39	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Potassium 40	0.26	18.7	18.7	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Radium 226	0.43	0.56	0.56	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Thallium 208	0.017	0.13	0.13	PCI/G	
04-PD-D0034-10	251449-010	SO	N	THORIUM-232DA	0.073	0.24	0.24	PCI/G	
04-PD-D0034-10	251449-010	SO	N	Uranium 235	0.030	0.034	0.034	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Bismuth 214	0.034	0.36	0.36	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Lead 212	0.033	0.34	0.34	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Lead 214	0.046	0.22	0.22	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Potassium 40	0.30	17.5	17.5	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Radium 226	0.32	0.63	0.63	PCI/G	
04-PD-D0034-11	251449-011	SO	N	Thallium 208	0.022	0.078	0.078	PCI/G	
04-PD-D0034-11	251449-011	SO	N	THORIUM-232DA	0.082	0.22	0.22	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Bismuth 214	0.054	0.13	0.13	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Lead 212	0.043	0.37	0.37	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Lead 214	0.048	0.19	0.19	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Potassium 40	0.25	17.4	17.4	PCI/G	
04-PD-D0034-12	251449-012	SO	N	Thallium 208	0.019	0.099	0.099	PCI/G	
04-PD-D0034-12	251449-012	SO	N	THORIUM-232DA	0.090	0.13	0.13	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Bismuth 214	0.032	0.22	0.22	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Lead 212	0.028	0.41	0.41	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Lead 214	0.025	0.32	0.32	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Potassium 40	0.30	21.5	21.5	PCI/G	
04-PD-D0034-13	251449-013	SO	N	Radium 226	0.38	0.47	0.47	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-13	251449-013	SO	N	Thallium 208	0.013	0.11	0.11	PCI/G	
04-PD-D0034-13	251449-013	SO	N	THORIUM-232DA	0.078	0.25	0.25	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Bismuth 214	0.034	0.36	0.36	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Lead 212	0.033	0.39	0.39	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Lead 214	0.050	0.19	0.19	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Potassium 40	0.28	19.2	19.2	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Radium 226	0.34	0.46	0.46	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Thallium 208	0.015	0.13	0.13	PCI/G	
04-PD-D0034-14	251449-014	SO	N	THORIUM-232DA	0.091	0.13	0.13	PCI/G	
04-PD-D0034-14	251449-014	SO	N	Uranium 235	0.022	0.029	0.029	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Bismuth 214	0.034	0.35	0.35	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Lead 212	0.038	0.30	0.30	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Lead 214	0.029	0.32	0.32	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Potassium 40	0.23	16.4	16.4	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Thallium 208	0.013	0.13	0.13	PCI/G	
04-PD-D0034-15	251449-015	SO	N	THORIUM-232DA	0.015	0.47	0.47	PCI/G	
04-PD-D0034-15	251449-015	SO	N	Uranium 235	0.026	0.034	0.034	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Bismuth 214	0.050	0.41	0.41	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Lead 212	0.038	0.35	0.35	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Lead 214	0.037	0.31	0.31	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Potassium 40	0.32	15.2	15.2	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Radium 226	0.35	0.61	0.61	PCI/G	
04-PD-D0034-16	251449-016	SO	N	Thallium 208	0.025	0.047	0.047	PCI/G	
04-PD-D0034-16	251449-016	SO	N	THORIUM-232DA	0.094	0.21	0.21	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Bismuth 214	0.035	0.40	0.40	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Lead 212	0.030	0.29	0.29	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Lead 214	0.037	0.35	0.35	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Potassium 40	0.30	18.6	18.6	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Radium 226	0.41	0.75	0.75	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-17	251449-017	SO	N	Thallium 208	0.013	0.16	0.16	PCI/G	
04-PD-D0034-17	251449-017	SO	N	Thorium 234	0.37	0.37	0.37	PCI/G	
04-PD-D0034-17	251449-017	SO	N	THORIUM-232DA	0.091	0.15	0.15	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Bismuth 212	0.17	0.21	0.21	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Bismuth 214	0.051	0.23	0.23	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Lead 212	0.029	0.38	0.38	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Lead 214	0.041	0.33	0.33	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Potassium 40	0.25	17.8	17.8	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Radium 226	0.38	0.45	0.45	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Thallium 208	0.026	0.042	0.042	PCI/G	
04-PD-D0034-18	251449-018	SO	N	THORIUM-232DA	0.042	0.55	0.55	PCI/G	
04-PD-D0034-18	251449-018	SO	N	Uranium 235	0.022	0.051	0.051	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Bismuth 214	0.047	0.23	0.23	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Lead 212	0.029	0.35	0.35	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Lead 214	0.033	0.37	0.37	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Potassium 40	0.29	16.6	16.6	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Radium 226	0.41	0.48	0.48	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Thallium 208	0.022	0.066	0.066	PCI/G	
04-PD-D0034-19	251449-019	SO	N	THORIUM-232DA	0.078	0.20	0.20	PCI/G	
04-PD-D0034-19	251449-019	SO	N	Uranium 235	0.024	0.041	0.041	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Bismuth 212	0.13	0.19	0.19	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Bismuth 214	0.050	0.32	0.32	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Lead 212	0.034	0.43	0.43	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Lead 214	0.044	0.38	0.38	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Potassium 40	0.21	15.6	15.6	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Radium 226	0.39	0.74	0.74	PCI/G	
04-PD-D0034-20	251449-020	SO	N	Thallium 208	0.013	0.13	0.13	PCI/G	
04-PD-D0034-20	251449-020	SO	N	THORIUM-232DA	0.059	0.25	0.25	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Bismuth 214	0.033	0.29	0.29	PCI/G	

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-21	251449-021	SO	N	Europium 152	0.047	0.053	0.053	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Lead 212	0.027	0.35	0.35	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Lead 214	0.019	0.31	0.31	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Potassium 40	0.33	21.1	21.1	PCI/G	
04-PD-D0034-21	251449-021	SO	N	Thallium 208	0.016	0.11	0.11	PCI/G	
04-PD-D0034-21	251449-021	SO	N	THORIUM-232DA	0.075	0.25	0.25	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Bismuth 214	0.035	0.23	0.23	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Lead 212	0.035	0.32	0.32	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Lead 214	0.043	0.23	0.23	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Potassium 40	0.26	21.2	21.2	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Radium 226	0.33	0.44	0.44	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Thallium 208	0.011	0.12	0.12	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Thorium 234	0.39	0.43	0.43	PCI/G	
04-PD-D0034-22	251449-022	SO	N	THORIUM-232DA	0.091	0.20	0.20	PCI/G	
04-PD-D0034-22	251449-022	SO	N	Uranium 235	0.023	0.024	0.024	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Bismuth 212	0.15	0.17	0.17	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Bismuth 214	0.048	0.25	0.25	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Lead 212	0.043	0.30	0.30	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Lead 214	0.045	0.40	0.40	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Potassium 40	0.33	14.2	14.2	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Radium 226	0.44	0.54	0.54	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Thallium 208	0.024	0.055	0.055	PCI/G	
04-PD-D0034-23	251449-023	SO	N	THORIUM-232DA	0.089	0.20	0.20	PCI/G	
04-PD-D0034-23	251449-023	SO	N	Uranium 235	0.029	0.039	0.039	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Bismuth 212	0.21	0.24	0.24	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Bismuth 214	0.039	0.53	0.53	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Lead 212	0.038	0.49	0.49	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Lead 214	0.050	0.39	0.39	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Potassium 40	0.30	17.1	17.1	PCI/G	

synectics
connecting people and data

Detected Results

Test Method: GS186 Extraction Method: METHOD Leach Method: NONE

FieldSample ID	LabSample ID	Matrix	Type	Analyte	RL	Lab Result	Qualified Result	Units	Reason
04-PD-D0034-24	251449-024	SO	N	Radium 226	0.41	0.91	0.91	PCI/G	
04-PD-D0034-24	251449-024	SO	N	Thallium 208	0.023	0.13	0.13	PCI/G	
04-PD-D0034-24	251449-024	SO	N	THORIUM-232DA	0.10	0.24	0.24	PCI/G	

Rejected Results

--No Records Found--

synectics
connecting people and data

Anomalies Count

Test/Extraction Method/Leach	Field Samples Outside of Compliance	Analytes Outside of Compliance
E901.1/METHOD/NONE	24	311
GS186/METHOD/NONE	24	310

Anomalies are cases where the reported RL exceeds that specified in the governing project document.

synectics
connecting people and data

Review Questions

Method: E901.1

Review Questions	Yes	No	NA	Comment
Sampling/Login: COC - Custody Trail?	•			
Sampling/Login: COC - Temperature/Condition?	•			
Sampling/Login: COC - Receipt anomalies?	•			
Sampling/Login: COC - Sample/Methods checked?	•			
Sampling/Login: Samples - Collection date?	•			
ICAL: Calibration - Verification source when calculated with the new efficiency must be +- 10% of known value?		•		Not provided in the laboratory data package.
ICAL: Full Width at the Half Maximum (FWHM) < +- 2 sigma or FWHM <= 3.0 keV at 1332 KeV or reference manufactures specifications?	•			1408.01 keV was used for evaluation. No outliers found.
ICAL: Peak Shape - FWHM difference < 0.5 keV for selected peaks – one low end (ie: 241Am), one middle (ie: 60Co) and one high (ie: 137Cs)	•			Detectors are calibrated using 0.25 kev/Channel. This value appears in the energy equation as the second coefficient. No outliers found.
ICAL: Background - Monthly - Long count and Daily - Short count +- 3 sigma of measured population.	•			Long count not provided in laboratory data package.
ICAL: Background counting time was equal to or longer than sample counting time?	•			Background was taken with 600 seconds while samples were 2700 seconds. No action taken on this basis.
CCV: Daily Verification - Verification +- 3 sigma?	•			It is noted that the laboratory uses +-7% for activity difference, FWHM is controlled at +- 10% of the calibrated FWHM, and Energy is set at a control of +- 0.5 keV.
Analysis: Samples - Extraction date?	•			
Analysis: Samples - Analysis date?	•			
Analysis: Samples - Holding time?	•			
Analysis: Samples - Batching?	•			
Analysis: Samples - Lab qualifiers?	•			
Analysis: Blank - Method blank <MDA?	•			
Analysis: Blank - Equipment blank <MDA?			•	
Analysis: Precision/Accuracy - MS/MSD?			•	
Analysis: Precision/Accuracy - LCS/LCSD (75-125%)?	•			
Analysis: Precision/Accuracy - Laboratory Duplicates (Act. < 5*MDC then RPD < 100%, Act. > 5*MDC then < 20%RPD or RER <= 3)?	•			
Analysis: Quantitation - PQLs (Lab RL < Project RL)?	•			
Analysis: Quantitation - MDA < required detection limit (RDL). Formula 3.5 * CSU <= RDL? If this is not true then: If the result is less than Lc and the result plus 1.65 times its uncertainty is greater than the action level,it shall be qualified as unusable (R).	•			

synectics
connecting people and data

Review Questions

Method: E901.1

Review Questions	Yes	No	NA	Comment
Analysis: Quantitation - Sample Uncertainty (Negative results less than 2X TPU flagged "U", between 2X and 3X TPU flagged "UJ", > 3X TPU flagged "R"?	•			
Analysis: Quantitation - Dilution Factor?			•	
Analysis: Field Duplicates - RPD in criteria?			•	

Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 251449
ANALYTICAL REPORT
Radiation Chemistry

Innovative Technical Solutions,Inc. 2730 Shadelands Drive Walnut Creek, CA 94598	Project : 07204.0004 Location : HPNS Parcel D-1 Level : IV Contract # : N62473-10-D0808

Sample ID	Lab ID	Sample ID	Lab ID
04-PD-D0034-01	251449-001	04-PD-D0034-13	251449-013
04-PD-D0034-02	251449-002	04-PD-D0034-14	251449-014
04-PD-D0034-03	251449-003	04-PD-D0034-15	251449-015
04-PD-D0034-04	251449-004	04-PD-D0034-16	251449-016
04-PD-D0034-05	251449-005	04-PD-D0034-17	251449-017
04-PD-D0034-06	251449-006	04-PD-D0034-18	251449-018
04-PD-D0034-07	251449-007	04-PD-D0034-19	251449-019
04-PD-D0034-08	251449-008	04-PD-D0034-20	251449-020
04-PD-D0034-09	251449-009	04-PD-D0034-21	251449-021
04-PD-D0034-10	251449-010	04-PD-D0034-22	251449-022
04-PD-D0034-11	251449-011	04-PD-D0034-23	251449-023
04-PD-D0034-12	251449-012	04-PD-D0034-24	251449-024

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: _____ Date: 02/05/2014

John Goyette
Senior Program Manager
goyette@ctberk.com
(510) 204-2233

NELAP # 01107CA

Curtis & Tompkins, Ltd.

CASE NARRATIVE
RADIATION CHEMISTRY (DOE HASL 300 4.5.2.3)

Laboratory number:	**251449**
Client:	**Innovative Technical Solutions,Inc.**
Project:	**07204.0004**
Location:	**HPNS Parcel D-1**
Request Date:	**12/09/13**
Samples Received:	**12/09/13**

This data package contains sample and QC results for twenty four soil samples, requested for the above referenced project on 12/09/13. See attached cooler receipt form for any sample receipt problems or discrepancies.

Radiation Chemistry (DOE HASL 300 4.5.2.3):
These samples were analyzed without a minimum ingrowth period.

No analytical problems were encountered.

Chain of Custody

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

Gilbane

207004 PS 1/15/14

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag,

251449 12-9-13 sealed 12/30/13 bin# 21

mgrowth bin# 21

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
1	04-PD-D0034-01 CA	SO	11/29/2013	1344	KLM	X	X	04-PD-D0034-01	N1	0.00	0.00
2	04-PD-D0034-02 CA	SO	11/29/2013	1346	KLM	X	X	04-PD-D0034-02	N1	0.00	0.00
3	04-PD-D0034-03 CA	SO	11/29/2013	1349	KLM	X	X	04-PD-D0034-03	N1	0.00	0.00
4	04-PD-D0034-04 CA	SO	11/29/2013	1351	KLM	X	X	04-PD-D0034-04	N1	0.00	0.00
5	04-PD-D0034-05 CA	SO	11/29/2013	1353	KLM	X	X	04-PD-D0034-05	N1	0.00	0.00
6	04-PD-D0034-06 CA	SO	11/29/2013	1355	KLM	X	X	04-PD-D0034-06	N1	0.00	0.00
7	04-PD-D0034-07 CA	SO	11/29/2013	1357	KLM	X	X	04-PD-D0034-07	N1	0.00	0.00
8	04-PD-D0034-08 CA	SO	11/29/2013	1359	KLM	X	X	04-PD-D0034-08	N1	0.00	0.00
9	04-PD-D0034-09 CA	SO	11/29/2013	1401	KLM	X	X	04-PD-D0034-09	N1	0.00	0.00
10	04-PD-D0034-10 CA	SO	11/29/2013	1403	KLM	X	X	04-PD-D0034-10	N1	0.00	0.00
Cooler # 8		**Turnaround Time: 0 Days**									

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Date	Time
[signature]	12-9-13	0800	[signature]	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

[signature] CT 12-9-13 0950 OK

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

207004 PS 1/15/14

Gilbane

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag.

251449 4 12-9-13

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
11	04-PD-D0034-11 CA	SO	11/29/2013	1406	KLM	X	X	04-PD-D0034-11	N1	0.00	0.00
12	04-PD-D0034-12 CA	SO	11/29/2013	1408	KLM	X	X	04-PD-D0034-12	N1	0.00	0.00
13	04-PD-D0034-13 CA	SO	11/29/2013	1411	KLM	X	X	04-PD-D0034-13	N1	0.00	0.00
14	04-PD-D0034-14 CA	SO	11/29/2013	1413	KLM	X	X	04-PD-D0034-14	N1	0.00	0.00
15	04-PD-D0034-15 CA	SO	11/29/2013	1415	KLM	X	X	04-PD-D0034-15	N1	0.00	0.00
16	04-PD-D0034-16 CA	SO	11/29/2013	1418	KLM	X	X	04-PD-D0034-16	N1	0.00	0.00
17	04-PD-D0034-17 CA	SO	11/29/2013	1420	KLM	X	X	04-PD-D0034-17	N1	0.00	0.00
18	04-PD-D0034-18 CA	SO	11/29/2013	1423	KLM	X	X	04-PD-D0034-18	N1	0.00	0.00
19	04-PD-D0034-19 CA	SO	11/29/2013	1425	KLM	X	X	04-PD-D0034-19	N1	0.00	0.00
20	04-PD-D0034-20 CA	SO	11/29/2013	1427	KLM	X	X	04-PD-D0034-20	N1	0.00	0.00
Cooler # 8		**Turnaround Time: 0 Days**									

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Date	Time
[signature]	12/9/13	0800	[signature]	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

C. Eldt @ 12-9-13 0950 OK

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

207008 PS 1/15/14

Gilbane

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Analytical Test Method

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag,

251449 12-9-13

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
21	04-PD-D0034-21	SO	12/8/2013	1026		X	X	04-PD-D0034-21	N1	0.00	0.00
22	04-PD-D0034-22	SO	12/8/2013	1029		X	X	04-PD-D0034-22	N1	0.00	0.00
23	04-PD-D0034-23	SO	12/8/2013	1032		X	X	04-PD-D0034-23	N1	0.00	0.00
24	04-PD-D0034-24	SO	12/8/2013	1035		X	X	04-PD-D0034-24	N1	0.00	0.00
Cooler # 8		Turnaround Time: 0 Days									

Relinquished by: *(Signature)*	Date	Time
	12/9/13	0800

Received by: *(Signature)*	Date	Time
	12-09-13	0800

Shipping Date / Carrier / Airbill Number
Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* & condition
12-9-13 0950 OK

Results & QC Summary

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-01	Received:	12/09/13
Lab ID:	251449-001	Prepared:	12/30/13 16:45
Matrix:	Soil	Analyzed:	01/08/14 16:58
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	346.12 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:44		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.113 U	0.226	0.177	
Bismuth-212	0.134 U	0.208	0.157	
Bismuth-214	0.344	0.0771	0.0339	
Cesium-137	0.00833 U	0.0227	0.0176	0.07
Cobalt-60	0.00202 U	0.0223	0.0285	
Europium-152	0 U	0.0555	0.0457	
Europium-154	0.0186 U	0.100	0.0805	
Lead-212	0.375	0.0779	0.0341	
Lead-214	0.275	0.0890	0.0414	
Potassium-40	17.6	1.34	0.249	
Protactinium-234	0.0377 U	0.153	0.121	
Radium-226	0.00567 U	0.401	0.330	1.3
Thallium-208	0.107	0.0331	0.0133	
Thorium-232 (By Actinium-228)	0.278	0.110	0.0606	
Thorium-234	0.316 U	0.513	0.405	
Uranium-235	0.0186 U	0.0310	0.0243	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-02	Received:	12/09/13
Lab ID:	251449-002	Prepared:	12/30/13 16:47
Matrix:	Soil	Analyzed:	01/08/14 17:00
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	334.81 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:46		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0308 U	0.236	0.192	
Bismuth-212	0.0137 U	0.228	0.187	
Bismuth-214	0.366	0.0870	0.0338	
Cesium-137	-0.00646 U	0.0262	0.0209	0.07
Cobalt-60	0.00392 U	0.0273	0.0307	
Europium-152	0.0179 U	0.0644	0.0514	
Europium-154	-0.0245 U	0.118	0.0945	
Lead-212	0.221	0.0559	0.0340	
Lead-214	0.337	0.0892	0.0393	
Potassium-40	20.9	1.44	0.222	
Protactinium-234	0.0200 U	0.170	0.137	
Radium-226	0.221 U	0.455	0.359	1.3
Thallium-208	0.147	0.0355	0.0109	
Thorium-232 (By Actinium-228)	0.177	0.109	0.0711	
Thorium-234	0 U	0.416	0.581	
Uranium-235	0.0165 U	0.0298	0.0234	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-03	Received:	12/09/13
Lab ID:	251449-003	Prepared:	12/30/13 16:49
Matrix:	Soil	Analyzed:	01/08/14 17:01
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	363 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:49		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.129 U	0.419	0.336	
Bismuth-212	-0.0431 U	0.226	0.182	
Bismuth-214	0.157	0.0628	0.0400	
Cesium-137	0.0107 U	0.0257	0.0199	0.07
Cobalt-60	0.0190 U	0.0380	0.0295	
Europium-152	-0.0114 U	0.0660	0.0534	
Europium-154	-0.0194 U	0.106	0.0849	
Lead-212	0.304	0.0748	0.0331	
Lead-214	0.264	0.0656	0.0279	
Potassium-40	21.2	1.53	0.308	
Protactinium-234	0.0314 U	0.175	0.141	
Radium-226	0.650	0.528	0.394	1.3
Thallium-208	0.146	0.0383	0.0135	
Thorium-232 (By Actinium-228)	0.161	0.117	0.0806	
Thorium-234	0.210 U	0.501	0.399	
Uranium-235	0.0461	0.0340	0.0250	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-04	Received:	12/09/13
Lab ID:	251449-004	Prepared:	12/30/13 16:53
Matrix:	Soil	Analyzed:	01/08/14 17:02
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	333.35 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:51		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00442 U	0.225	0.185	
Bismuth-212	0 U	0.187	0.273	
Bismuth-214	0.410	0.0861	0.0307	
Cesium-137	-0.000167 U	0.0297	0.0244	0.07
Cobalt-60	-0.00126 U	0.0339	0.0277	
Europium-152	0 U	0.0370	0.0812	
Europium-154	-0.0245 U	0.123	0.0991	
Lead-212	0.326	0.0695	0.0296	
Lead-214	0.298	0.0822	0.0364	
Potassium-40	15.7	1.36	0.282	
Protactinium-234	0 U	0.0685	0.0326	
Radium-226	0.285 U	0.586	0.464	1.3
Thallium-208	0.124	0.0390	0.0165	
Thorium-232 (By Actinium-228)	0.205	0.124	0.0839	
Thorium-234	0.312 U	0.500	0.391	
Uranium-235	0.0347	0.0388	0.0296	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-05	Received:	12/09/13
Lab ID:	251449-005	Prepared:	12/30/13 16:56
Matrix:	Soil	Analyzed:	01/08/14 17:03
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	323.67 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:53		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.108 U	0.411	0.332	
Bismuth-212	0.00242 U	0.269	0.222	
Bismuth-214	0.240	0.0795	0.0486	
Cesium-137	-0.00638 U	0.0293	0.0234	0.07
Cobalt-60	0.00113 U	0.00229	0.0339	
Europium-152	-0.000966 U	0.0708	0.0582	
Europium-154	-0.0358 U	0.129	0.102	
Lead-212	0.296	0.0771	0.0361	
Lead-214	0.321	0.101	0.0475	
Potassium-40	18.5	1.50	0.263	
Protactinium-234	0.0152 U	0.190	0.154	
Radium-226	0.566	0.609	0.465	1.3
Thallium-208	0.141	0.0391	0.0151	
Thorium-232 (By Actinium-228)	0.140	0.113	0.0826	
Thorium-234	0.0434 U	0.587	0.481	
Uranium-235	0.0205 U	0.0407	0.0323	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-06	Received:	12/09/13
Lab ID:	251449-006	Prepared:	12/30/13 16:59
Matrix:	Soil	Analyzed:	01/08/14 17:53
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	340.92 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:55		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0812 U	0.159	0.126	
Bismuth-212	0.150 U	0.204	0.152	
Bismuth-214	0.318	0.0739	0.0323	
Cesium-137	0.00582 U	0.0255	0.0203	0.07
Cobalt-60	-0.00184 U	0.0645	0.0280	
Europium-152	-0.00269 U	0.0596	0.0489	
Europium-154	0 U	0.0181	0.167	
Lead-212	0.378	0.0665	0.0283	
Lead-214	0.370	0.0881	0.0347	
Potassium-40	14.4	1.22	0.289	
Protactinium-234	-0.0236 U	0.157	0.127	
Radium-226	0.459	0.533	0.412	1.3
Thallium-208	0.109	0.0305	0.0134	
Thorium-232 (By Actinium-228)	0.508	0.112	0.0143	
Thorium-234	0.117 U	0.462	0.374	
Uranium-235	0.0330	0.0345	0.0264	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-07	Received:	12/09/13
Lab ID:	251449-007	Prepared:	12/30/13 17:01
Matrix:	Soil	Analyzed:	01/08/14 17:52
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	339.57 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:57		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0161 U	0.241	0.198	
Bismuth-212	0.141 U	0.215	0.163	
Bismuth-214	0.226	0.0717	0.0455	
Cesium-137	0.0171 U	0.0274	0.0207	0.07
Cobalt-60	-0.00645 U	0.0352	0.0284	
Europium-152	-0.0318 U	0.0778	0.0618	
Europium-154	0.00305 U	0.0930	0.0762	
Lead-212	0.356	0.0671	0.0295	
Lead-214	0.355	0.0717	0.0357	
Potassium-40	18.2	1.40	0.285	
Protactinium-234	-0.00116 U	0.183	0.151	
Radium-226	0.255 U	0.534	0.425	1.3
Thallium-208	0.0600	0.0343	0.0240	
Thorium-232 (By Actinium-228)	0.329	0.132	0.0795	
Thorium-234	0.460	0.531	0.412	
Uranium-235	0.0307	0.0360	0.0279	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-08	Received:	12/09/13
Lab ID:	251449-008	Prepared:	12/30/13 17:05
Matrix:	Soil	Analyzed:	01/08/14 17:51
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	330.01 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:59		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0 U	0.197	0.198	
Bismuth-212	0.0110 U	0.181	0.153	
Bismuth-214	0.320	0.0790	0.0359	
Cesium-137	0.00688 U	0.0285	0.0229	0.07
Cobalt-60	0.00135 U	0.0273	0.0223	
Europium-152	-0.00802 U	0.0545	0.0441	
Europium-154	0.0109 U	0.0931	0.0755	
Lead-212	0.334	0.0703	0.0332	
Lead-214	0.347	0.0904	0.0422	
Potassium-40	17.0	1.27	0.218	
Protactinium-234	-0.0721 U	0.206	0.163	
Radium-226	0.0443 U	0.484	0.396	1.3
Thallium-208	0.0575	0.0328	0.0232	
Thorium-232 (By Actinium-228)	0.211	0.119	0.0811	
Thorium-234	-0.331 U	0.484	0.381	
Uranium-235	0.0375	0.0316	0.0236	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-09	Received:	12/09/13
Lab ID:	251449-009	Prepared:	12/30/13 17:09
Matrix:	Soil	Analyzed:	01/08/14 17:53
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	345.27 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:01		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0847 U	0.281	0.226	
Bismuth-212	0.100 U	0.221	0.172	
Bismuth-214	0.305	0.0794	0.0335	
Cesium-137	-0.0106 U	0.0313	0.0249	0.07
Cobalt-60	0 U	0.00605	0.00498	
Europium-152	0.0117 U	0.0482	0.0383	
Europium-154	-0.0208 U	0.109	0.0874	
Lead-212	0.283	0.0605	0.0291	
Lead-214	0.349	0.0808	0.0340	
Potassium-40	19.5	1.38	0.215	
Protactinium-234	-0.00979 U	0.193	0.158	
Radium-226	0.569	0.496	0.372	1.3
Thallium-208	0.0741	0.0300	0.0176	
Thorium-232 (By Actinium-228)	0.153	0.110	0.0751	
Thorium-234	0.0107 U	0.466	0.383	
Uranium-235	0.0375	0.0320	0.0238	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-10	Received:	12/09/13
Lab ID:	251449-010	Prepared:	12/30/13 17:12
Matrix:	Soil	Analyzed:	01/08/14 17:54
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	327.83 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:03		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.652	0.408	0.226	
Bismuth-212	0.184	0.246	0.184	
Bismuth-214	0.237	0.0776	0.0469	
Cesium-137	0.0115 U	0.0301	0.0236	0.07
Cobalt-60	0.00134 U	0.0365	0.0299	
Europium-152	0.0126 U	0.0699	0.0565	
Europium-154	0.0244 U	0.105	0.0839	
Lead-212	0.406	0.0913	0.0396	
Lead-214	0.391	0.0827	0.0322	
Potassium-40	18.7	1.45	0.263	
Protactinium-234	-0.0598 U	0.228	0.182	
Radium-226	0.558	0.565	0.430	1.3
Thallium-208	0.128	0.0412	0.0173	
Thorium-232 (By Actinium-228)	0.241	0.121	0.0732	
Thorium-234	0.387 U	0.630	0.496	
Uranium-235	0.0344	0.0384	0.0295	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-11	Received:	12/09/13
Lab ID:	251449-011	Prepared:	12/30/13 17:14
Matrix:	Soil	Analyzed:	01/08/14 17:56
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	356.36 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:06		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0309 U	0.196	0.159	
Bismuth-212	0.0945 U	0.216	0.167	
Bismuth-214	0.363	0.0875	0.0337	
Cesium-137	-0.00790 U	0.0336	0.0269	0.07
Cobalt-60	-0.00899 U	0.0419	0.0336	
Europium-152	-0.0102 U	0.0761	0.0619	
Europium-154	-0.0527 U	0.132	0.104	
Lead-212	0.337	0.0745	0.0333	
Lead-214	0.223	0.0733	0.0461	
Potassium-40	17.5	1.42	0.301	
Protactinium-234	0.0730 U	0.147	0.110	
Radium-226	0.632	0.458	0.324	1.3
Thallium-208	0.0783	0.0338	0.0216	
Thorium-232 (By Actinium-228)	0.215	0.123	0.0823	
Thorium-234	0.299 U	0.525	0.414	
Uranium-235	0.00293 U	0.0332	0.0272	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-12	Received:	12/09/13
Lab ID:	251449-012	Prepared:	12/30/13 17:17
Matrix:	Soil	Analyzed:	01/08/14 17:56
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	343.45 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:08		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0666 U	0.303	0.244	
Bismuth-212	0.0729 U	0.233	0.184	
Bismuth-214	0.130	0.0742	0.0540	
Cesium-137	0.00798 U	0.0236	0.0183	0.07
Cobalt-60	0.00109 U	0.0424	0.0348	
Europium-152	0.0109 U	0.0651	0.0525	
Europium-154	-0.000423 U	0.103	0.0844	
Lead-212	0.366	0.0970	0.0434	
Lead-214	0.187	0.0713	0.0477	
Potassium-40	17.4	1.41	0.248	
Protactinium-234	0.0147 U	0.171	0.139	
Radium-226	0.171 U	0.537	0.431	1.3
Thallium-208	0.0988	0.0372	0.0186	
Thorium-232 (By Actinium-228)	0.133	0.120	0.0902	
Thorium-234	0.407 U	0.562	0.436	
Uranium-235	0.0104 U	0.0364	0.0293	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-13	Received:	12/09/13
Lab ID:	251449-013	Prepared:	12/30/13 17:20
Matrix:	Soil	Analyzed:	01/08/14 18:45
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	334.92 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:11		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.117 U	0.172	0.134	
Bismuth-212	0.155 U	0.231	0.175	
Bismuth-214	0.222	0.0637	0.0319	
Cesium-137	0.00187 U	0.0252	0.0205	0.07
Cobalt-60	-0.0124 U	0.115	0.0350	
Europium-152	0 U	0.0217	0.0624	
Europium-154	-0.00165 U	0.108	0.0887	
Lead-212	0.405	0.0680	0.0278	
Lead-214	0.318	0.0711	0.0250	
Potassium-40	21.5	1.49	0.297	
Protactinium-234	0.0292 U	0.112	0.0867	
Radium-226	0.469	0.500	0.382	1.3
Thallium-208	0.113	0.0356	0.0132	
Thorium-232 (By Actinium-228)	0.249	0.123	0.0782	
Thorium-234	-0.00434 U	0.476	0.392	
Uranium-235	-0.00325 U	0.0409	0.0335	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-14	Received:	12/09/13
Lab ID:	251449-014	Prepared:	12/30/13 17:22
Matrix:	Soil	Analyzed:	01/08/14 18:44
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	306.02 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:13		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0660 U	0.216	0.173	
Bismuth-212	0.0969 U	0.229	0.184	
Bismuth-214	0.355	0.0784	0.0335	
Cesium-137	0 U	0.0167	0.0391	0.07
Cobalt-60	0.0000465 U	0.0356	0.0293	
Europium-152	0.0279 U	0.0655	0.0514	
Europium-154	0.0446 U	0.0878	0.0664	
Lead-212	0.387	0.0762	0.0326	
Lead-214	0.194	0.0724	0.0502	
Potassium-40	19.2	1.44	0.276	
Protactinium-234	0 U	0.0492	0.227	
Radium-226	0.462	0.456	0.343	1.3
Thallium-208	0.129	0.0374	0.0147	
Thorium-232 (By Actinium-228)	0.132	0.122	0.0908	
Thorium-234	0.234 U	0.496	0.395	
Uranium-235	0.0288	0.0293	0.0219	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-15	Received:	12/09/13
Lab ID:	251449-015	Prepared:	12/30/13 17:25
Matrix:	Soil	Analyzed:	01/08/14 18:47
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	329.98 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:15		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0478 U	0.256	0.207	
Bismuth-212	0.0656 U	0.219	0.174	
Bismuth-214	0.353	0.0870	0.0342	
Cesium-137	0.00428 U	0.0243	0.0195	0.07
Cobalt-60	0.00260 U	0.00725	0.0274	
Europium-152	-0.0137 U	0.0636	0.0511	
Europium-154	-0.00404 U	0.0568	0.0460	
Lead-212	0.300	0.0643	0.0381	
Lead-214	0.322	0.0708	0.0293	
Potassium-40	16.4	1.29	0.225	
Protactinium-234	0.000178 U	0.185	0.152	
Radium-226	0.327 U	0.516	0.404	1.3
Thallium-208	0.128	0.0382	0.0130	
Thorium-232 (By Actinium-228)	0.466	0.109	0.0149	
Thorium-234	0.268 U	0.505	0.400	
Uranium-235	0.0339	0.0336	0.0255	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-16	Received:	12/09/13
Lab ID:	251449-016	Prepared:	12/30/13 17:28
Matrix:	Soil	Analyzed:	01/08/14 18:48
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	306.6 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:18		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0380 U	0.336	0.273	
Bismuth-212	0.126 U	0.236	0.180	
Bismuth-214	0.407	0.124	0.0499	
Cesium-137	0.00979 U	0.0280	0.0219	0.07
Cobalt-60	-0.00263 U	0.0380	0.0310	
Europium-152	-0.000695 U	0.0787	0.0647	
Europium-154	0 U	0.0159	0.206	
Lead-212	0.348	0.0848	0.0383	
Lead-214	0.305	0.0819	0.0370	
Potassium-40	15.2	1.40	0.321	
Protactinium-234	0.00607 U	0.186	0.152	
Radium-226	0.614	0.485	0.349	1.3
Thallium-208	0.0468	0.0348	0.0251	
Thorium-232 (By Actinium-228)	0.210	0.139	0.0938	
Thorium-234	0.0357 U	0.592	0.485	
Uranium-235	0.00356 U	0.0383	0.0314	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-17	Received:	12/09/13
Lab ID:	251449-017	Prepared:	12/30/13 17:31
Matrix:	Soil	Analyzed:	01/08/14 18:49
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	352.28 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:20		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0716 U	0.224	0.180	
Bismuth-212	0.0709 U	0.218	0.171	
Bismuth-214	0.395	0.0927	0.0348	
Cesium-137	-0.00928 U	0.0312	0.0248	0.07
Cobalt-60	0.0119 U	0.0373	0.0294	
Europium-152	-0.0277 U	0.0752	0.0596	
Europium-154	-0.0314 U	0.114	0.0905	
Lead-212	0.285	0.0638	0.0298	
Lead-214	0.348	0.0893	0.0370	
Potassium-40	18.6	1.47	0.302	
Protactinium-234	0.00307 U	0.216	0.178	
Radium-226	0.748	0.558	0.409	1.3
Thallium-208	0.162	0.0381	0.0134	
Thorium-232 (By Actinium-228)	0.147	0.124	0.0910	
Thorium-234	0.372	0.476	0.367	
Uranium-235	0.00419 U	0.0408	0.0334	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-18	Received:	12/09/13
Lab ID:	251449-018	Prepared:	12/30/13 17:34
Matrix:	Soil	Analyzed:	01/08/14 18:50
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	343.7 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:23		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0564 U	0.342	0.278	
Bismuth-212	0.206	0.232	0.167	
Bismuth-214	0.228	0.0795	0.0505	
Cesium-137	-0.00668 U	0.0294	0.0235	0.07
Cobalt-60	-0.00340 U	0.0397	0.0323	
Europium-152	-0.0323 U	0.0796	0.0629	
Europium-154	0 U	0.0774	0.0638	
Lead-212	0.383	0.0731	0.0288	
Lead-214	0.333	0.0881	0.0408	
Potassium-40	17.8	1.43	0.248	
Protactinium-234	0 U	0.0546	0.153	
Radium-226	0.448	0.504	0.382	1.3
Thallium-208	0.0424	0.0345	0.0258	
Thorium-232 (By Actinium-228)	0.547	0.131	0.0424	
Thorium-234	0.0402 U	0.656	0.539	
Uranium-235	0.0510	0.0317	0.0220	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-19	Received:	12/09/13
Lab ID:	251449-019	Prepared:	12/30/13 17:36
Matrix:	Soil	Analyzed:	01/08/14 19:37
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.76 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:25		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0884 U	0.211	0.168	
Bismuth-212	0.117 U	0.219	0.174	
Bismuth-214	0.227	0.0724	0.0468	
Cesium-137	0.000805 U	0.0233	0.0191	0.07
Cobalt-60	0.000493 U	0.0356	0.0293	
Europium-152	0.00122 U	0.0461	0.0378	
Europium-154	0 U	0.0175	0.160	
Lead-212	0.352	0.0648	0.0293	
Lead-214	0.373	0.0778	0.0328	
Potassium-40	16.6	1.32	0.287	
Protactinium-234	-0.0415 U	0.197	0.158	
Radium-226	0.476	0.526	0.406	1.3
Thallium-208	0.0661	0.0321	0.0218	
Thorium-232 (By Actinium-228)	0.204	0.115	0.0776	
Thorium-234	0.287 U	0.477	0.377	
Uranium-235	0.0407	0.0323	0.0241	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-20	Received:	12/09/13
Lab ID:	251449-020	Prepared:	12/30/13 17:38
Matrix:	Soil	Analyzed:	01/08/14 19:38
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.16 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:27		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.00855 U	0.262	0.215	
Bismuth-212	0.188	0.187	0.131	
Bismuth-214	0.317	0.0831	0.0502	
Cesium-137	-0.00427 U	0.0284	0.0230	0.07
Cobalt-60	-0.0193 U	0.0419	0.0328	
Europium-152	-0.00770 U	0.0608	0.0494	
Europium-154	-0.0277 U	0.0891	0.0700	
Lead-212	0.433	0.0742	0.0344	
Lead-214	0.376	0.0958	0.0444	
Potassium-40	15.6	1.24	0.214	
Protactinium-234	-0.0197 U	0.185	0.151	
Radium-226	0.737	0.526	0.387	1.3
Thallium-208	0.129	0.0343	0.0130	
Thorium-232 (By Actinium-228)	0.245	0.107	0.0593	
Thorium-234	0.00232 U	0.529	0.436	
Uranium-235	0.0270 U	0.0364	0.0284	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-21	Received:	12/09/13
Lab ID:	251449-021	Prepared:	12/30/13 17:41
Matrix:	Soil	Analyzed:	01/08/14 19:44
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.96 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:26		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0 U	0.0515	0.163	
Bismuth-212	0.116 U	0.216	0.166	
Bismuth-214	0.294	0.0723	0.0327	
Cesium-137	0.00599 U	0.0260	0.0208	0.07
Cobalt-60	-0.00577 U	0.231	0.0313	
Europium-152	0.0528	0.0635	0.0474	
Europium-154	-0.0355 U	0.113	0.0896	
Lead-212	0.353	0.0622	0.0266	
Lead-214	0.309	0.0653	0.0188	
Potassium-40	21.1	1.51	0.330	
Protactinium-234	0.0449 U	0.168	0.133	
Radium-226	0.299 U	0.462	0.361	1.3
Thallium-208	0.110	0.0397	0.0158	
Thorium-232 (By Actinium-228)	0.245	0.120	0.0750	
Thorium-234	-0.00708 U	0.424	0.349	
Uranium-235	0.0205 U	0.0307	0.0239	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-22	Received:	12/09/13
Lab ID:	251449-022	Prepared:	12/30/13 17:47
Matrix:	Soil	Analyzed:	01/08/14 19:39
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	339.12 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:29		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.115 U	0.271	0.215	
Bismuth-212	0.107 U	0.238	0.186	
Bismuth-214	0.233	0.0745	0.0350	
Cesium-137	0.0000459 U	0.0256	0.0211	0.07
Cobalt-60	0.0157 U	0.0393	0.0309	
Europium-152	0 U	0.0655	0.0624	
Europium-154	-0.0360 U	0.107	0.0849	
Lead-212	0.320	0.0725	0.0347	
Lead-214	0.225	0.0692	0.0434	
Potassium-40	21.2	1.48	0.262	
Protactinium-234	-0.0244 U	0.195	0.158	
Radium-226	0.436	0.438	0.328	1.3
Thallium-208	0.121	0.0331	0.0109	
Thorium-232 (By Actinium-228)	0.201	0.131	0.0913	
Thorium-234	0.433	0.500	0.386	
Uranium-235	0.0238	0.0296	0.0227	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-23	Received:	12/09/13
Lab ID:	251449-023	Prepared:	12/30/13 17:50
Matrix:	Soil	Analyzed:	01/08/14 19:40
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	301.52 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:32		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0379 U	0.409	0.334	
Bismuth-212	0.169	0.214	0.154	
Bismuth-214	0.253	0.0811	0.0477	
Cesium-137	0.00542 U	0.0328	0.0264	0.07
Cobalt-60	-0.000297 U	0.0357	0.0294	
Europium-152	0 U	0.0686	0.0949	
Europium-154	0 U	0.0323	0.0266	
Lead-212	0.296	0.0719	0.0426	
Lead-214	0.402	0.0984	0.0446	
Potassium-40	14.2	1.38	0.332	
Protactinium-234	0.0172 U	0.183	0.148	
Radium-226	0.540	0.583	0.444	1.3
Thallium-208	0.0553	0.0343	0.0236	
Thorium-232 (By Actinium-228)	0.195	0.133	0.0891	
Thorium-234	0.0343 U	0.659	0.541	
Uranium-235	0.0385	0.0379	0.0285	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-24	Received:	12/09/13
Lab ID:	251449-024	Prepared:	12/30/13 17:55
Matrix:	Soil	Analyzed:	01/08/14 19:41
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	354.56 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:35		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.00182 U	0.210	0.173	
Bismuth-212	0.243	0.278	0.207	
Bismuth-214	0.529	0.103	0.0385	
Cesium-137	0.00293 U	0.0302	0.0246	0.07
Cobalt-60	-0.0117 U	0.0435	0.0347	
Europium-152	-0.00967 U	0.0742	0.0603	
Europium-154	-0.00417 U	0.0920	0.0752	
Lead-212	0.493	0.0894	0.0375	
Lead-214	0.385	0.0882	0.0500	
Potassium-40	17.1	1.41	0.304	
Protactinium-234	0 U	0.0263	0.150	
Radium-226	0.912	0.568	0.407	1.3
Thallium-208	0.127	0.0393	0.0226	
Thorium-232 (By Actinium-228)	0.241	0.147	0.104	
Thorium-234	0.277 U	0.625	0.501	
Uranium-235	0.0266 U	0.0430	0.0339	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Type:	BLANK	Prepared:	12/30/13 14:40
Lab ID:	QC722413	Analyzed:	01/06/14 16:28
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	323.66 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	206637	Uncert. Units:	pCi/g

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0400 U	0.186	0.149	
Bismuth-212	-0.00251 U	0.147	0.121	
Bismuth-214	-0.0523 U	7.90	0.0415	
Cesium-137	-0.00686 U	0.0219	0.0171	0.07
Cobalt-60	0 U	0.00642	0.0315	
Europium-152	-0.000312 U	0.0434	0.0357	
Europium-154	-0.0129 U	0.0624	0.0490	
Lead-212	-0.0162 U	0.206	0.0273	
Lead-214	-0.00402 U	0.0486	0.0360	
Potassium-40	-0.362 U	14.5	0.222	
Protactinium-234	0.0147 U	0.116	0.0931	
Radium-226	-0.0825 U	0.341	0.273	1.3
Thallium-208	0.00199 U	0.0187	0.0160	
Thorium-232 (By Actinium-228)	0.0192 U	0.0559	0.0422	
Thorium-234	-0.0339 U	0.271	0.219	
Uranium-235	0 U	0.0111	0.0124	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Analyte:	Radium-226	Prepared:	12/30/13 14:35
Type:	LCS	Analyzed:	01/06/14 16:27
Lab ID:	QC722414	Duration (sec):	2,700
Matrix:	Soil	Sample Amount:	330.03 g
Units:	pCi/g	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Spiked	Result	Uncert	%REC	Limits
13.00	13.10	1.487	101	54-146

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0039-06	Sampled:	11/29/13 15:34
Type:	IDUP	Received:	12/09/13
MSS Lab ID:	251445-006	Prepared:	12/30/13 15:03
Lab ID:	QC722415	Analyzed:	01/08/14 10:53
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	364.34 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.01627 U	0.1963	0.05933 U	0.1905	0.1529		NC	40	NC	1
Bismuth-212	0.09106 U	0.2099	0.1514 U	0.2018	0.1554		NC	40	NC	1
Bismuth-214	0.2164	0.06754	0.2121	0.06366	0.03780		2	40	0.033	1
Cesium-137	0.01773 U	0.02398	0.005317 U	0.02457	0.01969	0.07	NC	20	NC	1
Cobalt-60	0.0008273 U	0.01082	0.002703 U	0.008361	0.02833		NC	40	NC	1
Europium-152	0 U	0.04646	0.01869 U	0.05266	0.04160		NC	40	NC	1
Europium-154	-0.02134 U	0.08987	0.02423 U	0.09339	0.07445		NC	40	NC	1
Lead-212	0.4019	0.06831	0.4292	0.07094	0.02525		7	40	0.196	1
Lead-214	0.4362	0.09576	0.3316	0.07931	0.03581		27	40	0.597	1
Potassium-40	13.41	1.426	13.75	1.451	0.1971		2	40	0.116	1
Protactinium-234	0 U	0.04131	-0.01776 U	0.1503	0.1217		NC	40	NC	1
Radium-226	0.7453	0.4444	0.3560	0.4557	0.3534	1.3	71	20	0.432	1
Thallium-208	0.1017	0.03569	0.1497	0.03802	0.01383		38	40	0.652	1
Thorium-232 (By Actinium-228)	0.1893	0.1125	0.2683	0.1104	0.06602		35	40	0.354	1
Thorium-234	1.023	0.5964	0.3341	0.4167	0.3226		102	40	0.680	1
Uranium-235	0.01712 U	0.03282	0.03909	0.03012	0.02227		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0039-16	Sampled:	11/29/13 15:49
Type:	SDUP	Received:	12/09/13
MSS Lab ID:	251445-016	Prepared:	12/30/13 15:55
Lab ID:	QC722416	Analyzed:	01/08/14 15:11
Matrix:	Soil	Duration (sec):	5,400
Units:	pCi/g	Sample Amount:	368.76 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.04699 U	0.1173	0.05915 U	0.1415	0.1139		NC	40	NC	1
Bismuth-212	0.1237	0.1180	0.3977	0.1461	0.06406		105	40	1.038 *	1
Bismuth-214	0.2590	0.05087	0.2712	0.05919	0.02659		5	40	0.110	1
Cesium-137	0.008498 U	0.01695	0.007396 U	0.01522	0.01193	0.07	NC	20	NC	1
Cobalt-60	-0.003197 U	0.01273	0.002716 U	0.01260	0.01528		NC	40	NC	1
Europium-152	-0.01622 U	0.04367	0.01009 U	0.03719	0.02997		NC	40	NC	1
Europium-154	0 U	0.02727	0.0001480 U	0.03949	0.03251		NC	40	NC	1
Lead-212	0.3552	0.05169	0.3096	0.04705	0.01850		14	40	0.462	1
Lead-214	0.3923	0.07135	0.3391	0.05291	0.02127		15	40	0.429	1
Potassium-40	13.09	1.212	12.71	1.180	0.1735		3	40	0.159	1
Protactinium-234	0.0001344 U	0.1038	0.01176 U	0.1063	0.08660		NC	40	NC	1
Radium-226	0.3755	0.2974	0.3482	0.2978	0.2285	1.3	8	20	0.046	1
Thallium-208	0.1382	0.02618	0.09537	0.02328	0.01358		37	40	0.866	1
Thorium-232 (By Actinium-228)	0.4371	0.08893	0.4014	0.09714	0.03395		9	40	0.192	1
Thorium-234	0.3987	0.3140	0.2032 U	0.3386	0.2713		NC	40	NC	1
Uranium-235	0.02245	0.02005	0.02013	0.02004	0.01556		11	40	0.058	1

*= Value outside of QC limits; see narrative
U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-07	Sampled:	11/29/13 13:57
Type:	IDUP	Received:	12/09/13
MSS Lab ID:	251449-007	Prepared:	12/30/13 17:01
Lab ID:	QC722417	Analyzed:	01/08/14 18:45
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	339.57 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.01614 U	0.2411	-0.05048 U	0.2622	0.2126		NC	40	NC	1
Bismuth-212	0.1405 U	0.2156	0.07982 U	0.2022	0.1578		NC	40	NC	1
Bismuth-214	0.2265	0.07333	0.2985	0.08280	0.03761		27	40	0.461	1
Cesium-137	0.01709 U	0.02739	0.02613	0.03079	0.02280	0.07	NC	20	NC	1
Cobalt-60	-0.006453 U	0.03524	0.0003491 U	0.0007699	0.03059		NC	40	NC	1
Europium-152	-0.03181 U	0.07785	0 U	0.03698	0.06692		NC	40	NC	1
Europium-154	0.003052 U	0.09296	0.03341 U	0.08282	0.06375		NC	40	NC	1
Lead-212	0.3558	0.07220	0.3555	0.07409	0.03341		0	40	0.002	1
Lead-214	0.3552	0.07565	0.3455	0.07790	0.03362		3	40	0.063	1
Potassium-40	18.22	1.892	18.90	1.894	0.2114		4	40	0.181	1
Protactinium-234	-0.001164 U	0.1828	-0.003618 U	0.1598	0.1312		NC	40	NC	1
Radium-226	0.2546 U	0.5344	0.3784 U	0.4957	0.3833	1.3	NC	20	NC	1
Thallium-208	0.06005	0.03455	0.08646	0.03596	0.02276		36	40	0.375	1
Thorium-232 (By Actinium-228)	0.3285	0.1342	0.2022	0.1106	0.06894		48	40	0.516	1
Thorium-234	0.4599	0.5324	0.5528	0.5186	0.3936		18	40	0.088	1
Uranium-235	0.03073	0.03609	0.02425 U	0.03457	0.02696		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0033-09	Sampled:	12/08/13 14:03
Type:	IDUP	Received:	12/10/13
MSS Lab ID:	251491-009	Prepared:	12/30/13 18:41
Lab ID:	QC722418	Analyzed:	01/08/14 17:02
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	328.86 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.004235 U	0.1289	-0.001714 U	0.1510	0.1243		NC	40	NC	1
Bismuth-212	0 U	0.1305	0.1613	0.1860	0.1325		NC	40	NC	1
Bismuth-214	0.3893	0.08807	0.4464	0.09399	0.03601		14	40	0.314	1
Cesium-137	-0.009770 U	0.02635	0.0006930 U	0.02542	0.02086	0.07	NC	20	NC	1
Cobalt-60	-0.005893 U	0.2357	-0.003561 U	0.08953	0.01970		NC	40	NC	1
Europium-152	-0.008480 U	0.06802	-0.01264 U	0.07196	0.05826		NC	40	NC	1
Europium-154	0.007089 U	0.1035	0.006049 U	0.08227	0.06696		NC	40	NC	1
Lead-212	0.3798	0.07960	0.3409	0.07131	0.03024		11	40	0.258	1
Lead-214	0.4603	0.08674	0.4557	0.08737	0.02545		1	40	0.027	1
Potassium-40	12.29	1.414	13.07	1.474	0.2701		6	40	0.272	1
Protactinium-234	0.05143 U	0.1425	-0.004273 U	0.1726	0.1417		NC	40	NC	1
Radium-226	0.6051	0.5022	0.6639	0.5213	0.3856	1.3	9	20	0.057	1
Thallium-208	0.07129	0.03059	0.1592	0.04539	0.01534		76	40	1.156	1
Thorium-232 (By Actinium-228)	0.2495	0.1176	0.2989	0.1297	0.07727		18	40	0.200	1
Thorium-234	-0.01085 U	0.4978	-0.2285 U	0.4401	0.3486		NC	40	NC	1
Uranium-235	0.04079	0.03717	0.04650	0.03365	0.02453		13	40	0.081	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0042-16	Sampled:	12/09/13 11:26
Type:	IDUP	Received:	12/10/13
MSS Lab ID:	251492-016	Prepared:	12/31/13 12:05
Lab ID:	QC722419	Analyzed:	01/07/14 14:13
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	306.37 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	0.01692 U	0.1834	-0.03582 U	0.2088	0.1692		NC	40	NC	1
Bismuth-212	0.1240 U	0.2523	0.2375	0.2429	0.1701		NC	40	NC	1
Bismuth-214	0.2339	0.08824	0.2267	0.08651	0.05407		3	40	0.041	1
Cesium-137	0 U	0.01252	0.005082 U	0.03144	0.02530	0.07	NC	20	NC	1
Cobalt-60	-0.02055 U	0.04418	0.001461 U	0.003766	0.03000		NC	40	NC	1
Europium-152	-0.01680 U	0.07556	0.001745 U	0.08770	0.07209		NC	40	NC	1
Europium-154	0 U	0.02373	-0.02849 U	0.1108	0.08766		NC	40	NC	1
Lead-212	0.4714	0.09184	0.4074	0.09483	0.04107		15	40	0.342	1
Lead-214	0.4026	0.1140	0.4272	0.09512	0.03649		6	40	0.117	1
Potassium-40	15.63	1.829	14.94	1.736	0.3063		5	40	0.195	1
Protactinium-234	-0.04857 U	0.1881	0.06609 U	0.2022	0.1581		NC	40	NC	1
Radium-226	0.7725	0.5641	0.7371	0.6281	0.4641	1.3	5	20	0.030	1
Thallium-208	0.1026	0.04316	0.1244	0.04077	0.01731		19	40	0.260	1
Thorium-232 (By Actinium-228)	-0.009209 U	0.3065	0.1878	0.1452	0.1044		NC	40	NC	1
Thorium-234	-0.1064 U	0.6211	1.003	0.6951	0.3627		NC	40	NC	1
Uranium-235	0.01769 U	0.04273	0.04542	0.04338	0.03260		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	ZZZZZZZZZZ	Sampled:	12/16/13 14:15
Type:	IDUP	Received:	12/19/13
MSS Lab ID:	251785-009	Prepared:	12/31/13 06:45
Lab ID:	QC723810	Analyzed:	01/10/14 19:22
Matrix:	Soil	Duration (sec):	5,400
Units:	pCi/g	Sample Amount:	346.66 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.02562 U	0.3396	0.01261 U	0.3485	0.2868		NC	40	NC	1
Bismuth-212	0.06155 U	0.1695	0.4699	0.2281	0.1008		NC	40	NC	1
Bismuth-214	3.556	0.2971	3.441	0.2902	0.03754		3	40	0.196	1
Cesium-137	0.09671	0.03128	0.1233	0.03509	0.01534	0.07	24	20	0.401	1
Cobalt-60	-0.002301 U	0.02553	0 U	0.02253	0.02030		NC	40	NC	1
Europium-152	0.02658 U	0.07672	-0.06463 U	0.07891	0.06260		NC	40	NC	1
Europium-154	-0.009794 U	0.07079	-0.003540 U	0.06900	0.05657		NC	40	NC	1
Lead-212	0.3466	0.07060	0.3970	0.07350	0.03442		14	40	0.350	1
Lead-214	3.729	0.3080	3.672	0.3059	0.04654		2	40	0.093	1
Potassium-40	9.210	1.031	9.466	1.023	0.2138		3	40	0.124	1
Protactinium-234	-0.01854 U	0.1459	-0.005142 U	0.1265	0.1039		NC	40	NC	1
Radium-226	4.691	0.7425	3.971	0.7270	0.4448	1.3	17	20	0.490	1
Thallium-208	0.1607	0.04165	0.1073	0.03060	0.01946		40	40	0.739	1
Thorium-232 (By Actinium-228)	0.2884	0.09457	0.3129	0.09344	0.05497		8	40	0.130	1
Thorium-234	0.2207 U	0.5978	0.8327	0.6050	0.3638		NC	40	NC	1
Uranium-235	0.005327 U	0.05129	0.03615 U	0.04804	0.03874		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	ZZZZZZZZZZ	Sampled:	12/17/13 15:27
Type:	IDUP	Received:	12/19/13
MSS Lab ID:	251786-003	Prepared:	12/31/13 07:22
Lab ID:	QC723811	Analyzed:	01/10/14 18:37
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	317.98 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	0.04042 U	0.5031	0 U	0.1578	0.3876		NC	40	NC	1
Bismuth-212	0.2955	0.2451	0.2487	0.2306	0.1600		17	40	0.099	1
Bismuth-214	0.4359	0.1001	0.5774	0.1039	0.02793		28	40	0.694	1
Cesium-137	-0.004163 U	0.02920	0.009553 U	0.02776	0.02171	0.07	NC	20	NC	1
Cobalt-60	-0.00009298 U	0.03865	-0.001654 U	0.04286	0.03514		NC	40	NC	1
Europium-152	-0.0001387 U	0.06759	0.0009036 U	0.07824	0.06437		NC	40	NC	1
Europium-154	0 U	0.01531	0.001920 U	0.1108	0.09109		NC	40	NC	1
Lead-212	0.5080	0.09508	0.5108	0.1036	0.04184		1	40	0.014	1
Lead-214	0.4634	0.1031	0.5957	0.1256	0.04862		25	40	0.579	1
Potassium-40	11.64	1.429	11.71	1.474	0.3126		1	40	0.024	1
Protactinium-234	0.02876 U	0.1907	-0.02999 U	0.1962	0.1581		NC	40	NC	1
Radium-226	0.9502	0.6897	0.7292	0.5986	0.4449	1.3	26	20	0.172	1
Thallium-208	0.1719	0.04459	0.1161	0.03701	0.01559		39	40	0.683	1
Thorium-232 (By Actinium-228)	0.3310	0.1440	0.2974	0.1241	0.06550		11	40	0.125	1
Thorium-234	0.7660	0.7058	0.4166 U	0.5823	0.4513		NC	40	NC	1
Uranium-235	0.06768	0.04456	0.03514	0.04160	0.03211		63	40	0.378	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma-Ray Radioactivity in Soil

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	ZZZZZZZZZZ	Sampled:	12/16/13 11:12
Type:	IDUP	Received:	12/19/13
MSS Lab ID:	251788-005	Prepared:	12/31/13 09:04
Lab ID:	QC723812	Analyzed:	01/10/14 20:29
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	340.66 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	206637		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.003289 U	0.3704	-0.09207 U	0.3622	0.2921		NC	40	NC	1
Bismuth-212	0.1382 U	0.2007	0.1313 U	0.1937	0.1413		NC	40	NC	1
Bismuth-214	0.3656	0.08444	0.3542	0.08403	0.03220		3	40	0.067	1
Cesium-137	-0.005433 U	0.02430	0 U	0.003975	0.03264	0.07	NC	20	NC	1
Cobalt-60	0 U	0.007224	0.004099 U	0.03687	0.02990		NC	40	NC	1
Europium-152	-0.009219 U	0.07732	-0.02159 U	0.07133	0.05674		NC	40	NC	1
Europium-154	0 U	0.02167	-0.008891 U	0.1014	0.08241		NC	40	NC	1
Lead-212	0.2750	0.08035	0.3095	0.06679	0.02438		12	40	0.234	1
Lead-214	0.3233	0.09158	0.3274	0.09182	0.04213		1	40	0.022	1
Potassium-40	9.347	1.239	8.723	1.187	0.2497		7	40	0.257	1
Protactinium-234	0.01647 U	0.1680	-0.002328 U	0.1697	0.1395		NC	40	NC	1
Radium-226	0.4807	0.4802	0.6173	0.4519	0.3170	1.3	25	20	0.146	1
Thallium-208	0.08946	0.03619	0.02689 U	0.03497	0.02757		NC	40	NC	1
Thorium-232 (By Actinium-228)	0.1510	0.1167	0.1342	0.1203	0.08953		12	40	0.071	1
Thorium-234	0.2710 U	0.4897	0.3072 U	0.5954	0.4710		NC	40	NC	1
Uranium-235	0.03270	0.03030	0.002041 U	0.03198	0.02619		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Calibration Data from file: 6_Soil 250ml TunaCan_01-04-2014.Clb
Energy Calibration Date: 1/8/2014 Time: 06:45:06
Efficiency Calibration Date: 1/6/2014 Time: 16:42:07

Calibration Description:
HPGE06 S23325 6_20140104002_EffCal

Energy Calibration Fit
Energy = 0.0778 +0.125066*Channel -6.42096e-009*Channel**2
FWHM (ch) = 5.8526 +0.001092*Channel -1.7813e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.37	121.78	121.93	-0.13%	0.85	0.86	-1.07%
1955.05	244.67	244.56	0.04%	1.00	0.99	0.94%
2751.68	344.30	344.17	0.04%	1.09	1.09	0.13%
6229.71	778.90	778.96	-0.01%	1.50	1.50	0.63%
7710.80	964.00	964.06	-0.01%	1.64	1.65	-0.92%
11264.26	1408.08	1408.04	0.00%	1.99	1.98	0.19%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.2625 %
Coefficients:
-0.387239 -4.158640 0.426222 -0.050686 0.002155 -0.000042

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.6698E-003	2.6649E-003	0.19%
59.54	1.1857E-002	1.1935E-002	-0.65%
88.03	3.3558E-002	3.2490E-002	3.18%
122.06	4.3548E-002	4.4209E-002	-1.52%
165.85	4.5149E-002	4.6035E-002	-1.96%
279.17	3.7320E-002	3.6951E-002	0.99%
391.71	3.0184E-002	2.9645E-002	1.79%
661.66	2.1250E-002	2.0666E-002	2.74%
898.02	1.5969E-002	1.6711E-002	-4.64%
1173.23	1.3652E-002	1.3771E-002	-0.88%
1332.51	1.2571E-002	1.2495E-002	0.61%
1836.01	9.6431E-003	9.5410E-003	1.06%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 7_Soil 250ml TunaCan_02-20-2013.Clb
Energy Calibration Date: 1/6/2014 Time: 07:33:28
Efficiency Calibration Date: 2/21/2013 Time: 11:46:56

Calibration Description:
HPGE07 S21603 7_20130220002_EffCal

Energy Calibration Fit
Energy = -0.0102 +0.125052*Channel -6.43934e-009*Channel**2
FWHM (ch) = 6.2432 +0.001029*Channel -1.75584e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.02	121.78	121.79	-0.01%	0.90	0.90	-0.22%
1956.85	244.67	244.67	-0.00%	1.04	1.02	1.33%
2753.60	344.30	344.28	0.00%	1.11	1.12	-0.70%
6230.64	778.90	778.89	0.00%	1.46	1.50	-2.49%
7712.04	964.00	964.01	-0.00%	1.68	1.64	2.37%
11266.52	1408.08	1408.08	0.00%	1.94	1.95	-0.39%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9839 %
Coefficients:
-0.343951 -4.203033 0.485929 -0.062075 0.002900 -0.000060

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.6038E-003	1.6008E-003	0.18%
59.54	9.9934E-003	1.0057E-002	-0.63%
88.03	3.2047E-002	3.1120E-002	2.89%
122.06	4.4340E-002	4.4801E-002	-1.04%
165.85	4.7374E-002	4.8299E-002	-1.95%
279.17	3.9550E-002	3.9499E-002	0.13%
391.71	3.1861E-002	3.1553E-002	0.97%
513.99	2.6504E-002	2.6020E-002	1.83%
661.66	2.2272E-002	2.1747E-002	2.36%
898.02	1.7022E-002	1.7530E-002	-2.98%
1173.23	1.4213E-002	1.4469E-002	-1.81%
1332.51	1.2880E-002	1.3162E-002	-2.19%
1836.01	1.0445E-002	1.0175E-002	2.58%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	15094.00	641.50	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1187.50	426.30	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15909.00	574.30	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	363.55	311.20	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	544.93	435.40	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1084.50	883.90	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	947.66	606.50	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1166.10	1116.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	473.09	402.60	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1583.80	1484.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	748.72	748.50	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	748.77	748.70	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1583.70	1571.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 7_Soil 250ml TunaCan_02-20-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:13:44
Efficiency Calibration Date: 2/21/2013 Time: 11:46:56

Calibration Description:
HPGE07 S21603 7_20130220002_EffCal

Energy Calibration Fit
Energy = 0.0018 +0.125050*Channel -5.8167e-009*Channel**2
FWHM (ch) = 6.0510 +0.001094*Channel -1.81268e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.97	121.78	121.79	-0.01%	0.88	0.89	-0.79%
1956.74	244.67	244.67	0.00%	1.01	1.02	-0.80%
2753.51	344.30	344.28	0.00%	1.14	1.12	1.92%
6230.48	778.90	778.90	0.00%	1.52	1.52	-0.04%
7711.81	964.00	964.02	-0.00%	1.67	1.68	-0.60%
11266.01	1408.08	1408.07	0.00%	2.01	2.01	0.19%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9839 %
Coefficients:
-0.343951 -4.203033 0.485929 -0.062075 0.002900 -0.000060

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.6038E-003	1.6008E-003	0.18%
59.54	9.9934E-003	1.0057E-002	-0.63%
88.03	3.2047E-002	3.1120E-002	2.89%
122.06	4.4340E-002	4.4801E-002	-1.04%
165.85	4.7374E-002	4.8299E-002	-1.95%
279.17	3.9550E-002	3.9499E-002	0.13%
391.71	3.1861E-002	3.1553E-002	0.97%
513.99	2.6504E-002	2.6020E-002	1.83%
661.66	2.2272E-002	2.1747E-002	2.36%
898.02	1.7022E-002	1.7530E-002	-2.98%
1173.23	1.4213E-002	1.4469E-002	-1.81%
1332.51	1.2880E-002	1.3162E-002	-2.19%
1836.01	1.0445E-002	1.0175E-002	2.58%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	15094.00	641.50	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1187.50	426.30	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15909.00	574.30	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	363.55	311.20	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	544.93	435.40	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1084.50	883.90	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	947.66	606.50	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1166.10	1116.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	473.09	402.60	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1583.80	1484.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	748.72	748.50	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	748.77	748.70	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1583.70	1571.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 8_Soil 250ml TunaCan_04-07-2013.Clb
Energy Calibration Date: 1/6/2014 Time: 07:47:05
Efficiency Calibration Date: 4/8/2013 Time: 11:06:59

Calibration Description:
HPGE08 S22147 8_20130407002_EffCal

Energy Calibration Fit
Energy = -0.0094 +0.125031*Channel -1.73782e-009*Channel**2
FWHM (ch) = 6.0128 +0.000945*Channel -1.2954e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.06	121.78	121.78	0.00%	0.86	0.87	-0.97%
1957.28	244.67	244.71	-0.01%	0.99	0.98	1.22%
2753.58	344.30	344.26	0.01%	1.07	1.06	0.05%
6230.19	778.90	778.89	0.00%	1.41	1.42	-0.88%
7711.13	964.00	964.02	-0.00%	1.57	1.57	0.56%
11263.61	1408.08	1408.07	0.00%	1.88	1.88	-0.03%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3437 %
Coefficients:
-0.359632 -4.215465 0.446712 -0.054338 0.002307 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.1480E-003	1.1459E-003	0.18%
59.54	7.8461E-003	7.8963E-003	-0.64%
88.03	2.8793E-002	2.7907E-002	3.07%
122.06	4.0568E-002	4.1250E-002	-1.68%
165.85	4.4022E-002	4.4468E-002	-1.01%
279.17	3.6126E-002	3.6350E-002	-0.62%
391.71	2.9368E-002	2.9198E-002	0.58%
513.99	2.4752E-002	2.4220E-002	2.15%
661.66	2.1181E-002	2.0350E-002	3.92%
898.02	1.5779E-002	1.6486E-002	-4.48%
1173.23	1.3373E-002	1.3640E-002	-2.00%
1332.51	1.2187E-002	1.2412E-002	-1.85%
1836.01	9.8414E-003	9.5788E-003	2.67%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14139.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1112.50	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	14903.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	340.54	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1016.00	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	887.81	568.20	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1093.00	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	443.24	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1483.50	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	701.41	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	701.37	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1482.90	1471.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 8_Soil 250ml TunaCan_04-07-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:40:12
Efficiency Calibration Date: 4/8/2013 Time: 11:06:59

Calibration Description:
HPGE08 S22147 8_20130407002_EffCal

Energy Calibration Fit
Energy = -0.0001 +0.125028*Channel -1.41986e-009*Channel**2
FWHM (ch) = 5.8562 +0.001118*Channel -3.00837e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.04	121.78	121.78	-0.00%	0.87	0.86	0.06%
1957.25	244.67	244.71	-0.01%	0.98	0.99	-1.01%
2753.48	344.30	344.25	0.01%	1.10	1.09	1.06%
7711.07	964.00	964.02	-0.00%	1.58	1.59	-0.23%
11263.49	1408.08	1408.07	0.00%	1.83	1.83	0.07%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3437 %
Coefficients:
-0.359632 -4.215465 0.446712 -0.054338 0.002307 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.1480E-003	1.1459E-003	0.18%
59.54	7.8461E-003	7.8963E-003	-0.64%
88.03	2.8793E-002	2.7907E-002	3.07%
122.06	4.0568E-002	4.1250E-002	-1.68%
165.85	4.4022E-002	4.4468E-002	-1.01%
279.17	3.6126E-002	3.6350E-002	-0.62%
391.71	2.9368E-002	2.9198E-002	0.58%
513.99	2.4752E-002	2.4220E-002	2.15%
661.66	2.1181E-002	2.0350E-002	3.92%
898.02	1.5779E-002	1.6486E-002	-4.48%
1173.23	1.3373E-002	1.3640E-002	-2.00%
1332.51	1.2187E-002	1.2412E-002	-1.85%
1836.01	9.8414E-003	9.5788E-003	2.67%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14139.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1112.50	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	14903.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	340.54	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1016.00	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	887.81	568.20	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1093.00	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	443.24	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1483.50	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	701.41	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	701.37	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1482.90	1471.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 9_Soil 250ml TunaCan_12-29-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:26:14
Efficiency Calibration Date: 12/30/2013 Time: 12:17:54

Calibration Description:
HPGE09 S23325 9_20131229002_EffCal

Energy Calibration Fit
Energy = 0.0949 +0.125077*Channel -5.67454e-009*Channel**2
FWHM (ch) = 6.0944 +0.000986*Channel -1.06572e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.79	121.78	121.89	-0.09%	0.88	0.88	-0.66%
1955.38	244.67	244.65	0.01%	0.99	1.00	-1.07%
2750.98	344.30	344.13	0.05%	1.12	1.09	2.21%
6229.21	778.90	779.00	-0.01%	1.47	1.48	-0.71%
11262.57	1408.08	1408.06	0.00%	1.98	1.98	0.11%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9396 %
Coefficients:
-0.405508 -4.148311 0.423719 -0.051216 0.002101 -0.000043

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	9.6799E-004	9.6656E-004	0.15%
59.54	7.1400E-003	7.1767E-003	-0.51%
88.03	2.7754E-002	2.7086E-002	2.41%
122.06	4.0400E-002	4.0745E-002	-0.85%
165.85	4.3400E-002	4.4228E-002	-1.91%
279.17	3.6871E-002	3.6468E-002	1.09%
391.71	2.9633E-002	2.9420E-002	0.72%
661.66	2.1148E-002	2.0523E-002	2.95%
898.02	1.6152E-002	1.6551E-002	-2.47%
1173.23	1.3311E-002	1.3584E-002	-2.05%
1332.51	1.2247E-002	1.2294E-002	-0.39%
1836.01	9.4555E-003	9.3078E-003	1.56%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 9_Soil 250ml TunaCan_12-29-2013.Clb
Energy Calibration Date: 1/10/2014 Time: 06:14:13
Efficiency Calibration Date: 12/30/2013 Time: 12:17:54

Calibration Description:
HPGE09 S23325 9_20131229002_EffCal

Energy Calibration Fit
Energy = 0.1501 +0.125042*Channel -3.16821e-009*Channel**2
FWHM (ch) = 6.1535 +0.001002*Channel -1.94678e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.76	121.78	121.91	-0.11%	0.88	0.89	-1.52%
1955.41	244.67	244.65	0.01%	1.02	1.00	1.38%
2750.96	344.30	344.11	0.05%	1.10	1.10	-0.01%
6229.35	778.90	778.95	-0.01%	1.48	1.45	1.60%
7710.29	964.00	964.07	-0.01%	1.56	1.59	-2.02%
11262.61	1408.08	1408.04	0.00%	1.88	1.87	0.38%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9396 %
Coefficients:
-0.405508 -4.148311 0.423719 -0.051216 0.002101 -0.000043

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	9.6799E-004	9.6656E-004	0.15%
59.54	7.1400E-003	7.1767E-003	-0.51%
88.03	2.7754E-002	2.7086E-002	2.41%
122.06	4.0400E-002	4.0745E-002	-0.85%
165.85	4.3400E-002	4.4228E-002	-1.91%
279.17	3.6871E-002	3.6468E-002	1.09%
391.71	2.9633E-002	2.9420E-002	0.72%
661.66	2.1148E-002	2.0523E-002	2.95%
898.02	1.6152E-002	1.6551E-002	-2.47%
1173.23	1.3311E-002	1.3584E-002	-2.05%
1332.51	1.2247E-002	1.2294E-002	-0.39%
1836.01	9.4555E-003	9.3078E-003	1.56%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 10_Soil 250ml TunaCan_12-30-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:52:53
Efficiency Calibration Date: 12/30/2013 Time: 19:08:15

Calibration Description:
HPGE10 S23325 10_20131230002_EffCal

Energy Calibration Fit
Energy = 0.0222 +0.125067*Channel -5.21964e-009*Channel**2
FWHM (ch) = 6.3648 +0.000906*Channel -1.18817e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.38	121.78	121.88	-0.08%	0.90	0.90	-0.54%
1956.12	244.67	244.65	0.01%	1.00	1.01	-0.72%
2751.90	344.30	344.16	0.04%	1.12	1.10	1.70%
6229.58	778.90	778.94	-0.00%	1.43	1.44	-0.72%
7710.63	964.00	964.06	-0.01%	1.58	1.58	0.14%
11263.46	1408.08	1408.05	0.00%	1.88	1.88	0.07%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9077 %
Coefficients:
-0.405663 -4.247105 0.428613 -0.050516 0.001891 -0.000039

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.9104E-004	3.9052E-004	0.13%
59.54	4.3412E-003	4.3611E-003	-0.46%
88.03	2.2760E-002	2.2293E-002	2.05%
122.06	3.6359E-002	3.6522E-002	-0.45%
165.85	3.9843E-002	4.0637E-002	-1.99%
279.17	3.3898E-002	3.3619E-002	0.82%
391.71	2.7263E-002	2.7019E-002	0.89%
661.66	1.9310E-002	1.8746E-002	2.92%
898.02	1.4720E-002	1.5083E-002	-2.46%
1173.23	1.2257E-002	1.2360E-002	-0.84%
1332.51	1.0979E-002	1.1180E-002	-1.83%
1836.01	8.6118E-003	8.4538E-003	1.83%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 10_Soil 250ml TunaCan_12-30-2013.Clb
Energy Calibration Date: 1/10/2014 Time: 06:53:23
Efficiency Calibration Date: 12/30/2013 Time: 19:08:15

Calibration Description:
HPGE10 S23325 10_20131230002_EffCal

Energy Calibration Fit
Energy = 0.0309 +0.125067*Channel -5.40063e-009*Channel**2
FWHM (ch) = 6.6891 +0.000706*Channel +8.51382e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.30	121.78	121.88	-0.08%	0.91	0.92	-1.74%
1956.06	244.67	244.65	0.01%	1.02	1.01	0.98%
2751.85	344.30	344.16	0.04%	1.10	1.09	1.01%
6229.60	778.90	778.94	-0.01%	1.44	1.43	0.84%
7710.59	964.00	964.05	-0.01%	1.56	1.58	-1.56%
11263.58	1408.08	1408.05	0.00%	1.97	1.96	0.34%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9077 %
Coefficients:
-0.405663 -4.247105 0.428613 -0.050516 0.001891 -0.000039

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.9104E-004	3.9052E-004	0.13%
59.54	4.3412E-003	4.3611E-003	-0.46%
88.03	2.2760E-002	2.2293E-002	2.05%
122.06	3.6359E-002	3.6522E-002	-0.45%
165.85	3.9843E-002	4.0637E-002	-1.99%
279.17	3.3898E-002	3.3619E-002	0.82%
391.71	2.7263E-002	2.7019E-002	0.89%
661.66	1.9310E-002	1.8746E-002	2.92%
898.02	1.4720E-002	1.5083E-002	-2.46%
1173.23	1.2257E-002	1.2360E-002	-0.84%
1332.51	1.0979E-002	1.1180E-002	-1.83%
1836.01	8.6118E-003	8.4538E-003	1.83%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 11_Soil 250ml TunaCan_01-02-2014.Clb
Energy Calibration Date: 1/7/2014 Time: 07:07:34
Efficiency Calibration Date: 1/3/2014 Time: 14:18:33

Calibration Description:
HPGE11 S23325 11_20140102002_EffCal

Energy Calibration Fit
Energy = 0.1174 +0.125120*Channel -1.07184e-008*Channel**2
FWHM (ch) = 5.7600 +0.001075*Channel -1.52036e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.93	121.78	121.97	-0.15%	0.85	0.85	-0.10%
1954.24	244.67	244.59	0.03%	0.99	0.98	1.40%
2749.70	344.30	344.08	0.06%	1.07	1.08	-0.89%
6228.30	778.90	778.99	-0.01%	1.45	1.48	-2.65%
7709.30	964.00	964.07	-0.01%	1.69	1.64	2.55%
11263.36	1408.08	1408.03	0.00%	1.98	1.99	-0.42%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0987 %
Coefficients:
-0.389026 -4.316173 0.421471 -0.052531 0.002317 -0.000045

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.1698E-003	2.1663E-003	0.16%
59.54	9.2183E-003	9.2714E-003	-0.58%
88.03	2.5586E-002	2.4875E-002	2.78%
122.06	3.4140E-002	3.4560E-002	-1.23%
165.85	3.6166E-002	3.6856E-002	-1.91%
279.17	3.0944E-002	3.0501E-002	1.43%
391.71	2.4890E-002	2.4766E-002	0.50%
661.66	1.8028E-002	1.7443E-002	3.24%
898.02	1.3678E-002	1.4148E-002	-3.44%
1173.23	1.1583E-002	1.1677E-002	-0.81%
1332.51	1.0506E-002	1.0600E-002	-0.90%
1836.01	8.2242E-003	8.0984E-003	1.53%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 11_Soil 250ml TunaCan_01-02-2014.Clb
Energy Calibration Date: 1/8/2014 Time: 07:30:05
Efficiency Calibration Date: 1/3/2014 Time: 14:18:33

Calibration Description:
HPGE11 S23325 11_20140102002_EffCal

Energy Calibration Fit
Energy = 0.1247 +0.125122*Channel -1.05437e-008*Channel**2
FWHM (ch) = 5.9057 +0.000996*Channel -7.52245e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.85	121.78	121.97	-0.15%	0.85	0.86	-1.26%
1954.16	244.67	244.59	0.03%	0.97	0.98	-1.00%
2749.58	344.30	344.08	0.06%	1.10	1.07	2.78%
6228.10	778.90	778.99	-0.01%	1.47	1.48	-0.30%
7709.06	964.00	964.07	-0.01%	1.63	1.64	-0.66%
11262.97	1408.08	1408.03	0.00%	2.02	2.02	0.24%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0987 %
Coefficients:
-0.389026 -4.316173 0.421471 -0.052531 0.002317 -0.000045

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.1698E-003	2.1663E-003	0.16%
59.54	9.2183E-003	9.2714E-003	-0.58%
88.03	2.5586E-002	2.4875E-002	2.78%
122.06	3.4140E-002	3.4560E-002	-1.23%
165.85	3.6166E-002	3.6856E-002	-1.91%
279.17	3.0944E-002	3.0501E-002	1.43%
391.71	2.4890E-002	2.4766E-002	0.50%
661.66	1.8028E-002	1.7443E-002	3.24%
898.02	1.3678E-002	1.4148E-002	-3.44%
1173.23	1.1583E-002	1.1677E-002	-0.81%
1332.51	1.0506E-002	1.0600E-002	-0.90%
1836.01	8.2242E-003	8.0984E-003	1.53%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 12_Soil 250ml TunaCan_01-03-2014.Clb
Energy Calibration Date: 1/8/2014 Time: 07:54:39
Efficiency Calibration Date: 1/3/2014 Time: 19:51:11

Calibration Description:
HPGE12 S23325 12_20140103002_EffCal

Energy Calibration Fit
Energy = 0.0939 +0.124966*Channel +3.48228e-009*Channel**2
FWHM (ch) = 6.2423 +0.000966*Channel -1.76989e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.89	121.78	121.80	-0.02%	0.89	0.90	-0.28%
1956.90	244.67	244.65	0.01%	1.01	1.01	0.63%
2754.11	344.30	344.29	0.00%	1.09	1.10	-0.66%
6230.97	778.90	778.89	0.00%	1.46	1.45	1.21%
7711.91	964.00	964.03	-0.00%	1.56	1.58	-1.12%
11263.37	1408.08	1408.07	0.00%	1.86	1.86	0.16%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0370 %
Coefficients:
-0.383371 -4.365972 0.460548 -0.057677 0.002462 -0.000050

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	7.0564E-004	7.0481E-004	0.12%
59.54	5.4777E-003	5.4997E-003	-0.40%
88.03	2.2152E-002	2.1771E-002	1.72%
122.06	3.4027E-002	3.4034E-002	-0.02%
165.85	3.6904E-002	3.7803E-002	-2.44%
279.17	3.2090E-002	3.1481E-002	1.90%
391.71	2.5170E-002	2.5287E-002	-0.47%
661.66	1.8058E-002	1.7473E-002	3.24%
898.02	1.3711E-002	1.4043E-002	-2.43%
1173.23	1.1371E-002	1.1521E-002	-1.32%
1332.51	1.0346E-002	1.0434E-002	-0.85%
1836.01	8.0582E-003	7.9410E-003	1.45%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 12_Soil 250ml TunaCan_01-03-2014.Clb
Energy Calibration Date: 1/10/2014 Time: 06:54:40
Efficiency Calibration Date: 1/3/2014 Time: 19:51:11

Calibration Description:
HPGE12 S23325 12_20140103002_EffCal

Energy Calibration Fit
Energy = 0.0765 +0.124974*Channel +3.35111e-009*Channel**2
FWHM (ch) = 6.3851 +0.000923*Channel -1.36064e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.92	121.78	121.79	-0.01%	0.90	0.91	-0.74%
1956.94	244.67	244.66	0.01%	1.01	1.02	-0.98%
2754.11	344.30	344.29	0.00%	1.13	1.10	2.26%
6230.92	778.90	778.91	-0.00%	1.44	1.45	-0.78%
11262.96	1408.08	1408.08	0.00%	1.88	1.88	0.12%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0370 %
Coefficients:
-0.383371 -4.365972 0.460548 -0.057677 0.002462 -0.000050

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	7.0564E-004	7.0481E-004	0.12%
59.54	5.4777E-003	5.4997E-003	-0.40%
88.03	2.2152E-002	2.1771E-002	1.72%
122.06	3.4027E-002	3.4034E-002	-0.02%
165.85	3.6904E-002	3.7803E-002	-2.44%
279.17	3.2090E-002	3.1481E-002	1.90%
391.71	2.5170E-002	2.5287E-002	-0.47%
661.66	1.8058E-002	1.7473E-002	3.24%
898.02	1.3711E-002	1.4043E-002	-2.43%
1173.23	1.1371E-002	1.1521E-002	-1.32%
1332.51	1.0346E-002	1.0434E-002	-0.85%
1836.01	8.0582E-003	7.9410E-003	1.45%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE06
Seqnum : 1554009668001
Cal : 06-JAN-2014 17:29:29,04-JAN-2014 11:46:48

Run Name : QUALITY CONTROL CHEC
File : 6_20140106_001
Caldate : 06-JAN-2014, 04-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 06-JAN-2014 17:08
Dead Time : 4.43 %

Standards: S19584

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9905	uCi	.0057764	974.25	972.00 - 976.00	121.92	121.58 - 121.98	0.89	0.77 - 0.95	-0.95	5	
QA-779	1.000	1.018	uCi	.017302					1.53	1.40 - 1.71	1.78	5	
QA-1408	1.000	0.9897	uCi	.0127	11263.89	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	2.03	1.85 - 2.26	-1.03	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE06
Seqnum : 1554011902001
Cal : 08-JAN-2014 06:45:06,04-JAN-2014 11:46:48

Run Name : QUALITY CONTROL CHEC
File : 6_20140108_001
Caldate : 08-JAN-2014, 04-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 06:22
Dead Time : 7.95 %

Standards: S19584

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9824	uCi	.0057552	974.37	972.00 - 976.00	121.93	121.58 - 121.98	0.85	0.77 - 0.95	-1.76	5	
QA-779	1.000	1.009	uCi	.017635					1.52	1.40 - 1.71	0.92	5	
QA-1408	1.000	0.9885	uCi	.012978	11264.15	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.99	1.85 - 2.26	-1.15	5	

FWHM=Full Width Half Max

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 7_20130221001_QCAsLeft
Acquired: 2/21/2013 11:55:56
Detector: HPGE07 51-TP32743A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1408 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	974.00	967.00	969.00	973.90	979.00	981.00	PASS
Energy	121.78	121.28	121.45	121.79	122.11	122.28	PASS
FWHM	0.80	0.55	0.60	0.89	1.00	1.05	PASS
ActivityDiff	1.00	-7.00	-5.00	0.42	5.00	7.00	PASS
QA-779							
FWHM	1.50	1.10	1.20	1.52	1.80	1.90	PASS
ActivityDiff	1.00	-7.00	-5.00	-4.20	5.00	7.00	PASS
QA-1408							
Channel	11264.00	11257.00	11259.00	11262.90	11269.00	11271.00	PASS
Energy	1408.08	1407.58	1407.75	1408.05	1408.41	1408.58	PASS
FWHM	2.00	1.60	1.70	2.03	2.30	2.40	PASS
ActivityDiff	1.00	-7.00	-5.00	-1.51	5.00	7.00	PASS

Analyst: Philip Smith Reviewer:

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564009082001
Cal : 06-JAN-2014 07:33:28,20-FEB-2013 20:31:28

Run Name : QUALITY CONTROL CHEC
File : 7_20140106_001
Caldate : 06-JAN-2014, 20-FEB-2013
Live Time : 600 sec

IDF : 1.0
Time : 06-JAN-2014 07:22
Dead Time : 4.1 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9975	uCi	.0081719	974.02	972.00 - 976.00	121.79	121.58 - 121.98	0.90	0.80 - 0.98	-0.25	5	
QA-779	1.000	1.041	uCi	.024183					1.48	1.37 - 1.67	4.07	5	
QA-1408	1.000	1.014	uCi	.0185	11266.41	11259.00 - 11269.00	1408.06	1407.58 - 1408.58	1.95	1.80 - 2.20	1.44	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564011942001
Cal : 08-JAN-2014 07:13:44,20-FEB-2013 20:31:28

Run Name : QUALITY CONTROL CHEC
File : 7_20140108_001
Caldate : 08-JAN-2014, 20-FEB-2013
Live Time : 600 sec

IDF : 1.0
Time : 08-JAN-2014 07:02
Dead Time : 4.09 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9934	uCi	.0082924	973.97	972.00 - 976.00	121.79	121.58 - 121.98	0.88	0.80 - 0.98	-0.66	5	
QA-779	1.000	1.020	uCi	.024392					1.56	1.37 - 1.67	1.96	5	
QA-1408	1.000	0.9897	uCi	.019066	11265.99	11259.00 - 11269.00	1408.07	1407.58 - 1408.58	2.01	1.80 - 2.20	-1.03	5	

FWHM=Full Width Half Max

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 8_20130408001_QCAsLeft
Acquired: 4/8/2013 11:13:48
Detector: HPGE08 50-TP42229A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1408 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	974.00	967.00	969.00	973.90	979.00	981.00	PASS
Energy	121.78	121.28	121.45	121.78	122.11	122.28	PASS
FWHM	0.86	0.76	0.79	0.86	0.93	0.96	PASS
ActivityDiff	1.00	-7.00	-5.00	0.48	5.00	7.00	PASS
QA-779							
FWHM	1.47	1.29	1.35	1.53	1.59	1.65	PASS
ActivityDiff	1.00	-7.00	-5.00	-1.25	5.00	7.00	PASS
QA-1408							
Channel	11264.00	11257.00	11259.00	11263.40	11269.00	11271.00	PASS
Energy	1408.08	1407.58	1407.75	1408.07	1408.41	1408.58	PASS
FWHM	1.94	1.71	1.78	2.01	2.10	2.17	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.45	5.00	7.00	PASS

Analyst: Philip Smith Reviewer:

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574009095001
Cal : 06-JAN-2014 07:47:05,07-APR-2013 12:02:30

Run Name : QUALITY CONTROL CHEC
File : 8_20140106_001
Caldate : 06-JAN-2014, 07-APR-2013
Live Time : 600 sec

IDF : 1.0
Time : 06-JAN-2014 07:35
Dead Time : 10.53 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9920	uCi	.0085159	974.06	972.00 - 976.00	121.78	121.58 - 121.98	0.86	0.77 - 0.95	-0.80	5	
QA-779	1.000	1.000	uCi	.022232					1.43	1.32 - 1.62	0.00	5	
QA-1408	1.000	1.003	uCi	.018924	11263.47	11259.00 - 11269.00	1408.06	1407.58 - 1408.58	1.88	1.75 - 2.13	0.33	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574011955002
Cal : 08-JAN-2014 07:40:12,07-APR-2013 12:02:30

Run Name : QUALITY CONTROL CHEC
File : 8_20140108_002
Caldate : 08-JAN-2014, 07-APR-2013
Live Time : 600 sec

IDF : 1.0
Time : 08-JAN-2014 07:28
Dead Time : 10.58 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9975	uCi	.008388	974.04	972.00 - 976.00	121.78	121.58 - 121.98	0.87	0.77 - 0.95	-0.25	5	
QA-779	1.000	0.9960	uCi	.022622					1.42	1.32 - 1.62	-0.40	5	
QA-1408	1.000	1.002	uCi	.018929	11263.43	11259.00 - 11269.00	1408.07	1407.58 - 1408.58	1.83	1.75 - 2.13	0.22	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1583525113001
Cal : 30-DEC-2013 16:14:21,29-DEC-2013 16:56:20

Run Name : QUALITY CONTROL CHEC
File : 9_20131230_001
Caldate : 30-DEC-2013, 29-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 30-DEC-2013 15:53
Dead Time : 3.95 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9788	uCi	.0060696	973.90	972.00 - 976.00	121.91	121.58 - 121.98	0.86	0.76 - 0.92	-2.12	5	
QA-779	1.000	1.008	uCi	.016482					1.45	1.33 - 1.63	0.80	5	
QA-1408	1.000	0.9937	uCi	.013119	11263.32	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.91	1.76 - 2.15	-0.63	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1584011944001
Cal : 08-JAN-2014 07:26:14,29-DEC-2013 16:56:20

Run Name : QUALITY CONTROL CHEC
File : 9_20140108_001
Caldate : 08-JAN-2014, 29-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:04
Dead Time : 3.93 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9761	uCi	.0060473	973.78	972.00 - 976.00	121.89	121.58 - 121.98	0.88	0.76 - 0.92	-2.39	5	
QA-779	1.000	0.9979	uCi	.017082					1.48	1.33 - 1.63	-0.21	5	
QA-1408	1.000	0.9836	uCi	.013706	11262.48	11259.00 - 11269.00	1408.05	1407.58 - 1408.58	1.98	1.76 - 2.15	-1.64	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1584014752001
Cal : 10-JAN-2014 06:14:13,29-DEC-2013 16:56:20

Run Name : QUALITY CONTROL CHEC
File : 9_20140110_001
Caldate : 10-JAN-2014, 29-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 10-JAN-2014 05:52
Dead Time : 3.92 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9788	uCi	.0060705	973.75	972.00 - 976.00	121.91	121.58 - 121.98	0.88	0.76 - 0.92	-2.12	5	
QA-779	1.000	1.019	uCi	.017141					1.49	1.33 - 1.63	1.89	5	
QA-1408	1.000	0.9807	uCi	.013621	11262.59	11259.00 - 11269.00	1408.04	1407.58 - 1408.58	1.88	1.76 - 2.15	-1.93	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE10
Seqnum : 1594011971001
Cal : 08-JAN-2014 07:52:53,30-DEC-2013 15:43:50

Run Name : QUALITY CONTROL CHEC
File : 10_20140108_001
Caldate : 08-JAN-2014, 30-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:31
Dead Time : 3.62 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9765	uCi	.0062128	974.38	972.00 - 976.00	121.88	121.58 - 121.98	0.90	0.77 - 0.95	-2.35	5	
QA-779	1.000	1.019	uCi	.018661					1.45	1.30 - 1.58	1.91	5	
QA-1408	1.000	1.007	uCi	.01439	11263.36	11259.00 - 11269.00	1408.04	1407.58 - 1408.58	1.89	1.75 - 2.13	0.67	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE10
Seqnum : 1594014792001
Cal : 10-JAN-2014 06:53:23,30-DEC-2013 15:43:50

Run Name : QUALITY CONTROL CHEC
File : 10_20140110_001
Caldate : 10-JAN-2014, 30-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 10-JAN-2014 06:32
Dead Time : 3.62 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9817	uCi	.0064492	974.28	972.00 - 976.00	121.88	121.58 - 121.98	0.91	0.77 - 0.95	-1.83	5	
QA-779	1.000	1.010	uCi	.017602					1.45	1.30 - 1.58	1.02	5	
QA-1408	1.000	1.006	uCi	.01414	11263.43	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.97	1.75 - 2.13	0.58	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604005225002
Cal : 03-JAN-2014 15:27:04,21-FEB-2013 21:48:39

Run Name : QUALITY CONTROL CHEC
File : 11_20140103_002
Caldate : 03-JAN-2014, 21-FEB-2013
Live Time : 1200 sec

IDF : 1.0
Time : 03-JAN-2014 15:05
Dead Time : 7.24 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9869	uCi	.0067631	973.89	972.00 - 976.00	121.94	121.58 - 121.98	0.84	0.77 - 0.94	-1.31	5	
QA-779	1.000	1.029	uCi	.017516					1.50	1.33 - 1.63	2.94	5	
QA-1408	1.000	0.9981	uCi	.014009	11263.22	11259.00 - 11269.00	1408.05	1407.58 - 1408.58	2.03	1.77 - 2.17	-0.20	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604010485001
Cal : 07-JAN-2014 07:07:34,21-FEB-2013 21:48:39

Run Name : QUALITY CONTROL CHEC
File : 11_20140107_001
Caldate : 07-JAN-2014, 21-FEB-2013
Live Time : 1200 sec

IDF : 1.0
Time : 07-JAN-2014 06:45
Dead Time : 7.26 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9903	uCi	.0065657	973.93	972.00 - 976.00	121.97	121.58 - 121.98	0.85	0.77 - 0.94	-0.97	5	
QA-779	1.000	1.002	uCi	.017005					1.46	1.33 - 1.63	0.15	5	
QA-1408	1.000	0.9869	uCi	.014056	11263.35	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.98	1.77 - 2.17	-1.31	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604011948001
Cal : 08-JAN-2014 07:30:05,21-FEB-2013 21:48:39

Run Name : QUALITY CONTROL CHEC
File : 11_20140108_001
Caldate : 08-JAN-2014, 21-FEB-2013
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:08
Dead Time : 7.23 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9980	uCi	.006771	973.83	972.00 - 976.00	121.96	121.58 - 121.98	0.85	0.77 - 0.94	-0.20	5	
QA-779	1.000	0.9961	uCi	.016707					1.49	1.33 - 1.63	-0.39	5	
QA-1408	1.000	0.9917	uCi	.013839	11262.92	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	2.03	1.77 - 2.17	-0.83	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614005283003
Cal : 03-JAN-2014 20:28:37,30-DEC-2012 16:03:28

Run Name : QUALITY CONTROL CHEC
File : 12_20140103_003
Caldate : 03-JAN-2014, 30-DEC-2012
Live Time : 1200 sec

IDF : 1.0
Time : 03-JAN-2014 20:07
Dead Time : 4.03 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.014	uCi	.0069424	973.85	972.00 - 976.00	121.79	121.58 - 121.98	0.88	0.80 - 0.98	1.41	5	
QA-779	1.000	1.025	uCi	.019016					1.51	1.33 - 1.63	2.48	5	
QA-1408	1.000	1.023	uCi	.014518	11264.17	11259.00 - 11269.00	1408.08	1407.58 - 1408.58	1.92	1.73 - 2.11	2.27	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614011949002
Cal : 08-JAN-2014 07:54:39,30-DEC-2012 16:03:28

Run Name : QUALITY CONTROL CHEC
File : 12_20140108_002
Caldate : 08-JAN-2014, 30-DEC-2012
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:33
Dead Time : 4.02 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9962	uCi	.0068858	973.88	972.00 - 976.00	121.80	121.58 - 121.98	0.89	0.80 - 0.98	-0.38	5	
QA-779	1.000	1.001	uCi	.017941					1.49	1.33 - 1.63	0.10	5	
QA-1408	1.000	1.036	uCi	.014771	11263.32	11259.00 - 11269.00	1408.07	1407.58 - 1408.58	1.86	1.73 - 2.11	3.60	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614014793001
Cal : 10-JAN-2014 06:54:40,30-DEC-2012 16:03:28

Run Name : QUALITY CONTROL CHEC
File : 12_20140110_001
Caldate : 10-JAN-2014, 30-DEC-2012
Live Time : 1200 sec

IDF : 1.0
Time : 10-JAN-2014 06:33
Dead Time : 4 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.008	uCi	.0069013	973.90	972.00 - 976.00	121.79	121.58 - 121.98	0.90	0.80 - 0.98	0.78	5	
QA-779	1.000	1.018	uCi	.018263					1.45	1.33 - 1.63	1.76	5	
QA-1408	1.000	1.020	uCi	.014503	11262.96	11259.00 - 11269.00	1408.08	1407.58 - 1408.58	1.89	1.73 - 2.11	1.99	5	

FWHM=Full Width Half Max

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 6_20140108002_BG
Acquired: 1/8/2014 06:46:07
Detector: HPGE06 51-TP32744A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.96	1.75	1.82	1.90	2.10	2.17	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 7_20140106002_BG
Acquired: 1/6/2014 07:34:46
Detector: HPGE07 51-TP32743A
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.92	1.73	1.80	1.96	2.05	2.12	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 7_20140108002_BG
Acquired: 1/8/2014 07:15:01
Detector: HPGE07 51-TP32743A
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.92	1.73	1.80	1.85	2.05	2.12	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 8_20140106002_BG
Acquired: 1/6/2014 07:49:25
Detector: HPGE08 50-TP42229A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.90	1.69	1.76	1.87	2.04	2.11	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 8_20140108003_BG
Acquired: 1/8/2014 07:42:10
Detector: HPGE08 50-TP42229A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.90	1.69	1.76	1.94	2.04	2.11	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 9_20140108002_BG
Acquired: 1/8/2014 07:31:08
Detector: HPGE09 50-TP42232A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.66	1.73	1.87	2.02	2.09	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 9_20140110002_BG
Acquired: 1/10/2014 06:31:51
Detector: HPGE09 50-TP42232A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.66	1.73	1.83	2.02	2.09	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 10_20140108003_BG
Acquired: 1/8/2014 08:20:48
Detector: HPGE10 51-TP42231A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.69	1.75	1.88	2.00	2.07	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 10_20140110002_BG
Acquired: 1/10/2014 07:18:39
Detector: HPGE10 51-TP42231A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.69	1.75	1.90	2.00	2.07	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 11_20140107002_BG
Acquired: 1/7/2014 07:09:08
Detector: HPGE11 50-TP50818A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.84	1.67	1.72	1.91	1.96	2.01	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 11_20140108002_BG
Acquired: 1/8/2014 07:32:31
Detector: HPGE11 50-TP50818A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.84	1.67	1.72	1.78	1.96	2.01	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 12_20140108003_BG
Acquired: 1/8/2014 07:57:38
Detector: HPGE12 50-TP32731A
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.73	1.57	1.63	1.69	1.83	1.89	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 12_20140110002_BG
Acquired: 1/10/2014 07:22:23
Detector: HPGE12 50-TP32731A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.73	1.57	1.63	1.78	1.83	1.89	PASS

Analyst: Chris Fluty Reviewer:

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1554006423

Instrument : HPGE06 Begun : 01/04/14 11:03
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	6_20140104_001	RICAL	POINT SOURCE			01/04/14 11:03	1.0	1	
002	6_20140104_002	RICAL	TUNACAN			01/04/14 11:58	1.0	2	

Standards used: 1=S19584 2=S23325

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1554009668

Instrument : HPGE06 Begun : 01/06/14 17:08
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	6_20140106_001	RCCV	QUALITY CONTROL CHEC			01/06/14 17:08	1.0	1	
002	6_20140106_002	RICV	EFFICIENCY VERIFICAT			01/06/14 17:32	1.0	2	
003	6_20140106_003	X	BACKGROUND LONG PBC			01/06/14 20:36	1.0		

Standards used: 1=S19584 2=S22147

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1554011902

Instrument : HPGE06 Begun : 01/08/14 06:22
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	6_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 06:22	1.0	1
002	6_20140108_002	RIB	BACKGROUND CONTAMINA			01/08/14 06:46	1.0	
003	6_20140108_003	SAMPLE	251481-006	Soil	206675	01/08/14 06:59	1.0	
004	6_20140108_004	SAMPLE	251445-004	Soil	206637	01/08/14 07:50	1.0	
005	6_20140108_005	SAMPLE	251445-010	Soil	206637	01/08/14 09:05	1.0	
006	6_20140108_006	MSS	251445-016	Soil	206637	01/08/14 10:12	1.0	
007	6_20140108_007	MSS	251445-016	Soil	206637	01/08/14 11:13	1.0	
008	6_20140108_008	SAMPLE	251491-008	Soil	206637	01/08/14 14:32	1.0	
009	6_20140108_009	MSS	251491-009	Soil	206637	01/08/14 15:24	1.0	
010	6_20140108_010	SAMPLE	251491-015	Soil	206637	01/08/14 16:13	1.0	
011	6_20140108_011	IDUP	QC722418	Soil	206637	01/08/14 17:02	1.0	
012	6_20140108_012	SAMPLE	251449-006	Soil	206637	01/08/14 17:53	1.0	
013	6_20140108_013	SAMPLE	251449-013	Soil	206637	01/08/14 18:45	1.0	
014	6_20140108_014	SAMPLE	251449-021	Soil	206637	01/08/14 19:44	1.0	
015	6_20140108_015	SAMPLE	251444-017	Soil	206625	01/08/14 20:31	1.0	
016	6_20140108_016	SAMPLE	251444-018	Soil	206625	01/08/14 21:18	1.0	

Standards used: 1=S19584

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1563074650

Instrument : HPGE07 Begun : 02/20/13 20:10
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	7_20130220_001	RICAL	POINT SOURCE			02/20/13 20:10	1.0	1	
002	7_20130220_002	RICAL	TUNACAN			02/20/13 20:39	1.0	2	

Standards used: 1=S19585 2=S21603

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1563075595

Instrument : HPGE07 Begun : 02/21/13 11:55
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	7_20130221_001	RCCV	QUALITY CONTROL CHEC			02/21/13 11:55	1.0	1	
002	7_20130221_002	RICV	EFFICIENCY VERIFICAT			02/21/13 12:59	1.0	2	
003	7_20130221_003	X	BSC			02/21/13 17:31	1.0		

Standards used: 1=S19585 2=S20633

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1564009082

Instrument : HPGE07 Begun : 01/06/14 07:22
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	7_20140106_001	RCCV	QUALITY CONTROL CHEC			01/06/14 07:22	1.0	1
002	7_20140106_002	RIB	BACKGROUND CONTAMINA			01/06/14 07:34	1.0	
003	7_20140106_003	SAMPLE	251904-022	Soil	206597	01/06/14 08:03	1.0	
004	7_20140106_004	SAMPLE	251904-028	Soil	206597	01/06/14 09:08	1.0	
005	7_20140106_005	SAMPLE	251866-010	Soil	206597	01/06/14 10:05	1.0	
006	7_20140106_006	SAMPLE	251866-016	Soil	206597	01/06/14 10:53	1.0	
007	7_20140106_007	SAMPLE	251866-020	Soil	206597	01/06/14 12:44	1.0	
008	7_20140106_008	SAMPLE	251865-003	Soil	206597	01/06/14 13:37	1.0	
009	7_20140106_009	SAMPLE	251865-009	Soil	206597	01/06/14 14:48	1.0	
010	7_20140106_010	SAMPLE	251865-015	Soil	206597	01/06/14 15:36	1.0	
011	7_20140106_011	LCS	QC722414	Soil	206637	01/06/14 16:27	1.0	2
012	7_20140106_012	SAMPLE	251865-024	Soil	206597	01/06/14 17:14	1.0	
013	7_20140106_013	SAMPLE	251903-005	Soil	206597	01/06/14 18:03	1.0	
014	7_20140106_014	SAMPLE	251903-012	Soil	206597	01/06/14 18:52	1.0	
015	7_20140106_015	SAMPLE	251903-016	Soil	206597	01/06/14 19:40	1.0	
016	7_20140106_016	SAMPLE	251903-022	Soil	206597	01/06/14 20:33	1.0	
017	7_20140106_017	SAMPLE	251904-001	Soil	206597	01/06/14 21:19	1.0	

Standards used: 1=S19585 2=S19706

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1564011942

Instrument : HPGE07 Begun : 01/08/14 07:02
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	7_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 07:02	1.0	1
002	7_20140108_002	RIB	BACKGROUND CONTAMINA			01/08/14 07:15	1.0	
003	7_20140108_003	SAMPLE	251445-002	Soil	206637	01/08/14 07:30	1.0	
004	7_20140108_004	MSS	251445-006	Soil	206637	01/08/14 08:19	1.0	
005	7_20140108_005	SAMPLE	251445-011	Soil	206637	01/08/14 09:31	1.0	
006	7_20140108_006	IDUP	QC722415	Soil	206637	01/08/14 10:53	1.0	
007	7_20140108_007	SDUP	QC722416	Soil	206637	01/08/14 13:22	1.0	
008	7_20140108_008	SAMPLE	251491-003	Soil	206637	01/08/14 14:20	1.0	
009	7_20140108_009	SDUP	QC722416	Soil	206637	01/08/14 15:11	1.0	
010	7_20140108_010	SAMPLE	251491-021	Soil	206637	01/08/14 16:58	1.0	
011	7_20140108_011	SAMPLE	251449-008	Soil	206637	01/08/14 17:51	1.0	
012	7_20140108_012	SAMPLE	251449-014	Soil	206637	01/08/14 18:44	1.0	
013	7_20140108_013	SAMPLE	251449-019	Soil	206637	01/08/14 19:37	1.0	
014	7_20140108_014	SAMPLE	251444-011	Soil	206625	01/08/14 20:25	1.0	
015	7_20140108_015	SAMPLE	251444-019	Soil	206625	01/08/14 21:16	1.0	

Standards used: 1=S19585

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1573140388

Instrument : HPGE08 Begun : 04/07/13 11:48
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	8_20130407_001	RICAL	POINT SOURCE			04/07/13 11:48	1.0	1	
002	8_20130407_002	RICAL	TUNACAN			04/07/13 12:44	1.0	2	

Standards used: 1=S19585 2=S22147

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1573141793

Instrument : HPGE08 Begun : 04/08/13 11:13
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	8_20130408_001	RCCV	QUALITY CONTROL CHEC			04/08/13 11:13	1.0	1	
002	8_20130408_002	RICV	EFF VERIFICATION			04/08/13 11:41	1.0	2	
003	8_20130408_003	RIB	BACKGROUND CONTAMINA			04/08/13 15:02	1.0		
004	8_20130408_004	X	BSC			04/08/13 15:19	1.0		

Standards used: 1=S19585 2=S20633

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1574009095

Instrument : HPGE08 Begun : 01/06/14 07:35
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	8_20140106_001	RCCV	QUALITY CONTROL CHEC			01/06/14 07:35	1.0	1
002	8_20140106_002	RIB	BACKGROUND CONTAMINA			01/06/14 07:49	1.0	
003	8_20140106_003	SAMPLE	251904-023	Soil	206597	01/06/14 08:03	1.0	
004	8_20140106_004	SAMPLE	251866-005	Soil	206597	01/06/14 09:11	1.0	
005	8_20140106_005	SAMPLE	251866-011	Soil	206597	01/06/14 10:06	1.0	
006	8_20140106_006	MSS	251866-015	Soil	206597	01/06/14 10:55	1.0	
007	8_20140106_007	SAMPLE	251866-021	Soil	206597	01/06/14 12:49	1.0	
008	8_20140106_008	SAMPLE	251865-004	Soil	206597	01/06/14 13:40	1.0	
009	8_20140106_009	SAMPLE	251865-010	Soil	206597	01/06/14 14:48	1.0	
010	8_20140106_010	SAMPLE	251865-016	Soil	206597	01/06/14 15:37	1.0	
011	8_20140106_011	BLANK	QC722413	Soil	206637	01/06/14 16:28	1.0	
012	8_20140106_012	IDUP	QC722270	Soil	206597	01/06/14 17:16	1.0	
013	8_20140106_013	SAMPLE	251903-006	Soil	206597	01/06/14 18:04	1.0	
014	8_20140106_014	SAMPLE	251903-011	Soil	206597	01/06/14 18:53	1.0	
015	8_20140106_015	SAMPLE	251903-017	Soil	206597	01/06/14 19:41	1.0	
016	8_20140106_016	SAMPLE	251903-023	Soil	206597	01/06/14 20:34	1.0	
017	8_20140106_017	SAMPLE	251904-002	Soil	206597	01/06/14 21:20	1.0	

Standards used: 1=S19585

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1574011955

Instrument : HPGE08 Begun : 01/08/14 07:15
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	8_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 07:15	1.0	1	
002	8_20140108_002	RCCV	QUALITY CONTROL CHEC			01/08/14 07:28	1.0	1	
003	8_20140108_003	RIB	BACKGROUND CONTAMINA			01/08/14 07:42	1.0		
004	8_20140108_004	SAMPLE	251445-005	Soil	206637	01/08/14 07:55	1.0		
005	8_20140108_005	SAMPLE	251445-009	Soil	206637	01/08/14 08:44	1.0		
006	8_20140108_006	SAMPLE	251445-014	Soil	206637	01/08/14 09:31	1.0		
007	8_20140108_007	SAMPLE	251445-017	Soil	206637	01/08/14 10:53	1.0		
008	8_20140108_008	SAMPLE	251445-022	Soil	206637	01/08/14 13:23	1.0		
009	8_20140108_009	SAMPLE	251491-004	Soil	206637	01/08/14 14:21	1.0		
010	8_20140108_010	SAMPLE	251491-010	Soil	206637	01/08/14 15:12	1.0		
011	8_20140108_011	SAMPLE	251491-016	Soil	206637	01/08/14 16:08	1.0		
012	8_20140108_012	SAMPLE	251449-001	Soil	206637	01/08/14 16:58	1.0		
013	8_20140108_013	MSS	251449-007	Soil	206637	01/08/14 17:52	1.0		
014	8_20140108_014	IDUP	QC722417	Soil	206637	01/08/14 18:45	1.0		
015	8_20140108_015	SAMPLE	251449-020	Soil	206637	01/08/14 19:38	1.0		
016	8_20140108_016	SAMPLE	251444-012	Soil	206625	01/08/14 20:25	1.0		
017	8_20140108_017	SAMPLE	251444-001	Soil	206625	01/08/14 21:17	1.0		

Standards used: 1=S19585

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1583523697

Instrument : HPGE09 Begun : 12/29/13 16:17
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	9_20131229_001	RICAL	POINT SOURCE			12/29/13 16:17	1.0	1	
002	9_20131229_002	RICAL	TUNACAN			12/29/13 17:07	1.0	2	

Standards used: 1=S19587 2=S23325

Page 1 of 1

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1583525113

Instrument : HPGE09 Begun : 12/30/13 15:53
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	9_20131230_001	RCCV	QUALITY CONTROL CHEC			12/30/13 15:53	1.0	1	
002	9_20131230_002	RICV	EFF VERIFICATION - S			12/30/13 16:17	1.0		
003	9_20131230_003	X	BACKGROUND LONG PBC			12/30/13 21:39	1.0		

Standards used: 1=S19587

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1584011944

Instrument : HPGE09 Begun : 01/08/14 07:04
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	9_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 07:04	1.0	1
002	9_20140108_002	RIB	BACKGROUND CONTAMINA			01/08/14 07:31	1.0	
003	9_20140108_003	SAMPLE	251481-002	Soil	206675	01/08/14 07:43	1.0	
004	9_20140108_004	SAMPLE	251445-012	Soil	206637	01/08/14 09:32	1.0	
005	9_20140108_005	SAMPLE	251445-018	Soil	206637	01/08/14 10:53	1.0	
006	9_20140108_006	SAMPLE	251445-023	Soil	206637	01/08/14 13:26	1.0	
007	9_20140108_007	SAMPLE	251491-005	Soil	206637	01/08/14 14:23	1.0	
008	9_20140108_008	SAMPLE	251491-011	Soil	206637	01/08/14 15:14	1.0	
009	9_20140108_009	SAMPLE	251491-017	Soil	206637	01/08/14 16:09	1.0	
010	9_20140108_010	SAMPLE	251449-002	Soil	206637	01/08/14 17:00	1.0	
011	9_20140108_011	SAMPLE	251449-009	Soil	206637	01/08/14 17:53	1.0	
012	9_20140108_012	SAMPLE	251449-015	Soil	206637	01/08/14 18:47	1.0	
013	9_20140108_013	SAMPLE	251449-022	Soil	206637	01/08/14 19:39	1.0	
014	9_20140108_014	SAMPLE	251444-013	Soil	206625	01/08/14 20:27	1.0	
015	9_20140108_015	SAMPLE	251444-002	Soil	206625	01/08/14 21:18	1.0	

Standards used: 1=S19587

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1584014752

Instrument : HPGE09 Begun : 01/10/14 05:52
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	9_20140110_001	RCCV	QUALITY CONTROL CHEC			01/10/14 05:52	1.0	1	
002	9_20140110_002	RIB	BACKGROUND CONTAMINA			01/10/14 06:31	1.0		
003	9_20140110_003	SAMPLE	251447-016	Soil	206675	01/10/14 07:20	1.0		
004	9_20140110_004	SAMPLE	251448-001	Soil	206675	01/10/14 08:10	1.0		
005	9_20140110_005	MSS	251450-004	Soil	206675	01/10/14 09:14	1.0		
006	9_20140110_006	MSS	251452-003	Soil	206675	01/10/14 10:12	1.0		MASS+
007	9_20140110_007	IDUP	QC722578	Soil	206675	01/10/14 14:58	1.0		
008	9_20140110_008	SAMPLE	251785-009	Soil	206637	01/10/14 15:49	1.0		
009	9_20140110_009	MSS	251785-009	Soil	206637	01/10/14 16:57	1.0		
010	9_20140110_010	SAMPLE	251788-003	Soil	206637	01/10/14 18:34	1.0		
011	9_20140110_011	IDUP	QC723810	Soil	206637	01/10/14 19:22	1.0		
012	9_20140110_012	SAMPLE	252153-004	Soil	206949	01/10/14 21:17	1.0		

Standards used: 1=S19587

Flags used: +=high bias MASS=Analyzed mass outside of limits

Page 1 of 1

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1593525059

Instrument : HPGE10 Begun : 12/30/13 14:59
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	10_20131230_001	RICAL	POINT SOURCE			12/30/13 14:59	1.0	1	
002	10_20131230_002	RICAL	TUNACAN			12/30/13 15:49	1.0	2	
003	10_20131230_003	RICV	EFF VERIFICATION - S			12/30/13 22:06	1.0		

Standards used: 1=S19587 2=S23325

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1594011971

Instrument : HPGE10 Begun : 01/08/14 07:31
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	10_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 07:31	1.0	1
002	10_20140108_002	RIB	BACKGROUND CONTAMINA			01/08/14 07:56	1.0	
003	10_20140108_003	RIB	BACKGROUND CONTAMINA			01/08/14 08:20	1.0	
004	10_20140108_004	SAMPLE	251445-007	Soil	206637	01/08/14 08:39	1.0	
005	10_20140108_005	SAMPLE	251445-013	Soil	206637	01/08/14 09:32	1.0	
006	10_20140108_006	SAMPLE	251445-019	Soil	206637	01/08/14 10:54	1.0	
007	10_20140108_007	SAMPLE	251445-024	Soil	206637	01/08/14 13:28	1.0	
008	10_20140108_008	SAMPLE	251491-006	Soil	206637	01/08/14 14:24	1.0	
009	10_20140108_009	SAMPLE	251491-012	Soil	206637	01/08/14 15:15	1.0	
010	10_20140108_010	SAMPLE	251491-018	Soil	206637	01/08/14 16:10	1.0	
011	10_20140108_011	SAMPLE	251449-003	Soil	206637	01/08/14 17:01	1.0	
012	10_20140108_012	SAMPLE	251449-010	Soil	206637	01/08/14 17:54	1.0	
013	10_20140108_013	SAMPLE	251449-016	Soil	206637	01/08/14 18:48	1.0	
014	10_20140108_014	SAMPLE	251449-023	Soil	206637	01/08/14 19:40	1.0	
015	10_20140108_015	SAMPLE	251444-014	Soil	206625	01/08/14 20:28	1.0	
016	10_20140108_016	SAMPLE	251444-003	Soil	206625	01/08/14 21:18	1.0	

Standards used: 1=S19587

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1594014792

Instrument : HPGE10 Begun : 01/10/14 06:32
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	10_20140110_001	RCCV	QUALITY CONTROL CHEC			01/10/14 06:32	1.0	1	
002	10_20140110_002	RIB	BACKGROUND CONTAMINA			01/10/14 07:18	1.0		
003	10_20140110_003	SAMPLE	251447-019	Soil	206675	01/10/14 07:33	1.0		
004	10_20140110_004	SAMPLE	251448-003	Soil	206675	01/10/14 08:21	1.0		
005	10_20140110_005	SAMPLE	251450-006	Soil	206675	01/10/14 09:13	1.0		
006	10_20140110_006	SDUP	QC722580	Soil	206675	01/10/14 10:13	1.0		MASS+
007	10_20140110_007	SAMPLE	251785-002	Soil	206637	01/10/14 15:00	1.0		
008	10_20140110_008	SAMPLE	251785-010	Soil	206637	01/10/14 15:50	1.0		
009	10_20140110_009	MSS	251786-003	Soil	206637	01/10/14 16:58	1.0		
010	10_20140110_010	SAMPLE	251786-008	Soil	206637	01/10/14 17:45	1.0		
011	10_20140110_011	IDUP	QC723811	Soil	206637	01/10/14 18:37	1.0		
012	10_20140110_012	SAMPLE	251786-008	Soil	206637	01/10/14 19:29	1.0		
013	10_20140110_013	SAMPLE	252153-002	Soil	206949	01/10/14 21:18	1.0		

Standards used: 1=S19587

Flags used: +=high bias MASS=Analyzed mass outside of limits

Page 1 of 1

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1604003864

Instrument : HPGE11 Begun : 01/02/14 16:24
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	11_20140102_001	RICAL	POINT SOURCE			01/02/14 16:24	1.0	1	
002	11_20140102_002	RICAL	TUNACAN			01/02/14 17:15	1.0	2	

Standards used: 1=S19586 2=S23325

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1604005225

Instrument : HPGE11 Begun : 01/03/14 15:05
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
002	11_20140103_002	RCCV	QUALITY CONTROL CHEC			01/03/14 15:05	1.0	1	
003	11_20140103_003	RICV	EFFICIENCY VERIFICAT			01/03/14 15:29	1.0	2	
004	11_20140103_004	X	BSC			01/03/14 19:20	1.0		

Standards used: 1=S19586 2=S22147

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1604010485

Instrument : HPGE11 Begun : 01/07/14 06:45
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	11_20140107_001	RCCV	QUALITY CONTROL CHEC			01/07/14 06:45	1.0	1
002	11_20140107_002	RIB	BACKGROUND CONTAMINA			01/07/14 07:09	1.0	
003	11_20140107_003	SAMPLE	251904-010	Soil	206597	01/07/14 07:22	1.0	
004	11_20140107_004	SAMPLE	251904-016	Soil	206597	01/07/14 08:13	1.0	
005	11_20140107_005	SAMPLE	251904-029	Soil	206597	01/07/14 09:00	1.0	
006	11_20140107_006	SAMPLE	251492-004	Soil	206637	01/07/14 09:57	1.0	
007	11_20140107_007	SAMPLE	251492-010	Soil	206637	01/07/14 11:56	1.0	
008	11_20140107_008	MSS	251492-016	Soil	206637	01/07/14 13:25	1.0	
009	11_20140107_009	IDUP	QC722419	Soil	206637	01/07/14 14:13	1.0	
010	11_20140107_010	SAMPLE	251703-007	Soil	206675	01/07/14 15:04	1.0	
011	11_20140107_011	SAMPLE	251703-011	Soil	206675	01/07/14 15:52	1.0	
012	11_20140107_012	SAMPLE	251479-001	Soil	206675	01/07/14 16:40	1.0	
013	11_20140107_013	SAMPLE	251479-001	Soil	206675	01/07/14 17:36	1.0	
014	11_20140107_014	SAMPLE	251480-005	Soil	206675	01/07/14 19:19	1.0	
015	11_20140107_015	SAMPLE	251480-012	Soil	206675	01/07/14 20:18	1.0	
016	11_20140107_016	SAMPLE	251481-004	Soil	206675	01/07/14 21:16	1.0	

Standards used: 1=S19586

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1604011948

Instrument : HPGE11 Begun : 01/08/14 07:08
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	11_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 07:08	1.0	1	
002	11_20140108_002	RIB	BACKGROUND CONTAMINA			01/08/14 07:32	1.0		
003	11_20140108_003	SAMPLE	251445-003	Soil	206637	01/08/14 07:45	1.0		
004	11_20140108_004	SAMPLE	251445-008	Soil	206637	01/08/14 08:38	1.0		
005	11_20140108_005	SAMPLE	251445-015	Soil	206637	01/08/14 09:33	1.0		
006	11_20140108_006	SAMPLE	251445-021	Soil	206637	01/08/14 10:54	1.0		
007	11_20140108_007	SAMPLE	251491-001	Soil	206637	01/08/14 13:38	1.0		
008	11_20140108_008	SAMPLE	251491-001	Soil	206637	01/08/14 14:25	1.0		TIME
009	11_20140108_009	SAMPLE	251491-013	Soil	206637	01/08/14 15:18	1.0		
010	11_20140108_010	SAMPLE	251491-019	Soil	206637	01/08/14 16:11	1.0		
011	11_20140108_011	SAMPLE	251449-004	Soil	206637	01/08/14 17:02	1.0		
012	11_20140108_012	SAMPLE	251449-011	Soil	206637	01/08/14 17:56	1.0		
013	11_20140108_013	SAMPLE	251449-017	Soil	206637	01/08/14 18:49	1.0		
014	11_20140108_014	SAMPLE	251449-024	Soil	206637	01/08/14 19:41	1.0		
015	11_20140108_015	SAMPLE	251444-015	Soil	206625	01/08/14 20:29	1.0		
016	11_20140108_016	SAMPLE	251444-004	Soil	206625	01/08/14 21:19	1.0		

Standards used: 1=S19586

Flags used: TIME=Analysis duration problem

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1614005283

Instrument : HPGE12 Begun : 01/03/14 16:03
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	12_20140103_001	RICAL	POINT SOURCE			01/03/14 16:03	1.0	1	
002	12_20140103_002	RICAL	TUNACAN			01/03/14 16:45	1.0	2	
003	12_20140103_003	RCCV	QUALITY CONTROL CHEC			01/03/14 20:07	1.0	1	
004	12_20140103_004	RICV	EFFICIENCY VERIFICAT			01/03/14 21:40	1.0	3	

Standards used: 1=S19586 2=S23325 3=S22147

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1614011949

Instrument : HPGE12 Begun : 01/08/14 07:09
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	12_20140108_001	RCCV	QUALITY CONTROL CHEC			01/08/14 07:09	1.0	1	
002	12_20140108_002	RCCV	QUALITY CONTROL CHEC			01/08/14 07:33	1.0	1	
003	12_20140108_003	RIB	BACKGROUND CONTAMINA			01/08/14 07:57	1.0		
004	12_20140108_004	SAMPLE	251481-001	Soil	206675	01/08/14 08:23	1.0		
005	12_20140108_005	SAMPLE	251445-020	Soil	206637	01/08/14 10:54	1.0		
006	12_20140108_006	SAMPLE	251491-002	Soil	206637	01/08/14 13:45	1.0		
007	12_20140108_007	SAMPLE	251491-007	Soil	206637	01/08/14 14:34	1.0		
008	12_20140108_008	SAMPLE	251491-014	Soil	206637	01/08/14 15:21	1.0		
009	12_20140108_009	SAMPLE	251491-020	Soil	206637	01/08/14 16:12	1.0		
010	12_20140108_010	SAMPLE	251449-005	Soil	206637	01/08/14 17:03	1.0		
011	12_20140108_011	SAMPLE	251449-012	Soil	206637	01/08/14 17:56	1.0		
012	12_20140108_012	SAMPLE	251449-018	Soil	206637	01/08/14 18:50	1.0		
013	12_20140108_013	SAMPLE	251444-010	Soil	206625	01/08/14 19:42	1.0		
014	12_20140108_014	SAMPLE	251444-016	Soil	206625	01/08/14 20:30	1.0		
015	12_20140108_015	MSS	251444-005	Soil	206625	01/08/14 21:19	1.0		

Standards used: 1=S19586

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1614014793

Instrument : HPGE12 Begun : 01/10/14 06:33
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	12_20140110_001	RCCV	QUALITY CONTROL CHEC			01/10/14 06:33	1.0	1	
002	12_20140110_002	RIB	BACKGROUND CONTAMINA			01/10/14 07:22	1.0		
003	12_20140110_003	SAMPLE	251447-020	Soil	206675	01/10/14 07:35	1.0		
004	12_20140110_004	SAMPLE	251450-001	Soil	206675	01/10/14 08:23	1.0		
005	12_20140110_005	SAMPLE	251451-001	Soil	206675	01/10/14 09:13	1.0		
006	12_20140110_006	SAMPLE	251452-004	Soil	206675	01/10/14 10:17	1.0		
007	12_20140110_007	SAMPLE	251785-004	Soil	206637	01/10/14 15:02	1.0		
008	12_20140110_008	SAMPLE	251786-002	Soil	206637	01/10/14 15:53	1.0		
009	12_20140110_009	SAMPLE	251786-005	Soil	206637	01/10/14 17:00	1.0		
010	12_20140110_010	SAMPLE	251786-010	Soil	206637	01/10/14 17:48	1.0		
011	12_20140110_011	MSS	251788-005	Soil	206637	01/10/14 18:40	1.0		
012	12_20140110_012	SAMPLE	251788-009	Soil	206637	01/10/14 19:30	1.0		
013	12_20140110_013	IDUP	QC723812	Soil	206637	01/10/14 20:29	1.0		
014	12_20140110_014	SAMPLE	252153-007	Soil	206949	01/10/14 21:20	1.0		MASS+

Standards used: 1=S19586

Flags used: +=high bias MASS=Analyzed mass outside of limits

Page 1 of 1

Gamma Sample Preparation Summary
as of 05-FEB-2014 13:53

Batch Number : 206637
Matrix : Soil
Date Started : 29-DEC-2013 13:50

Dose Rate : <5 uR/hr
Started by : CA

Tray Num	Sample	QC Type	Weight (g)	Oven In Date	Oven Out Date	Sealed Date	Analysis	Comments
1	251445-001		373.21	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:44	GS 186	
2	251445-002		375.64	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:49	GS 186	
3	251445-003		388.99	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:53	GS 186	
4	251445-004		385.96	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:57	GS 186	
5	251445-005		378.8	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:00	GS 186	
6	251445-006		364.34	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:03	GS 186	
7	251445-007		374.74	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:07	GS 186	
8	251445-008		379.38	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:11	GS 186	
9	251445-009		377.85	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:23	GS 186	
10	251445-010		377.45	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:27	GS 186	
11	251445-011		366.59	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:33	GS 186	
12	251445-012		368.23	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:37	GS 186	
13	251445-013		376.85	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:41	GS 186	
14	251445-014		386.34	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:45	GS 186	
15	251445-015		377.21	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:49	GS 186	
16	251445-016		375.04	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:55	GS 186	
17	251445-017		379.54	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:01	GS 186	
18	251445-018		369.77	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:08	GS 186	
19	251445-019		373.8	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:14	GS 186	
20	251445-020		356.42	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:29	GS 186	
21	251445-021		372.95	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:30	GS 186	
22	251445-022		316.5	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:34	GS 186	
23	251445-023		330.83	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:39	GS 186	
24	251445-024		314	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:42	GS 186	
25	251449-001		346.12	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:45	GS 186	
26	251449-002		334.81	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:47	GS 186	
27	251449-003		363	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:49	GS 186	
28	251449-004		333.35	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:53	GS 186	
29	251449-005		323.67	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:56	GS 186	
30	251449-006		340.92	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:59	GS 186	
31	251449-007		339.57	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:01	GS 186	
32	251449-008		330.01	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:05	GS 186	
33	251449-009		345.27	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:09	GS 186	
34	251449-010		327.83	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:12	GS 186	
35	251449-011		356.36	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:14	GS 186	
36	251449-012		343.45	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:17	GS 186	
37	251449-013		334.92	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:20	GS 186	
38	251449-014		306.02	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:22	GS 186	
39	251449-015		329.98	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:25	GS 186	
40	251449-016		306.6	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:28	GS 186	
41	251449-017		352.28	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:31	GS 186	
42	251449-018		343.7	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:34	GS 186	
43	251449-019		335.76	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:36	GS 186	
44	251449-020		335.16	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:38	GS 186	
45	251449-021		335.96	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:41	GS 186	
46	251449-022		339.12	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:47	GS 186	
47	251449-023		301.52	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:50	GS 186	
48	251449-024		354.56	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:55	GS 186	
49	251491-001		367.12	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:02	GS 186	

Tray Num	Sample	QC Type	Weight (g)	Oven In Date	Oven Out Date	Sealed Date	Analysis	Comments
50	251491-002		323.6	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:08	GS 186	
51	251491-003		349.91	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:13	GS 186	
52	251491-004		339.69	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:18	GS 186	
53	251491-005		348.19	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:24	GS 186	
54	251491-006		352.01	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:29	GS 186	
55	251491-007		311.16	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:32	GS 186	
56	251491-008		332.6	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:37	GS 186	
57	251491-009		328.86	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:41	GS 186	
58	251491-010		322.72	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:24	GS 186	
59	251491-011		342.36	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:30	GS 186	
60	251491-012		349.15	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:35	GS 186	
61	251491-013		359.26	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:41	GS 186	
62	251491-014		333.75	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:44	GS 186	
63	251491-015		304.25	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:47	GS 186	
64	251491-016		320.68	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:50	GS 186	
65	251491-017		322.3	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:54	GS 186	
66	251491-018		360.52	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 19:59	GS 186	
67	251491-019		349.25	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 20:04	GS 186	
68	251491-020		344.69	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 20:09	GS 186	
69	251491-021		359.01	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 20:13	GS 186	
70	251785-001		318.48	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:05	GS 186	
70	252291-001		318.48	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:05	RA226	alias:251785-001
71	251785-002		346.15	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:13	GS 186	
71	252291-002		346.15	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:13	RA226	alias:251785-002
72	251785-003		341.7	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:16	GS 186	
72	252291-003		341.7	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:16	RA226	alias:251785-003
73	251785-004		346.65	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:20	GS 186	
73	252291-004		346.65	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:20	RA226	alias:251785-004
74	251785-005		316.13	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:24	GS 186	
74	252291-005		316.13	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:24	RA226	alias:251785-005
75	251785-006		324.18	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:29	GS 186	
75	252291-006		324.18	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:29	RA226	alias:251785-006
76	251785-007		345.07	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:34	GS 186	
76	252291-007		345.07	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:34	RA226	alias:251785-007
77	251785-008		332.24	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:40	GS 186	
77	252291-008		332.24	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:40	RA226	alias:251785-008
78	251785-009		346.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:45	GS 186	
78	252291-009		346.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:45	RA226	alias:251785-009
79	251785-010		305.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:50	GS 186	
79	252291-010		305.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:50	RA226	alias:251785-010
80	251786-001		301.37	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:11	GS 186	
80	252292-001		301.37	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:11	RA226	alias:251786-001
81	251786-002		318.45	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:16	GS 186	
81	252292-002		318.45	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:16	RA226	alias:251786-002
82	251786-003		317.98	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:22	GS 186	
82	252292-003		317.98	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:22	RA226	alias:251786-003
83	251786-004		309.4	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:28	GS 186	
83	252292-004		309.4	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:28	RA226	alias:251786-004
84	251786-005		320.11	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:48	GS 186	
84	252292-005		320.11	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:48	RA226	alias:251786-005
85	251786-006		347.33	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:54	GS 186	
85	252292-006		347.33	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:54	RA226	alias:251786-006
86	251786-007		319.31	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:59	GS 186	
86	252292-007		319.31	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:59	RA226	alias:251786-007
87	251786-008		311.25	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:06	GS 186	
87	252292-008		311.25	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:06	RA226	alias:251786-008

Tray Num	Sample	QC Type	Weight (g)	Oven In Date	Oven Out Date	Sealed Date	Analysis	Comments
88	251786-009		313.07	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:10	GS 186	
88	252292-009		313.07	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:10	RA226	alias:251786-009
89	251786-010		305.6	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:16	GS 186	
89	252292-010		305.6	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:16	RA226	alias:251786-010
90	251788-001		378.25	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:48	GS 186	
90	252293-001		378.25	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:48	RA226	alias:251788-001
91	251788-002		342	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:52	GS 186	
91	252293-002		342	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:52	RA226	alias:251788-002
92	251788-003		351.96	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:55	GS 186	
92	252293-003		351.96	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:55	RA226	alias:251788-003
93	251788-004		325.01	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:59	GS 186	
93	252293-004		325.01	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 08:59	RA226	alias:251788-004
94	251788-005		340.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:04	GS 186	
94	252293-005		340.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:04	RA226	alias:251788-005
95	251788-006		350.12	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:08	GS 186	
95	252293-006		350.12	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:08	RA226	alias:251788-006
96	251788-007		329.84	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:12	GS 186	
96	252293-007		329.84	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:12	RA226	alias:251788-007
97	251788-008		354.28	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:16	GS 186	
97	252293-008		354.28	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:16	RA226	alias:251788-008
98	251788-009		364.67	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:20	GS 186	
98	252293-009		364.67	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:20	RA226	alias:251788-009
99	251788-010		347.99	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:25	GS 186	
99	252293-010		347.99	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:25	RA226	alias:251788-010
100	251492-001		306.75	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 10:59	GS 186	
101	251492-002		301.48	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:03	GS 186	
102	251492-003		317.88	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:07	GS 186	
103	251492-004		328.9	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:10	GS 186	
104	251492-005		327.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:13	GS 186	
105	251492-006		329.76	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:17	GS 186	
106	251492-007		328.75	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:20	GS 186	
107	251492-008		314.07	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:26	GS 186	
108	251492-009		307.32	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:31	GS 186	
109	251492-010		309.29	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:34	GS 186	
110	251492-011		307.9	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:38	GS 186	
111	251492-012		313.99	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:41	GS 186	
112	251492-013		326.36	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:44	GS 186	
113	251492-014		317.58	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 11:57	GS 186	
114	251492-015		306.53	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:00	GS 186	
115	251492-016		306.37	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:04	GS 186	
116	251492-017		301.68	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:08	GS 186	
117	251492-018		310.17	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:12	GS 186	
118	251492-019		306.55	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:15	GS 186	
119	251492-020		308.72	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:25	GS 186	
QC1	QC722413	BLANK	323.66	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:40	GS 186	
QC2	QC722414	LCS	330.03	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:35	GS 186	
6	QC722415	IDUP of 251445-006	364.34	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:03	GS 186	
16	QC722416	SDUP of 251445-016	368.76	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 15:55	GS 186	
31	QC722417	IDUP of 251449-007	339.57	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:01	GS 186	
57	QC722418	IDUP of 251491-009	328.86	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 18:41	GS 186	
115	QC722419	IDUP of 251492-016	306.37	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 12:05	GS 186	
78	QC723810	IDUP of 251785-009	346.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:45	GS 186	
82	QC723811	IDUP of 251786-003	317.98	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:22	GS 186	
94	QC723812	IDUP of 251788-005	340.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:04	GS 186	
78	QC724252	IDUP of 252291-009	346.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 06:45	RA226	alias:QC723810
82	QC724253	IDUP of 252292-003	317.98	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 07:22	RA226	alias:QC723811

Tray Num	Sample	QC Type	Weight (g)	Oven In Date	Oven Out Date	Sealed Date	Analysis	Comments
94	QC724254	IDUP of 252293-005	340.66	29-DEC-2013 13:57	30-DEC-2013 10:15	31-DEC-2013 09:04	RA226	alias:QC723812

Sample Raw Data

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574011955012
File : 8_20140108_012
Cal : 08-JAN-2014 07:40:12,08-APR-2013 11:06:59
IDF : 1.0
PDF : 1.0

Lab ID : 251449-001
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 08-APR-2013
Sample Amount : 346.12 g

Client ID : 04-PD-D0034-01
Acct : ITSI (JG)
Time : 08-JAN-2014 16:58
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.13 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.113	0.177		.22567	.2259	-0.040	u
Bismuth-212	0.134	0.157		.20761	.20781	-0.0025	u
Bismuth-214	0.344	0.0339		.077115	.080474	-0.052	u
Cesium-137	0.00833	0.0176	0.07	.022681	.022688	-0.0069	u
Cobalt-60	0.00202	0.0285		.022345	.022345	0	u
Europium-152	0	0.0457		.055481	.055482	-0.00031	u
Europium-154	0.0186	0.0805		.10005	.10006	-0.013	u
Lead-212	0.375	0.0341		.077863	.082796	-0.016	u
Lead-214	0.275	0.0414		.088954	.090916	-0.0040	u
Potassium-40	17.6	0.249		1.336	1.8197	-0.36	u
Protactinium-234	0.0377	0.121		.15274	.15276	0.015	u
Radium-226	0.00567	0.330	1.3	.40068	.40068	-0.082	u
Thallium-208	0.107	0.0133		.033145	.033905	0.0020	u
Thorium-232 (By Actinium-228)	0.278	0.0606		.11048	.11207	0.019	u
Thorium-234	0.316	0.405		.51276	.51354	-0.034	u
Uranium-235	0.0186	0.0243		.03104	.031071	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-01
Sample Description: 251449-001, 206637

Detector: HPGE08 50-TP42229A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:44
Acquisition Time: 1/8/2014 16:58:55
Analysis Time: 1/8/2014 17:44
Analysis Quantity: 3.461E+02 g

Spectrum ID: 8_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.13 %

Efficiency: HPGE08 S22147 8_20130407002_EffCal
Efficiency Cal Date: 4/8/2013 11:06
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.782E-01	1.105E-01	1.121E-01	6.058E-02
Am-241	#AB	1.131E-01	2.257E-01	2.259E-01	1.774E-01
Bi-212	#AB	1.335E-01	2.076E-01	2.078E-01	1.568E-01
Bi-214	#	3.442E-01	7.711E-02	8.047E-02	3.390E-02
Co-60	#AB	2.024E-03	2.234E-02	2.234E-02	2.854E-02
Cs-137	#AB	8.331E-03	2.268E-02	2.269E-02	1.764E-02
Eu-152	#AB	0.000E+00	5.548E-02	5.548E-02	4.567E-02
Eu-154	#AB	1.856E-02	1.000E-01	1.001E-01	8.045E-02
K-40		1.765E+01	1.336E+00	1.820E+00	2.489E-01
Pa-234	#AB	3.768E-02	1.527E-01	1.528E-01	1.210E-01
Pb-212		3.746E-01	7.786E-02	8.280E-02	3.410E-02
Pb-214		2.754E-01	8.895E-02	9.092E-02	4.136E-02
Ra-226	#AB	5.673E-03	4.007E-01	4.007E-01	3.296E-01
Th-234	#AB	3.160E-01	5.128E-01	5.135E-01	4.048E-01
Tl-208		1.073E-01	3.314E-02	3.391E-02	1.329E-02
U-235	#AB	1.861E-02	3.104E-02	3.107E-02	2.433E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.968E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:44:06
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_012.An1

Sample description
     251449-001, 206637


Spectrum Filename: C:\User\SPC\Det8\8_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 16:58:55
       Live time:               2700
       Real time:               2703
       Dead time:                  0.13 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_04-07-2013.Clb
     HPGE08 S22147 8_20130407002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:40:12
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.420E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/8/2013 11:06:59
            Type:                  Polynomial
            Uncertainty:           1.344 %
            Coefficients:         -0.359632  -4.215465   0.446712
                                  -0.054338   0.002307  -0.000047

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4612E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4612E+02) =
                                   7.8086E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:44:06
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:44:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2013-12-28_0941.PBC 12/28/2013 09:41:06
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0591

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
50.63	16.	48.81	0.15	2.668E-03				
59.44	11.	99.76	0.80	7.896E-03	59.54	36.300	PBC<MDA	Am241
74.94	11.	155.85	0.81	1.910E-02	74.81	9.600	PBC<MDA	Pb212
77.12	61.	28.12	0.85	2.076E-02	77.11	17.500	4.488E-01	Pb212
86.90	1.	652.41	0.83	2.741E-02	87.20	6.300	PBC<MDA	Pb212
87.57	63.	32.62	0.16	2.763E-02				
93.01	19.	81.14	0.83	3.050E-02	92.60	5.600	PBC<MDA	Th234
99.04	11.	107.90	0.84	3.343E-02	98.44	25.100	PBC<MDA	Pa234
115.18	9.	93.05	0.18	3.958E-02				
122.54	5.	252.87	0.86	4.121E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	8.829E-03	Eu154
					121.87	28.590	1.257E-02	Eu152
122.86	5.	240.42	0.87	4.147E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	9.297E-03	Eu154
143.88	12.	122.12	0.89	4.408E-02	143.76	10.500	PBC<MDA	U235
163.19	20.	65.65	0.91	4.451E-02	163.35	4.700	PBC<MDA	U235
185.96	15.	83.42	0.93	4.366E-02	185.70	54.000	PBC<MDA	U235
238.60	233.	9.86	0.91	3.963E-02	238.63	43.100	3.746E-01	Pb212
241.77	59.	23.44	0.25	3.936E-02	241.92	7.470	5.811E-01	Pb214
270.16	15.	76.14	1.02	3.705E-02	270.25	3.460	PBC<MDA	Ac228
295.00	92.	15.64	0.73	3.516E-02	295.22	19.200	3.466E-01	Pb214
300.17	23.	44.69	1.05	3.479E-02	300.09	3.270	5.953E-01	Pb212
338.27	26.	42.20	1.08	3.221E-02	338.40	12.010	1.965E-01	Ac228
351.82	136.	13.81	0.66	3.139E-02	351.79	37.100	3.055E-01	Pb214
410.66	4.	243.76	1.15	2.825E-02	411.09	2.264	PBC<MDA	Eu152
					411.09	2.264	1.691E-01	Eu152
463.60	8.	102.65	1.20	2.603E-02	463.00	4.400	PBC<MDA	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:44:06
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
498.10	26.	24.28	0.15	2.475E-02				
583.14	71.	14.63	1.00	2.220E-02	583.14	86.000	1.073E-01	Tl208
609.39	135.	9.80	0.68	2.154E-02	609.69	46.090	3.441E-01	Bi214
660.92	5.	136.13	1.37	2.035E-02	661.66	84.620	PBC<MDA	Cs137
727.12	10.	77.74	1.42	1.907E-02	727.17	11.800	PBC<MDA	Bi212
784.62	4.	207.05	1.46	1.809E-02	785.42	2.000	PBC<MDA	Bi212
883.27	3.	202.68	1.53	1.668E-02	883.24	15.000	PBC<MDA	Pa234
911.38	46.	19.86	1.55	1.632E-02	911.07	29.000	2.782E-01	Ac228
964.53	8.	123.61	1.59	1.568E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.854E-01	Ac228
					964.05	14.580	9.764E-02	Eu152
964.70	9.	99.09	1.59	1.569E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	3.446E-01	Ac228
969.02	21.	45.33	1.59	1.563E-02	968.90	17.460	2.220E-01	Ac228
1120.43	14.	52.97	1.68	1.410E-02	1120.28	15.040	PBC<MDA	Bi214
1276.06	3.	269.47	1.77	1.283E-02	1274.80	35.500	PBC<MDA	Eu154
1333.00	1.	551.89	1.79	1.241E-02	1332.50	99.980	PBC<MDA	Co60
1376.92	0.	296.21	1.82	1.210E-02	1377.65	4.020	PBC<MDA	Bi214
1460.95	770.	3.71	1.46	1.156E-02	1460.80	10.700	1.765E+01	K40
1764.94	7.	56.09	1.95	9.913E-03	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
404.97	50.63	18.	16.	5.922E+03	97.62	0.149	-	s
700.43	87.57	95.	61.	2.202E+03	52.08	0.160	-	sM
921.26	115.18	26.	9.	2.173E+02	186.10	0.182	PB-212	sc
3984.05	498.10	3.	26.	1.042E+03	48.56	0.152	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:44:06
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_012.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	475.43	59.44	57.	11.	0.004	199.51	0.798s
Pb-212	599.40	74.94	134.	11.	0.004	311.70	0.814s
Pb-212	616.84	77.12	75.	56.	0.021	56.23	0.847s
Th-234	743.93	93.01	105.	19.	0.007	162.28	0.834s
Pa-234	792.13	99.04	62.	11.	0.004	215.79	0.840s
Eu-152	980.09	122.54	81.	5.	0.002	505.74	0.865s
Eu-154	982.71	122.86	81.	5.	0.002	480.83	0.866s
U-235	1150.79	143.88	96.	12.	0.004	244.24	0.888s
U-235	1305.25	163.19	79.	20.	0.008	131.29	0.908s
U-235	1487.36	185.96	72.	15.	0.006	166.84	0.931s
Pb-212	1908.42	238.60	75.	221.	0.082	19.73	0.907
Pb-214	1933.76	241.77	65.	59.	0.022	46.87	0.247s
Ac-228	2160.88	270.16	54.	15.	0.005	152.28	1.017s
Pb-214	2362.23	295.34	61.	44.	0.016	45.55	1.041s
Pb-212	2400.84	300.17	43.	23.	0.009	89.38	1.046s
Ac-228	2705.65	338.27	48.	26.	0.010	84.40	1.083s
Pb-214	2814.42	351.87	51.	111.	0.041	28.84	0.642s
Eu-152	3284.69	410.66	40.	4.	0.001	487.52	1.151s
Ac-228	3708.14	463.60	30.	8.	0.003	205.31	1.198s
Tl-208	4664.31	583.14	14.	71.	0.026	29.25	1.001s
Bi-214	4874.30	609.39	25.	118.	0.044	19.60	0.677s
Cs-137	5286.50	660.92	20.	5.	0.002	272.26	1.366s
Eu-154	5790.62	723.94	38.	-3.	-0.001	583.23	1.415s
Bi-212	5816.04	727.12	27.	10.	0.004	155.49	1.418s
Bi-212	6276.00	784.62	26.	4.	0.001	414.09	1.462s
Pa-234	7065.09	883.27	20.	3.	0.001	405.36	1.532s
Ac-228	7290.02	911.38	18.	46.	0.017	39.72	1.551s
Pa-234	7571.09	946.52	32.	-3.	-0.001	522.57	1.574s
Eu-152	7716.49	964.70	38.	9.	0.003	198.19	1.586s
Ac-228	7715.17	964.53	42.	8.	0.003	247.22	1.586s
Ac-228	7751.11	969.02	35.	21.	0.008	90.65	1.589s
Bi-214	8962.33	1120.43	36.	14.	0.005	105.93	1.682s
Eu-154	10207.37	1276.06	30.	3.	0.001	538.95	1.766s
Co-60	10662.87	1333.00	21.	1.	0.000	1103.78	1.794s
Bi-214	11250.11	1406.40	13.	-2.	-0.001	557.66	1.829s
K-40	11686.53	1460.95	21.	755.	0.280	7.43	1.463s
Bi-214	14118.62	1764.94	14.	7.	0.003	112.19	1.955s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:44:06
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_012.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Code	MDA Value pCi/g		COMMENTS
Ac-228	N	2.7815E-01					3.65E+11	
			911.07	2.782E-01	?(	6.058E-02	1.99E+01	2.90E+01 G
			968.90	2.220E-01	?	1.452E-01	4.53E+01	1.75E+01 GA
			338.40	1.965E-01	-	1.212E-01	4.22E+01	1.20E+01 GA
			964.77	2.854E-01	?	5.561E-01	1.24E+02	4.99E+00 GA
			463.00	2.015E-01	?	3.199E-01	1.03E+02	4.40E+00 GA
			794.95	0.000E+00	-	6.935E-01	1.00E+03	4.25E+00 GA
			270.25	3.289E-01	?	3.874E-01	7.61E+01	3.46E+00 GA
Am-241	I	1.1311E-01					3.65E+11	
			59.54	1.131E-01	?(	1.774E-01	9.98E+01	3.63E+01 G
Bi-212	N	1.3353E-01					3.65E+11	
			727.17	1.335E-01	?(	1.568E-01	7.77E+01	1.18E+01 G
			1620.56	0.000E+00	&	2.302E-01	1.00E+03	2.75E+00 GA
			785.42	2.879E-01	?	9.497E-01	2.07E+02	2.00E+00 GA
Bi-214	N	3.4415E-01					3.65E+11	
			609.69	3.441E-01	@(P	3.390E-02	9.80E+00	4.61E+01 G
			1764.51	1.246E-01	- P	1.609E-01	5.61E+01	1.59E+01 GA
			1120.28	1.854E-01	- P	1.898E-01	5.30E+01	1.50E+01 GA
			768.36	-1.345E-01	& P	4.829E-01	1.00E+03	4.89E+00 GA
			1377.65	1.085E-03	% P	5.798E-01	2.96E+02	4.02E+00 GA
			934.05	1.316E-02	%	6.981E-01	3.23E+03	3.17E+00 GA
			1407.98	-1.842E-01	-	8.166E-01	2.79E+02	2.48E+00 GA
			1509.19	0.000E+00	-	2.730E-01	1.00E+03	2.19E+00 GA
			665.45	1.064E-02	%	1.211E+00	6.92E+03	1.56E+00 GA
Co-60	T	2.0244E-03					3.65E+11	
			1173.24	1.280E-03	%(	2.854E-02	1.36E+03	9.99E+01 G
			1332.50	2.768E-03	?(	2.482E-02	5.52E+02	1.00E+02 G
Cs-137	I	8.3307E-03					3.65E+11	
			661.66	8.331E-03	?(	1.764E-02	1.36E+02	8.46E+01 G
Eu-154	I	1.8564E-02					3.65E+11	
			1274.80	1.856E-02	?(	8.045E-02	2.69E+02	3.55E+01 G
			123.10	9.297E-03	?	3.623E-02	2.40E+02	4.05E+01 GA
			723.30	-2.351E-02	+	1.108E-01	2.92E+02	1.97E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:44:06
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

K-40     N   1.7647E+01                                      3.65E+11
                          1460.80 1.765E+01  (P 2.489E-01 3.71E+00 1.07E+01 G

Pa-234   N   3.7680E-02                                      3.65E+11
                           883.24 3.768E-02 ?(  1.210E-01 2.03E+02 1.50E+01 G
                            98.44 3.721E-02 &   6.345E-02 1.08E+02 2.51E+01 GA
                           946.00-4.750E-02 +   1.996E-01 2.61E+02 1.20E+01 GA

Pb-212   N   3.7463E-01                                      3.65E+11
                           238.63 3.746E-01  (P 3.410E-02 9.86E+00 4.31E+01 G
                            77.11 4.488E-01   P 1.604E-01 2.81E+01 1.75E+01 GA
                            74.81 1.691E-01 -   4.257E-01 1.56E+02 9.60E+00 GA
                            87.20 2.233E-02 % P 4.209E-01 6.52E+02 6.30E+00 GA
                           300.09 5.953E-01 +   3.887E-01 4.47E+01 3.27E+00 GA

Pb-214   N   2.7543E-01                                      3.65E+11
                           351.79 2.754E-01  (P 4.136E-02 1.44E+01 3.71E+01 G
                           295.22 1.893E-01 - P 7.829E-02 2.28E+01 1.92E+01 GA
                           241.92 5.811E-01 + P 1.847E-01 2.34E+01 7.47E+00 GA

Ra-226   N   5.6734E-03                                      3.65E+11
                           186.20 5.673E-03 &(  3.296E-01 3.53E+03 3.60E+00 G

Th-234   N   3.1596E-01                                      3.65E+11
                            92.60 3.160E-01 ?(  4.048E-01 8.11E+01 5.60E+00 G

Tl-208   N   1.0729E-01                                      3.65E+11
                           583.14 1.073E-01  (P 1.329E-02 1.46E+01 8.60E+01 G
                           860.47 0.000E+00 -   1.988E-01 1.00E+03 1.20E+01 GA

U-235    N   1.8605E-02                                      3.65E+11
                           185.70 1.860E-02 ?(  2.433E-02 8.34E+01 5.40E+01 G
                           143.76 7.285E-02 ?   1.423E-01 1.22E+02 1.05E+01 GA
                           163.35 2.818E-01 &   2.869E-01 6.56E+01 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:44:06
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_012.An1

= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.44	57.	11.	0.004	199.51	1.131E-01
Th-234	93.01	105.	19.	0.007	162.28	3.160E-01
Pa-234	99.04	62.	11.	0.004	215.79	3.721E-02
Eu-152	122.54	81.	5.	0.002	505.74	1.257E-02
Eu-154	122.86	81.	5.	0.002	480.83	9.297E-03
U-235	143.88	96.	12.	0.004	244.24	7.285E-02
U-235	163.19	79.	20.	0.008	131.29	2.818E-01
U-235	185.96	72.	15.	0.006	166.84	1.860E-02
Eu-152	410.66	40.	4.	0.001	487.52	1.691E-01
Cs-137	660.92	20.	5.	0.002	272.26	8.331E-03
Eu-154	723.94	38.	-3.	-0.001	583.23	-2.351E-02
Bi-212	727.12	27.	10.	0.004	155.49	1.335E-01
Bi-212	784.62	26.	4.	0.001	414.09	2.879E-01
Pa-234	883.27	20.	3.	0.001	405.36	3.768E-02
Pa-234	946.52	32.	-3.	-0.001	522.57	-4.750E-02
Eu-152	964.70	38.	9.	0.003	198.19	1.179E-01
Eu-154	1276.06	30.	3.	0.001	538.95	1.856E-02
Co-60	1333.00	21.	1.	0.000	1103.78	2.768E-03

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:44:06
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_012.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.7815E-01	2.7815E-01	1.1048E-01	1.1207E-01	6.058E-02
Am-241 #A	1.1311E-01	1.1311E-01	2.2567E-01	2.2590E-01	1.774E-01
Bi-212 #A	1.3353E-01	1.3353E-01	2.0761E-01	2.0781E-01	1.568E-01
Bi-214 #	3.4415E-01	3.4415E-01	7.7115E-02	8.0474E-02	3.390E-02
Co-60 #A	2.0244E-03	2.0244E-03	2.2345E-02	2.2345E-02	2.854E-02
Cs-137 #A	8.3307E-03	8.3307E-03	2.2681E-02	2.2688E-02	1.764E-02
Eu-152 #A	0.0000E+00	0.0000E+00	5.5481E-02	5.5482E-02	4.567E-02
Eu-154 #A	1.8564E-02	1.8564E-02	1.0005E-01	1.0006E-01	8.045E-02
K-40	1.7647E+01	1.7647E+01	1.3360E+00	1.8197E+00	2.489E-01
Pa-234 #A	3.7680E-02	3.7680E-02	1.5274E-01	1.5276E-01	1.210E-01
Pb-212	3.7463E-01	3.7463E-01	7.7863E-02	8.2796E-02	3.410E-02
Pb-214	2.7543E-01	2.7543E-01	8.8954E-02	9.0916E-02	4.136E-02
Ra-226 #A	5.6734E-03	5.6734E-03	4.0068E-01	4.0068E-01	3.296E-01
Th-234 #A	3.1596E-01	3.1596E-01	5.1276E-01	5.1354E-01	4.048E-01
Tl-208	1.0729E-01	1.0729E-01	3.3145E-02	3.3905E-02	1.329E-02
U-235 #A	1.8605E-02	1.8605E-02	3.1040E-02	3.1071E-02	2.433E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2042.1 keV) 1.903E+01 pCi/g
Total Decayed Activity (25.0 to 2042.1 keV) 1.9026743E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE09	Lab ID	: 251449-002	Client ID	: 04-PD-D0034-02
Seqnum	: 1584011944010	Matrix	: Soil	Acct	: ITSI (JG)
File	: 9_20140108_010	Batch	: 206637	Time	: 08-JAN-2014 17:00
Cal	: 08-JAN-2014 07:26:14,30-DEC-2013 12:17:54	Caldate	: 08-JAN-2014, 30-DEC-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 334.81 g	Live Time	: 2700 sec
				Dead Time	: 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0308	0.192		.23601	.23603	-0.040	u
Bismuth-212	0.0137	0.187		.22832	.22832	-0.0025	u
Bismuth-214	0.366	0.0338		.087013	.090741	-0.052	u
Cesium-137	-0.00646	0.0209	0.07	.026249	.026253	-0.0069	u
Cobalt-60	0.00392	0.0307		.027309	.027311	0	u
Europium-152	0.0179	0.0514		.064356	.064368	-0.00031	u
Europium-154	-0.0245	0.0945		.11754	.11755	-0.013	u
Lead-212	0.221	0.0340		.055886	.058348	-0.016	u
Lead-214	0.337	0.0393		.089239	.092355	-0.0040	u
Potassium-40	20.9	0.222		1.444	2.056	-0.36	u
Protactinium-234	0.0200	0.137		.16965	.16965	0.015	u
Radium-226	0.221	0.359	1.3	.45451	.45482	-0.082	u
Thallium-208	0.147	0.0109		.035522	.036996	0.0020	u
Thorium-232 (By Actinium-228)	0.177	0.0711		.1091	.10979	0.019	u
Thorium-234	0	0.581		.41623	.41624	-0.034	u
Uranium-235	0.0165	0.0234		.029844	.02987	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-02
Sample Description: 251449-002, 206637

Detector: HPGE09 50-TP42232A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:46
Acquisition Time: 1/8/2014 17:00:22
Analysis Time: 1/8/2014 17:45
Analysis Quantity: 3.348E+02 g

Spectrum ID: 9_20140108_010
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE09 S23325 9_20131229002_EffCal
Efficiency Cal Date: 12/30/2013 12:17
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		1.766E-01	1.091E-01	1.098E-01	7.113E-02
Am-241	#AB	-3.079E-02	2.360E-01	2.360E-01	1.919E-01
Bi-212	#AB	1.370E-02	2.283E-01	2.283E-01	1.868E-01
Bi-214		3.657E-01	8.701E-02	9.074E-02	3.375E-02
Co-60	#AB	3.924E-03	2.731E-02	2.731E-02	3.070E-02
Cs-137	#AB	-6.458E-03	2.625E-02	2.625E-02	2.091E-02
Eu-152	#AB	1.794E-02	6.436E-02	6.437E-02	5.140E-02
Eu-154	#AB	-2.454E-02	1.175E-01	1.176E-01	9.453E-02
K-40		2.090E+01	1.444E+00	2.056E+00	2.215E-01
Pa-234	#AB	2.004E-02	1.696E-01	1.697E-01	1.374E-01
Pb-212		2.211E-01	5.589E-02	5.835E-02	3.397E-02
Pb-214		3.373E-01	8.924E-02	9.235E-02	3.932E-02
Ra-226	#AB	2.209E-01	4.545E-01	4.548E-01	3.588E-01
Th-234	#AB	0.000E+00	4.162E-01	4.162E-01	5.809E-01
Tl-208		1.474E-01	3.552E-02	3.700E-02	1.085E-02
U-235	#AB	1.646E-02	2.984E-02	2.987E-02	2.340E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.244E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:45:31
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_010.An1

Sample description
     251449-002, 206637


Spectrum Filename: C:\User\SPC\Det9\9_20140108_010.An1

Acquisition information
       Start time:                 1/8/2014 17:00:22
       Live time:               2700
       Real time:               2702
       Dead time:                  0.06 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:26:14
            Zero offset:           0.095 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.675E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.11keV )
       Stop channel:           16336 (  2041.83keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3481E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3481E+02) =
                                   8.0723E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:45:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_010.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:46:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	9_2013-12-31_0939.PBC 12/31/2013 09:39:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 14 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1295

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.89	19.	77.30	0.84	1.819E-02	74.81	9.600	PBC<MDA	Pb212
77.31	76.	22.56	0.47	1.999E-02	77.11	17.500	6.292E-01	Pb212
87.02	26.	50.66	0.85	2.658E-02	87.20	6.300	4.682E-01	Pb212
98.38	5.	253.19	0.86	3.272E-02	98.44	25.100	PBC<MDA	Pa234
					98.44	25.100	1.790E-02	Pa234
116.93	38.	38.06	0.16	3.950E-02				
121.78	10.	121.12	0.88	4.097E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	1.730E-02	Eu154
121.93	9.	154.99	0.88	4.070E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	1.544E-02	Eu154
144.76	15.	87.72	0.90	4.372E-02	143.76	10.500	PBC<MDA	U235
163.78	11.	113.07	0.92	4.426E-02	163.35	4.700	PBC<MDA	U235
185.74	12.	102.87	0.94	4.348E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	2.209E-01	Ra226
185.79	13.	90.64	0.94	4.351E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	2.471E-01	Ra226
238.54	162.	10.91	0.67	3.967E-02	238.63	43.100	2.647E-01	Pb212
241.94	26.	42.96	1.00	3.940E-02	241.92	7.470	2.682E-01	Pb214
251.98	18.	51.80	0.15	3.859E-02				
270.20	14.	78.52	1.02	3.715E-02	270.25	3.460	PBC<MDA	Ac228
295.14	85.	16.84	0.31	3.529E-02	295.22	19.200	3.351E-01	Pb214
299.97	13.	74.40	1.05	3.494E-02	300.09	3.270	PBC<MDA	Pb212
337.70	73.	18.28	0.42	3.244E-02				
338.24	41.	27.74	1.09	3.240E-02	338.40	12.010	3.175E-01	Ac228
344.39	5.	179.39	1.09	3.204E-02	344.30	27.000	PBC<MDA	Eu152
351.86	142.	12.34	0.80	3.159E-02	351.79	37.100	3.373E-01	Pb214
424.88	10.	45.21	0.16	2.785E-02				

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:45:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_010.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
462.85	14.	67.41	1.20	2.626E-02	463.00	4.400	PBC<MDA	Ac228
583.15	95.	12.05	0.33	2.240E-02	583.14	86.000	1.474E-01	Tl208
609.30	132.	11.05	1.34	2.173E-02	609.69	46.090	3.657E-01	Bi214
669.24	2.	258.50	1.38	2.044E-02	665.45	1.560	PBC<MDA	Bi214
723.09	4.	190.82	1.43	1.929E-02	723.30	19.700	PBC<MDA	Eu154
727.81	1.	833.05	1.43	1.922E-02	727.17	11.800	PBC<MDA	Bi212
785.81	8.	97.66	1.48	1.820E-02	785.42	2.000	PBC<MDA	Bi212
796.23	3.	290.44	1.49	1.805E-02	794.95	4.250	PBC<MDA	Ac228
860.74	10.	79.60	1.55	1.706E-02	860.47	12.000	PBC<MDA	Tl208
881.91	2.	423.22	1.57	1.675E-02	883.24	15.000	PBC<MDA	Pa234
					883.24	15.000	2.004E-02	Pa234
911.24	28.	30.88	1.59	1.638E-02	911.07	29.000	1.766E-01	Ac228
964.31	2.	422.70	1.63	1.572E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	8.310E-02	Ac228
964.79	3.	275.87	1.63	1.572E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	1.271E-01	Ac228
968.63	12.	71.66	1.64	1.567E-02	968.90	17.460	PBC<MDA	Ac228
1119.05	-3.	429.48	1.76	1.407E-02	1120.28	15.040	PBC<MDA	Bi214
1173.43	2.	347.95	1.80	1.358E-02	1173.24	99.860	PBC<MDA	Co60
1332.34	1.	657.59	1.92	1.229E-02	1332.50	99.980	PBC<MDA	Co60
1408.07	2.	273.40	1.98	1.176E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	2.738E-02	Eu152
1408.35	2.	267.45	1.98	1.176E-02	1407.98	2.480	2.375E-01	Bi214
					1408.08	21.210	2.777E-02	Eu152
1460.88	868.	3.39	2.09	1.140E-02	1460.80	10.700	2.090E+01	K40
1620.88	1.	491.89	2.13	1.043E-02	1620.56	2.750	PBC<MDA	Bi212
1764.61	2.	77.41	2.23	9.660E-03	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
934.13	116.93	48.	38.	9.493E+02	76.13	0.160	-	s
2014.01	251.98	23.	18.	4.561E+02	103.60	0.148	-	sM
3396.70	424.88	4.	10.	3.447E+02	90.43	0.155	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:45:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_010.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	464.89	58.24	52.	-3.	-0.001	766.52	0.821s
Pb-212	597.98	74.89	102.	19.	0.007	154.60	0.835
Pb-212	617.37	77.31	70.	73.	0.027	45.13	0.472s
Pb-212	694.98	87.02	76.	26.	0.010	101.33	0.847
Pa-234	785.81	98.38	75.	5.	0.002	506.39	0.858s
Eu-152	974.13	121.93	84.	9.	0.003	309.97	0.881s
Eu-154	972.89	121.78	63.	10.	0.004	242.24	0.882s
U-235	1156.69	144.76	76.	15.	0.005	175.44	0.902s
U-235	1308.76	163.78	78.	11.	0.004	226.15	0.921s
U-235	1484.78	185.79	62.	13.	0.005	181.28	0.942s
Ra-226	1484.35	185.74	65.	12.	0.004	205.74	0.943s
Pb-212	1907.04	238.60	69.	126.	0.047	23.39	0.992s
Pb-214	1933.76	241.94	59.	26.	0.010	85.93	0.996s
Ac-228	2159.72	270.20	51.	14.	0.005	157.04	1.022
Pb-214	2358.00	294.99	56.	47.	0.017	43.58	1.046s
Pb-212	2397.78	299.97	41.	13.	0.005	148.79	1.050
Ac-228	2703.87	338.24	45.	41.	0.015	55.48	1.086s
Eu-152	2753.04	344.39	41.	5.	0.002	358.79	1.091s
Pb-214	2812.77	351.86	44.	132.	0.049	24.67	0.801s
Ac-228	3700.38	462.85	40.	14.	0.005	134.81	1.200s
Tl-208	4662.57	583.15	9.	95.	0.035	24.10	0.335s
Bi-214	4871.71	609.30	24.	122.	0.045	22.09	1.339
Cs-137	5290.37	661.64	27.	-4.	-0.001	406.44	1.377s
Bi-214	5351.17	669.24	17.	2.	0.001	516.99	1.380s
Eu-154	5781.91	723.09	26.	4.	0.001	381.65	1.430s
Bi-212	5819.67	727.81	37.	1.	0.000	1666.10	1.433s
Eu-152	6230.53	779.17	36.	-9.	-0.003	203.23	1.478s
Bi-212	6283.68	785.81	26.	8.	0.003	195.31	1.483s
Ac-228	6367.02	796.23	31.	3.	0.001	580.88	1.491s
Tl-208	6883.06	860.74	26.	10.	0.004	159.21	1.547s
Pa-234	7052.46	881.91	25.	2.	0.001	846.43	1.566s
Ac-228	7287.12	911.24	24.	28.	0.010	61.77	1.589s
Bi-214	7480.84	935.46	37.	-2.	-0.001	1192.59	1.608s
Pa-234	7564.92	945.96	33.	-5.	-0.002	338.60	1.618s
Eu-152	7711.71	964.31	41.	2.	0.001	845.41	1.633s
Ac-228	7715.50	964.79	41.	3.	0.001	551.74	1.633s
Ac-228	7746.23	968.63	31.	12.	0.004	143.32	1.637s
Co-60	9384.90	1173.43	36.	2.	0.001	695.90	1.800s
Eu-154	10187.34	1273.70	38.	-4.	-0.001	479.02	1.879s
Co-60	10656.56	1332.34	21.	1.	0.000	1315.18	1.923s
Bi-214	11262.67	1408.07	18.	2.	0.001	546.80	1.980s
Eu-152	11264.90	1408.35	18.	2.	0.001	534.91	1.980s
K-40	11685.32	1460.88	15.	853.	0.316	6.79	2.091
Bi-212	12965.99	1620.88	9.	1.	0.000	983.78	2.134s

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:45:31
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_010.An1

 Nuclide  Channel   Energy  Background  Net area  Cnts/sec   Uncert   FWHM
 Bi-214  14116.50  1764.61        11.         2.     0.001   154.82   2.234s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             pCi/g         keV     pCi/g         pCi/g          COMMENTS
 ____________________________________________________________________________

Ac-228   N   1.7663E-01                                     3.65E+11
                           911.07 1.766E-01 ?(  7.113E-02 3.09E+01 2.90E+01 G
                           968.90 1.314E-01 ?   1.420E-01 7.17E+01 1.75E+01 GA
                           338.40 3.175E-01 ?   1.202E-01 2.77E+01 1.20E+01 GA
                           964.77 1.271E-01 ?   5.661E-01 2.76E+02 4.99E+00 GA
                           463.00 3.726E-01 ?   3.808E-01 6.74E+01 4.40E+00 GA
                           794.95 1.073E-01 -   5.021E-01 2.90E+02 4.25E+00 GA
                           270.25 3.182E-01     3.864E-01 7.85E+01 3.46E+00 GA

Am-241   I  -3.0790E-02                                     3.65E+11
                            59.54-3.079E-02 &(  1.919E-01 3.83E+02 3.63E+01 G

Bi-212   N   1.3704E-02                                     3.65E+11
                           727.17 1.370E-02 ?(  1.868E-01 8.33E+02 1.18E+01 G
                          1620.56 9.373E-02 ?   7.419E-01 4.92E+02 2.75E+00 GA
                           785.42 6.455E-01 ?   9.669E-01 9.77E+01 2.00E+00 GA

Bi-214   N   3.6573E-01                                     3.65E+11
                           609.69 3.657E-01  (P 3.375E-02 1.10E+01 4.61E+01 G
                          1764.51 4.604E-02 - P 1.505E-01 7.74E+01 1.59E+01 GA
                          1120.28-4.241E-02 % P 2.224E-01 4.29E+02 1.50E+01 GA
                           768.36 2.718E-02 %   5.091E-01 1.14E+03 4.89E+00 GA
                          1377.65-6.603E-03 % P 9.907E-01 1.00E+03 4.02E+00 GA
                           934.05-9.492E-02 & P 8.256E-01 5.96E+02 3.17E+00 GA
                          1407.98 2.342E-01 -   1.023E+00 2.73E+02 2.48E+00 GA
                          1509.19 0.000E+00 -   2.111E+00 1.00E+03 2.19E+00 GA
                           665.45 2.158E-01 -   8.885E-01 2.58E+02 1.56E+00 GA

Co-60    T   3.9243E-03                                     3.65E+11
                          1173.24 5.448E-03 ?(  3.070E-02 3.48E+02 9.99E+01 G
                          1332.50 2.403E-03 ?(  2.573E-02 6.58E+02 1.00E+02 G

Cs-137   I  -6.4581E-03                                     3.65E+11
                           661.66-6.458E-03 ?(  2.091E-02 2.03E+02 8.46E+01 G
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:45:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_010.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Eu-152	I	1.7937E-02					3.65E+11	
			344.30	1.794E-02	?(	5.140E-02	1.79E+02	2.70E+01 G
			121.87	2.199E-02	&	5.477E-02	1.55E+02	2.86E+01 GA
			1408.08	2.777E-02	?	1.186E-01	2.67E+02	2.12E+01 GA
			964.05	2.843E-02	?	1.954E-01	4.23E+02	1.46E+01 GA
			778.90	-1.116E-01	+	1.764E-01	1.02E+02	1.30E+01 GA
			411.09	-3.375E-02	%	6.558E-01	1.19E+03	2.26E+00 GA
Eu-154	I	-2.4538E-02					3.65E+11	
			1274.80	-2.454E-02	?(	9.453E-02	2.40E+02	3.55E+01 G
			123.10	1.730E-02	&	3.327E-02	1.21E+02	4.05E+01 GA
			723.30	3.096E-02	&	9.387E-02	1.91E+02	1.97E+01 GA
K-40	N	2.0902E+01					3.65E+11	
			1460.80	2.090E+01	(P	2.215E-01	3.39E+00	1.07E+01 G
Pa-234	N	2.0042E-02					3.65E+11	
			883.24	2.004E-02	?(	1.374E-01	4.23E+02	1.50E+01 G
			98.44	1.790E-02	?	7.347E-02	2.53E+02	2.51E+01 GA
			946.00	-7.745E-02	+	2.083E-01	1.69E+02	1.20E+01 GA
Pb-212	N	2.2112E-01					3.65E+11	
			238.63	2.211E-01	?(P	3.397E-02	1.17E+01	4.31E+01 G
			77.11	6.292E-01	+ P	1.677E-01	2.26E+01	1.75E+01 GA
			74.81	3.309E-01	+	4.027E-01	7.73E+01	9.60E+00 GA
			87.20	4.682E-01	+ P	3.632E-01	5.07E+01	6.30E+00 GA
			300.09	3.432E-01	+	3.905E-01	7.44E+01	3.27E+00 GA
Pb-214	N	3.3729E-01					3.65E+11	
			351.79	3.373E-01	(P	3.932E-02	1.23E+01	3.71E+01 G
			295.22	2.081E-01	- P	7.694E-02	2.18E+01	1.92E+01 GA
			241.92	2.682E-01	& P	1.826E-01	4.30E+01	7.47E+00 GA
Ra-226	N	2.2091E-01					3.65E+11	
			186.20	2.209E-01	&(	3.588E-01	1.03E+02	3.60E+00 G
Tl-208	N	1.4742E-01					3.65E+11	
			583.14	1.474E-01	(	1.085E-02	1.20E+01	8.60E+01 G
			860.47	1.446E-01	?	1.739E-01	7.96E+01	1.20E+01 GA
U-235	N	1.6463E-02					3.65E+11	
			185.70	1.646E-02	?(	2.340E-02	9.06E+01	5.40E+01 G
			143.76	9.587E-02	&	1.323E-01	8.77E+01	1.05E+01 GA
			163.35	1.647E-01	?	2.962E-01	1.13E+02	4.70E+00 GA

(- This peak used in the nuclide activity average.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:45:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_010.An1

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	58.24	52.	-3.	-0.001	766.52	-3.079E-02
Pa-234	98.38	75.	5.	0.002	506.39	1.790E-02
Eu-152	121.93	84.	9.	0.003	309.97	2.199E-02
Eu-154	121.78	63.	10.	0.004	242.24	1.730E-02
U-235	144.76	76.	15.	0.005	175.44	9.587E-02
U-235	163.78	78.	11.	0.004	226.15	1.647E-01
U-235	185.79	62.	13.	0.005	181.28	1.646E-02
Ra-226	185.74	65.	12.	0.004	205.74	2.209E-01
Eu-152	344.39	41.	5.	0.002	358.79	1.794E-02
Cs-137	661.64	27.	-4.	-0.001	406.44	-6.458E-03
Eu-154	723.09	26.	4.	0.001	381.65	3.096E-02
Bi-212	727.81	37.	1.	0.000	1666.10	1.370E-02
Eu-152	779.17	36.	-9.	-0.003	203.23	-1.116E-01
Bi-212	785.81	26.	8.	0.003	195.31	6.455E-01
Pa-234	881.91	25.	2.	0.001	846.43	2.004E-02
Pa-234	945.96	33.	-5.	-0.002	338.60	-7.745E-02
Eu-152	964.31	41.	2.	0.001	845.41	2.843E-02
Co-60	1173.43	36.	2.	0.001	695.90	5.448E-03
Eu-154	1273.70	38.	-4.	-0.001	479.02	-2.454E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:45:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_010.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Co-60	1332.34	21.	1.	0.000	1315.18	2.403E-03	
Eu-152	1408.35	18.	2.	0.001	534.91	2.777E-02	
Bi-212	1620.88	9.	1.	0.000	983.78	9.373E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.7663E-01	1.7663E-01	1.0910E-01	1.0979E-01	7.113E-02
Am-241 #A	-3.0790E-02	-3.0790E-02	2.3601E-01	2.3603E-01	1.919E-01
Bi-212 #A	1.3704E-02	1.3704E-02	2.2832E-01	2.2832E-01	1.868E-01
Bi-214	3.6573E-01	3.6573E-01	8.7013E-02	9.0741E-02	3.375E-02
Co-60 #A	3.9243E-03	3.9243E-03	2.7309E-02	2.7311E-02	3.070E-02
Cs-137 #A	-6.4581E-03	-6.4581E-03	2.6249E-02	2.6253E-02	2.091E-02
Eu-152 #A	1.7937E-02	1.7937E-02	6.4356E-02	6.4368E-02	5.140E-02
Eu-154 #A	-2.4538E-02	-2.4538E-02	1.1754E-01	1.1755E-01	9.453E-02
K-40	2.0902E+01	2.0902E+01	1.4440E+00	2.0560E+00	2.215E-01
Pa-234 #A	2.0042E-02	2.0042E-02	1.6965E-01	1.6965E-01	1.374E-01
Pb-212	2.2112E-01	2.2112E-01	5.5886E-02	5.8348E-02	3.397E-02
Pb-214	3.3729E-01	3.3729E-01	8.9239E-02	9.2355E-02	3.932E-02
Ra-226 #A	2.2091E-01	2.2091E-01	4.5451E-01	4.5482E-01	3.588E-01
Th-234 #A	0.0000E+00	0.0000E+00	4.1623E-01	4.1624E-01	5.809E-01
Tl-208	1.4742E-01	1.4742E-01	3.5522E-02	3.6996E-02	1.085E-02
U-235 #A	1.6463E-02	1.6463E-02	2.9844E-02	2.9870E-02	2.340E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2041.8 keV) 2.215E+01 pCi/g
Total Decayed Activity (25.1 to 2041.8 keV) 2.2150267E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE10	Lab ID	: 251449-003	Client ID	: 04-PD-D0034-03
Seqnum	: 1594011971011	Matrix	: Soil	Acct	: ITSI (JG)
File	: 10_20140108_011	Batch	: 206637	Time	: 08-JAN-2014 17:01
Cal	: 08-JAN-2014 07:52:53,30-DEC-2013 19:08:15	Caldate	: 08-JAN-2014, 30-DEC-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 363 g	Live Time	: 2700 sec
				Dead Time	: 0.09 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.129	0.336		.41919	.41934	-0.040	u
Bismuth-212	-0.0431	0.182		.22646	.22648	-0.0025	u
Bismuth-214	0.157	0.0400		.062793	.063762	-0.052	u
Cesium-137	0.0107	0.0199	0.07	.025691	.025702	-0.0069	u
Cobalt-60	0.0190	0.0295		.038045	.038066	0	u
Europium-152	-0.0114	0.0534		.066039	.066044	-0.00031	u
Europium-154	-0.0194	0.0849		.10558	.10559	-0.013	u
Lead-212	0.304	0.0331		.0748	.078276	-0.016	u
Lead-214	0.264	0.0279		.065571	.068162	-0.0040	u
Potassium-40	21.2	0.308		1.5304	2.1335	-0.36	u
Protactinium-234	0.0314	0.141		.17546	.17548	0.015	u
Radium-226	0.650	0.394	1.3	.52776	.53006	-0.082	u
Thallium-208	0.146	0.0135		.038252	.039602	0.0020	u
Thorium-232 (By Actinium-228)	0.161	0.0806		.11693	.11747	0.019	u
Thorium-234	0.210	0.399		.50138	.50173	-0.034	u
Uranium-235	0.0461	0.0250		.034045	.034223	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-03
Sample Description: 251449-003, 206637

Detector: HPGE10 51-TP42231A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:49
Acquisition Time: 1/8/2014 17:01:09
Analysis Time: 1/8/2014 17:46
Analysis Quantity: 3.630E+02 g

Spectrum ID: 10_20140108_011
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.09 %

Efficiency: HPGE10 S23325 10_20131230002_EffCal
Efficiency Cal Date: 12/30/2013 19:08
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	1.608E-01	1.169E-01	1.175E-01	8.061E-02
Am-241	#AB	-1.290E-01	4.192E-01	4.193E-01	3.364E-01
Bi-212	#AB	-4.310E-02	2.265E-01	2.265E-01	1.823E-01
Bi-214	#	1.574E-01	6.279E-02	6.376E-02	3.999E-02
Co-60	#AB	1.897E-02	3.804E-02	3.807E-02	2.945E-02
Cs-137	#AB	1.066E-02	2.569E-02	2.570E-02	1.994E-02
Eu-152	#AB	-1.138E-02	6.604E-02	6.604E-02	5.341E-02
Eu-154	#AB	-1.941E-02	1.056E-01	1.056E-01	8.492E-02
K-40		2.123E+01	1.530E+00	2.133E+00	3.079E-01
Pa-234	#AB	3.145E-02	1.755E-01	1.755E-01	1.409E-01
Pb-212		3.042E-01	7.480E-02	7.828E-02	3.309E-02
Pb-214		2.639E-01	6.557E-02	6.816E-02	2.787E-02
Ra-226	#	6.501E-01	5.278E-01	5.301E-01	3.941E-01
Th-234	AB	2.097E-01	5.014E-01	5.017E-01	3.992E-01
Tl-208		1.462E-01	3.825E-02	3.960E-02	1.346E-02
U-235	#	4.612E-02	3.404E-02	3.422E-02	2.504E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.323E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:46:19
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_011.An1

Sample description
     251449-003, 206637


Spectrum Filename: C:\User\SPC\Det10\10_20140108_011.An1

Acquisition information
       Start time:                 1/8/2014 17:01:09
       Live time:               2700
       Real time:               2703
       Dead time:                  0.09 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:52:53
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.220E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.73keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.6300E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.6300E+02) =
                                   7.4455E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:46:19
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:49:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_2014-01-01_0202.PBC 1/1/2014 02:02:27
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1281

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.42	25.	31.62	0.33	0.000E+00				
74.86	20.	82.25	0.86	1.370E-02	74.81	9.600	PBC<MDA	Pb212
76.96	51.	28.19	0.32	1.525E-02	77.11	17.500	5.250E-01	Pb212
87.21	31.	46.41	0.26	2.179E-02	87.20	6.300	6.228E-01	Pb212
92.53	11.	119.56	0.88	2.495E-02	92.60	5.600	PBC<MDA	Th234
93.74	67.	27.94	0.21	2.558E-02				
98.06	9.	123.67	0.88	2.802E-02	98.44	25.100	PBC<MDA	Pa234
121.56	10.	138.90	0.90	3.648E-02	121.87	28.590	PBC<MDA	Eu152
163.86	11.	122.58	0.94	4.064E-02	163.35	4.700	PBC<MDA	U235
					163.35	4.700	1.560E-01	U235
185.95	36.	36.91	0.96	4.010E-02	185.70	54.000	4.612E-02	U235
					186.20	3.600	6.922E-01	Ra226
					185.70	54.000	4.612E-02	U235
185.96	34.	40.59	0.96	4.008E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	6.501E-01	Ra226
238.50	174.	12.30	1.11	3.661E-02	238.63	43.100	3.041E-01	Pb212
241.93	27.	57.72	1.01	3.636E-02	241.92	7.470	2.712E-01	Pb214
268.46	16.	60.00	1.03	3.426E-02	270.25	3.460	3.716E-01	Ac228
295.25	78.	20.21	0.54	3.251E-02	295.22	19.200	3.119E-01	Pb214
299.70	10.	100.48	1.06	3.218E-02	300.09	3.270	PBC<MDA	Pb212
338.24	15.	70.55	1.09	2.981E-02	338.40	12.010	PBC<MDA	Ac228
351.81	111.	11.54	0.88	2.905E-02	351.79	37.100	2.639E-01	Pb214
411.40	5.	184.54	1.15	2.614E-02	411.09	2.264	PBC<MDA	Eu152
464.38	6.	132.01	1.19	2.407E-02	463.00	4.400	PBC<MDA	Ac228
582.83	93.	12.49	0.19	2.049E-02	583.14	86.000	1.462E-01	Tl208
609.22	52.	17.14	1.31	1.986E-02	609.69	46.090	1.574E-01	Bi214
661.31	6.	120.55	1.35	1.875E-02	661.66	84.620	PBC<MDA	Cs137

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:46:19
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
665.92	6.	101.27	1.36	1.867E-02	665.45	1.560	PBC<MDA	Bi214
794.66	5.	164.01	1.46	1.646E-02	794.95	4.250	PBC<MDA	Ac228
835.31	9.	41.63	0.16	1.589E-02				
883.23	3.	278.98	1.52	1.526E-02	883.24	15.000	PBC<MDA	Pa234
911.30	25.	36.36	1.54	1.493E-02	911.07	29.000	1.608E-01	Ac228
934.97	2.	364.81	1.56	1.466E-02	934.05	3.170	PBC<MDA	Bi214
968.85	15.	61.72	1.58	1.427E-02	968.90	17.460	1.692E-01	Ac228
990.42	18.	30.91	0.14	1.404E-02				
1120.72	22.	34.19	1.69	1.281E-02	1120.28	15.040	3.113E-01	Bi214
1173.74	8.	100.29	1.73	1.236E-02	1173.24	99.860	PBC<MDA	Co60
1377.03	4.	119.25	1.86	1.088E-02	1377.65	4.020	PBC<MDA	Bi214
1460.95	884.	3.47	1.85	1.036E-02	1460.80	10.700	2.156E+01	K40

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
243.04	30.42	15.	25.	0.000E+00	63.25	0.334	-	s
697.16	87.21	79.	7.	3.385E+02	347.85	0.260	-	sc
748.77	93.74	57.	41.	1.608E+03	60.50	0.880	TH-234	D
6680.57	835.31	2.	9.	5.538E+02	83.26	0.158	AC-228	s
7921.52	990.42	3.	18.	1.275E+03	61.82	0.141	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	474.22	59.33	69.	-7.	-0.003	324.90	0.850s
Pb-212	598.39	74.86	126.	20.	0.007	164.50	0.863
Pb-212	615.16	76.96	53.	51.	0.019	56.38	0.319s
Pb-212	697.65	87.27	86.	24.	0.009	118.52	0.874
Th-234	740.25	92.60	75.	11.	0.004	239.12	0.879D
Pa-234	783.93	98.06	58.	9.	0.003	247.33	0.884s
Eu-152	971.84	121.56	86.	10.	0.004	277.79	0.905s
Eu-154	993.72	124.30	72.	-2.	-0.001	1422.34	0.906s
U-235	1148.65	143.67	107.	-8.	-0.003	370.93	0.924s
U-235	1310.04	163.86	82.	11.	0.004	245.15	0.941s
U-235	1486.68	185.95	71.	36.	0.013	73.81	0.961s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:46:19
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ra-226	1486.83	185.96	78.	34.	0.013	81.19	0.961s
Pb-212	1906.94	238.50	66.	174.	0.064	24.59	1.107
Pb-214	1934.42	241.93	105.	27.	0.010	115.44	1.010s
Ac-228	2146.50	268.46	38.	16.	0.006	120.00	1.034s
Pb-214	2359.98	295.15	60.	41.	0.015	50.94	1.055s
Pb-212	2396.38	299.70	48.	10.	0.004	200.96	1.059s
Ac-228	2704.59	338.24	45.	15.	0.005	141.09	1.092s
Eu-152	2760.16	345.19	44.	-3.	-0.001	580.15	1.097s
Pb-214	2813.13	351.81	22.	103.	0.038	23.09	0.880
Eu-152	3289.72	411.40	38.	5.	0.002	369.09	1.152s
Ac-228	3713.44	464.38	24.	6.	0.002	264.02	1.195s
Tl-208	4660.88	582.83	14.	93.	0.035	24.99	0.187s
Bi-214	4871.93	609.22	32.	52.	0.019	34.29	1.313s
Cs-137	5288.63	661.31	24.	6.	0.002	241.11	1.354s
Bi-214	5325.52	665.92	23.	6.	0.002	202.53	1.356s
Eu-154	5789.39	723.91	32.	-4.	-0.001	419.87	1.401s
Bi-212	5803.98	725.73	34.	-3.	-0.001	525.49	1.404s
Eu-152	6226.46	778.55	29.	-3.	-0.001	585.59	1.444s
Ac-228	6355.39	794.66	29.	5.	0.002	328.02	1.456s
Pa-234	7063.93	883.23	25.	3.	0.001	557.95	1.522s
Ac-228	7288.54	911.30	29.	25.	0.009	72.72	1.542s
Bi-214	7477.87	934.97	22.	2.	0.001	729.62	1.559s
Eu-152	7709.80	963.96	41.	-6.	-0.002	337.54	1.581s
Ac-228	7708.43	963.78	40.	-6.	-0.002	302.31	1.581s
Ac-228	7748.98	968.85	37.	15.	0.006	123.44	1.584s
Bi-214	8964.13	1120.72	33.	22.	0.008	68.37	1.691s
Co-60	9388.35	1173.74	32.	8.	0.003	200.58	1.727s
Eu-154	10180.31	1272.71	30.	-3.	-0.001	544.11	1.796s
Co-60	10666.10	1333.41	15.	-2.	-0.001	530.86	1.834s
Bi-214	11015.20	1377.03	12.	4.	0.002	238.49	1.863s
Eu-152	11268.67	1408.70	19.	-4.	-0.002	302.48	1.882s
K-40	11686.91	1460.96	28.	854.	0.316	7.07	1.845

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	1.6080E-01				3.65E+11	
			911.07	1.608E-01	?(	8.061E-02 3.64E+01	2.90E+01 G
			968.90	1.692E-01	?	1.566E-01 6.17E+01	1.75E+01 GA
			338.40	1.122E-01	?	1.211E-01 7.05E+01	1.20E+01 GA
			964.77	-2.383E-01	-	5.721E-01 1.51E+02	4.99E+00 GA
			463.00	1.451E-01	?	2.988E-01 1.32E+02	4.40E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:46:19
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_011.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		794.95	1.898E-01	?	4.927E-01	1.64E+02	4.25E+00 GA
		270.25	3.716E-01	?	3.339E-01	6.00E+01	3.46E+00 GA
Am-241 I	-1.2902E-01					3.65E+11	
		59.54	-1.290E-01	?(	3.364E-01	1.62E+02	3.63E+01 G
Bi-212 N	-4.3095E-02					3.65E+11	
		727.17	-4.309E-02	?(	1.823E-01	2.63E+02	1.18E+01 G
		1620.56	0.000E+00	+	2.465E-01	1.00E+03	2.75E+00 GA
		785.42	-1.698E-02	%	1.040E+00	3.72E+03	2.00E+00 GA
Bi-214 N	1.5737E-01					3.65E+11	
		609.69	1.574E-01	?(P	3.999E-02	1.71E+01	4.61E+01 G
		1764.51	-6.909E-02	% P	8.605E-02	1.00E+03	1.59E+01 GA
		1120.28	3.113E-01	+ P	1.903E-01	3.42E+01	1.50E+01 GA
		768.36	-1.182E-01	% P	4.953E-01	7.19E+02	4.89E+00 GA
		1377.65	2.645E-01	? P	5.106E-01	1.19E+02	4.02E+00 GA
		934.05	1.089E-01	-	6.412E-01	3.65E+02	3.17E+00 GA
		1407.98	0.000E+00	-	1.661E+00	1.00E+03	2.48E+00 GA
		1509.19	-2.215E-02	%	5.465E-01	1.52E+03	2.19E+00 GA
		665.45	5.653E-01	+ P	1.068E+00	1.01E+02	1.56E+00 GA
Co-60 T	1.8968E-02					3.65E+11	
		1173.24	1.897E-02	?(	2.945E-02	1.00E+02	9.99E+01 G
		1332.50	-5.291E-03	-	2.236E-02	2.65E+02	1.00E+02 G
Cs-137 I	1.0655E-02					3.65E+11	
		661.66	1.066E-02	?(	1.994E-02	1.21E+02	8.46E+01 G
Eu-152 I	-1.1383E-02					3.65E+11	
		344.30	-1.138E-02	?(	5.341E-02	2.90E+02	2.70E+01 G
		121.87	2.566E-02	?	5.714E-02	1.39E+02	2.86E+01 GA
		1408.08	-5.198E-02	+	1.227E-01	1.51E+02	2.12E+01 GA
		964.05	-7.302E-02	+	1.965E-01	1.69E+02	1.46E+01 GA
		778.90	-3.373E-02	+	1.591E-01	2.93E+02	1.30E+01 GA
		411.09	2.285E-01	?	6.735E-01	1.85E+02	2.26E+00 GA
Eu-154 I	-1.9405E-02					3.65E+11	
		1274.80	-1.940E-02	?(	8.492E-02	2.72E+02	3.55E+01 G
		123.10	-3.148E-03	+	3.667E-02	7.11E+02	4.05E+01 GA
		723.30	-3.143E-02	+	1.055E-01	2.10E+02	1.97E+01 GA
K-40 N	2.1229E+01					3.65E+11	
		1460.80	2.123E+01	(P	3.079E-01	3.53E+00	1.07E+01 G
Pa-234 N	3.1447E-02					3.65E+11	
		883.24	3.145E-02	?(	1.409E-01	2.79E+02	1.50E+01 G
		98.44	3.547E-02	?	6.962E-02	1.24E+02	2.51E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:46:19
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          946.00 0.000E+00 &   3.250E-01 1.00E+03 1.20E+01 GA

Pb-212   N   3.0415E-01                                     3.65E+11
                          238.63 3.041E-01  (  3.309E-02 1.23E+01 4.31E+01 G
                           77.11 5.250E-01 +   1.756E-01 2.82E+01 1.75E+01 GA
                           74.81 4.204E-01 +   5.484E-01 8.23E+01 9.60E+00 GA
                           87.20 4.746E-01 +   4.345E-01 5.93E+01 6.30E+00 GA
                          300.09 2.701E-01 ?   4.252E-01 1.00E+02 3.27E+00 GA

Pb-214   N   2.6392E-01                                     3.65E+11
                          351.79 2.639E-01  (P 2.787E-02 1.15E+01 3.71E+01 G
                          295.22 1.799E-01 - P 7.993E-02 2.55E+01 1.92E+01 GA
                          241.92 2.712E-01 ?   2.430E-01 5.77E+01 7.47E+00 GA

Ra-226   N   6.5007E-01                                     3.65E+11
                          186.20 6.501E-01  (  3.941E-01 4.06E+01 3.60E+00 G

Th-234   N   2.0968E-01                                     3.65E+11
                           92.60 2.097E-01  (  3.992E-01 1.20E+02 5.60E+00 G

Tl-208   N   1.4615E-01                                     3.65E+11
                          583.14 1.462E-01  (P 1.346E-02 1.25E+01 8.60E+01 G
                          860.47-5.540E-03 % P 2.652E-01 1.00E+03 1.20E+01 GA

U-235    N   4.6124E-02                                     3.65E+11
                          185.70 4.612E-02  (  2.504E-02 3.69E+01 5.40E+01 G
                          143.76-5.284E-02 -   1.585E-01 1.85E+02 1.05E+01 GA
                          163.35 1.560E-01 &   3.051E-01 1.23E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:46:19
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_011.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.33	69.	-7.	-0.003	324.90	-1.290E-01
Pa-234	98.06	58.	9.	0.003	247.33	3.547E-02
Eu-152	121.56	86.	10.	0.004	277.79	2.566E-02
Eu-154	124.30	72.	-2.	-0.001	1422.34	-3.148E-03
U-235	143.67	107.	-8.	-0.003	370.93	-5.284E-02
U-235	163.86	82.	11.	0.004	245.15	1.560E-01
U-235	185.95	71.	36.	0.013	73.81	4.612E-02
Ra-226	185.96	78.	34.	0.013	81.19	6.501E-01
Eu-152	345.19	44.	-3.	-0.001	580.15	-1.138E-02
Eu-152	411.40	38.	5.	0.002	369.09	2.285E-01
Cs-137	661.31	24.	6.	0.002	241.11	1.066E-02
Eu-154	723.91	32.	-4.	-0.001	419.87	-3.143E-02
Bi-212	725.73	34.	-3.	-0.001	525.49	-4.309E-02
Eu-152	778.55	29.	-3.	-0.001	585.59	-3.373E-02
Pa-234	883.23	25.	3.	0.001	557.95	3.145E-02
Eu-152	963.96	41.	-6.	-0.002	337.54	-7.302E-02
Eu-154	1272.71	30.	-3.	-0.001	544.11	-1.940E-02
Eu-152	1408.70	19.	-4.	-0.002	302.48	-5.198E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	1.6080E-01	1.6080E-01	1.1693E-01	1.1747E-01	8.061E-02
Am-241 #A	-1.2902E-01	-1.2902E-01	4.1919E-01	4.1934E-01	3.364E-01
Bi-212 #A	-4.3095E-02	-4.3095E-02	2.2646E-01	2.2648E-01	1.823E-01
Bi-214 #	1.5737E-01	1.5737E-01	6.2793E-02	6.3762E-02	3.999E-02
Co-60 #A	1.8968E-02	1.8968E-02	3.8045E-02	3.8066E-02	2.945E-02
Cs-137 #A	1.0655E-02	1.0655E-02	2.5691E-02	2.5702E-02	1.994E-02
Eu-152 #A	-1.1383E-02	-1.1383E-02	6.6039E-02	6.6044E-02	5.341E-02
Eu-154 #A	-1.9405E-02	-1.9405E-02	1.0558E-01	1.0559E-01	8.492E-02
K-40	2.1229E+01	2.1229E+01	1.5304E+00	2.1335E+00	3.079E-01
Pa-234 #A	3.1447E-02	3.1447E-02	1.7546E-01	1.7548E-01	1.409E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:46:19
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_011.An1

Pb-212	3.0415E-01	3.0415E-01	7.4800E-02	7.8276E-02	3.309E-02
Pb-214	2.6392E-01	2.6392E-01	6.5571E-02	6.8162E-02	2.787E-02
Ra-226 #	6.5007E-01	6.5007E-01	5.2776E-01	5.3006E-01	3.941E-01
Th-234 A	2.0968E-01	2.0968E-01	5.0138E-01	5.0173E-01	3.992E-01
Tl-208	1.4615E-01	1.4615E-01	3.8252E-02	3.9602E-02	1.346E-02
U-235 #	4.6124E-02	4.6124E-02	3.4045E-02	3.4223E-02	2.504E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (238.5 to 2041.7 keV) 2.226E+01 pCi/g
Total Decayed Activity (238.5 to 2041.7 keV) 2.2261347E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604011948011
File : 11_20140108_011
Cal : 08-JAN-2014 07:30:05,03-JAN-2014 14:18:33
IDF : 1.0
PDF : 1.0

Lab ID : 251449-004
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 03-JAN-2014
Sample Amount : 333.35 g

Client ID : 04-PD-D0034-04
Acct : ITSI (JG)
Time : 08-JAN-2014 17:02
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.00442	0.185		.22515	.22515	-0.040	u
Bismuth-212	0	0.273		.18666	.18666	-0.0025	u
Bismuth-214	0.410	0.0307		.08613	.090845	-0.052	u
Cesium-137	-0.000167	0.0244	0.07	.029679	.029679	-0.0069	u
Cobalt-60	-0.00126	0.0277		.033872	.033872	0	u
Europium-152	0	0.0812		.036977	.036977	-0.00031	u
Europium-154	-0.0245	0.0991		.12337	.12338	-0.013	u
Lead-212	0.326	0.0296		.069474	.073732	-0.016	u
Lead-214	0.298	0.0364		.082244	.084887	-0.0040	u
Potassium-40	15.7	0.282		1.3586	1.7473	-0.36	u
Protactinium-234	0	0.0326		.068524	.068524	0.015	u
Radium-226	0.285	0.464	1.3	.58587	.58627	-0.082	u
Thallium-208	0.124	0.0165		.038976	.039927	0.0020	u
Thorium-232 (By Actinium-228)	0.205	0.0839		.12418	.125	0.019	u
Thorium-234	0.312	0.391		.50004	.50082	-0.034	u
Uranium-235	0.0347	0.0296		.038769	.038857	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-04
Sample Description: 251449-004, 206637

Detector: HPGE11 50-TP50818A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:51
Acquisition Time: 1/8/2014 17:02:32
Analysis Time: 1/8/2014 17:47
Analysis Quantity: 3.334E+02 g

Spectrum ID: 11_20140108_011
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE11 S23325 11_20140102002_EffCal
Efficiency Cal Date: 1/3/2014 14:18
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.048E-01	1.242E-01	1.250E-01	8.387E-02
Am-241	#AB	-4.424E-03	2.252E-01	2.252E-01	1.852E-01
Bi-212	#AB	0.000E+00	1.867E-01	1.867E-01	2.732E-01
Bi-214		4.104E-01	8.613E-02	9.085E-02	3.067E-02
Co-60	#AB	-1.260E-03	3.387E-02	3.387E-02	2.774E-02
Cs-137	#AB	-1.675E-04	2.968E-02	2.968E-02	2.443E-02
Eu-152	#AB	0.000E+00	3.698E-02	3.698E-02	8.117E-02
Eu-154	#AB	-2.445E-02	1.234E-01	1.234E-01	9.908E-02
K-40		1.569E+01	1.359E+00	1.747E+00	2.815E-01
Pa-234	#AB	0.000E+00	6.852E-02	6.852E-02	3.259E-02
Pb-212		3.256E-01	6.947E-02	7.373E-02	2.959E-02
Pb-214		2.980E-01	8.224E-02	8.489E-02	3.643E-02
Ra-226	AB	2.854E-01	5.859E-01	5.863E-01	4.638E-01
Th-234	#AB	3.116E-01	5.000E-01	5.008E-01	3.908E-01
Tl-208		1.235E-01	3.898E-02	3.993E-02	1.647E-02
U-235		3.466E-02	3.877E-02	3.886E-02	2.959E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.769E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:47:40
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_011.An1

Sample description
     251449-004, 206637


Spectrum Filename: C:\User\SPC\Det11\11_20140108_011.An1

Acquisition information
       Start time:                 1/8/2014 17:02:32
       Live time:               2700
       Real time:               2702
       Dead time:                  0.06 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:30:05
            Zero offset:           0.125 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.054E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.31keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3335E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3335E+02) =
                                   8.1077E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:51:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	11_2014-01-04_0721.PBC 1/4/2014 07:21:07
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 21 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1559

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.71	21.	65.76	0.81	1.832E-02	74.81	9.600	PBC<MDA	Pb212
77.10	64.	19.75	0.43	1.956E-02	77.11	17.500	5.568E-01	Pb212
87.61	29.	41.82	0.83	2.451E-02	87.20	6.300	5.686E-01	Pb212
92.69	16.	80.23	0.83	2.677E-02	92.60	5.600	PBC<MDA	Th234
98.40	3.	344.63	0.84	2.890E-02	98.44	25.100	PBC<MDA	Pa234
143.78	8.	141.38	0.88	3.661E-02	143.76	10.500	PBC<MDA	U235
154.54	26.	39.10	0.61	3.690E-02				
159.53	21.	48.46	0.13	3.692E-02				
185.74	23.	55.93	0.92	3.622E-02	185.70	54.000	3.466E-02	U235
186.24	12.	102.64	0.92	3.620E-02	186.20	3.600	PBC<MDA	Ra226
230.56	41.	31.99	0.12	3.361E-02				
238.47	160.	10.32	0.49	3.310E-02	238.63	43.100	3.256E-01	Pb212
241.67	3.	144.08	0.98	3.287E-02	241.92	7.470	PBC<MDA	Pb214
241.98	45.	33.23	0.31	3.287E-02				
270.20	16.	66.79	1.00	3.105E-02	270.25	3.460	PBC<MDA	Ac228
295.13	56.	18.03	0.38	2.954E-02	295.22	19.200	2.942E-01	Pb214
300.50	8.	107.83	1.03	2.926E-02	300.09	3.270	PBC<MDA	Pb212
338.18	43.	23.68	0.25	2.721E-02	338.40	12.010	3.783E-01	Ac228
351.73	107.	12.60	0.23	2.654E-02	351.79	37.100	2.980E-01	Pb214
582.98	74.	14.29	0.43	1.900E-02	583.14	86.000	1.235E-01	Tl208
609.23	126.	9.69	0.93	1.844E-02	609.69	46.090	4.104E-01	Bi214
785.80	3.	226.23	1.48	1.552E-02	785.42	2.000	PBC<MDA	Bi212
					785.42	2.000	3.243E-01	Bi212
793.68	9.	74.66	1.49	1.539E-02	794.95	4.250	PBC<MDA	Ac228
860.52	11.	65.24	1.55	1.457E-02	860.47	12.000	1.850E-01	Tl208
911.28	28.	26.02	1.60	1.401E-02	911.07	29.000	2.048E-01	Ac228
965.08	5.	194.84	1.64	1.345E-02	964.77	4.990	PBC<MDA	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
					964.05	14.580	7.146E-02	Eu152
968.91	18.	50.54	1.65	1.341E-02	968.90	17.460	2.319E-01	Ac228
1120.68	7.	83.55	1.78	1.208E-02	1120.28	15.040	PBC<MDA	Bi214
1378.04	11.	43.87	1.99	1.033E-02	1377.65	4.020	7.725E-01	Bi214
1460.89	569.	4.19	1.50	9.854E-03	1460.80	10.700	1.569E+01	K40
1764.93	12.	40.06	2.31	8.394E-03	1764.51	15.920	2.657E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1234.22	154.54	29.	26.	7.074E+02	78.19	0.609	RA-223	sM
1274.14	159.53	30.	21.	5.580E+02	96.91	0.128	-	sM
1842.00	230.56	29.	41.	1.226E+03	63.97	0.118	-	s
1933.25	241.98	40.	45.	1.381E+03	66.45	0.312	PB-214	l

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	596.11	74.71	110.	21.	0.008	131.51	0.813
Pb-212	615.42	77.12	101.	50.	0.018	63.66	0.815s
Pb-212	699.26	87.61	77.	29.	0.011	83.65	0.825
Th-234	739.87	92.69	70.	16.	0.006	160.46	0.830s
Pa-234	785.48	98.40	61.	3.	0.001	689.27	0.836s
U-235	1148.22	143.78	63.	8.	0.003	282.76	0.881
U-235	1290.90	161.63	50.	-2.	-0.001	1071.53	0.900
U-235	1483.34	185.70	68.	23.	0.008	111.87	0.922D
Ra-226	1487.34	186.20	75.	12.	0.005	205.28	0.922D
Pb-212	1905.18	238.47	36.	155.	0.057	20.65	0.493s
Pb-214	1930.78	241.67	68.	3.	0.001	288.15	0.976s
Ac-228	2158.88	270.20	46.	16.	0.006	133.59	1.003s
Pb-214	2358.18	295.13	25.	56.	0.021	36.07	0.375s
Pb-212	2401.17	300.50	35.	8.	0.003	215.66	1.032
Ac-228	2702.35	338.17	38.	19.	0.007	92.90	1.069s
Pb-214	2810.79	351.73	26.	98.	0.036	25.20	0.226s
Tl-208	4660.09	582.98	15.	67.	0.025	28.58	0.434s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-214	4870.06	609.23	14.	116.	0.043	19.39	0.927s
Eu-154	5797.35	725.15	29.	-5.	-0.002	309.61	1.427s
Bi-214	6135.85	767.46	33.	-6.	-0.002	363.19	1.468s
Bi-212	6282.56	785.80	27.	3.	0.001	452.47	1.483s
Ac-228	6345.63	793.68	17.	9.	0.003	149.32	1.491s
Tl-208	6880.44	860.52	19.	11.	0.004	130.48	1.550s
Ac-228	7286.62	911.28	24.	28.	0.010	52.04	1.595s
Pa-234	7565.81	946.17	29.	-2.	-0.001	631.24	1.626s
Ac-228	7717.13	965.08	39.	5.	0.002	389.67	1.642s
Ac-228	7747.75	968.91	33.	18.	0.007	101.07	1.646s
Bi-214	8962.48	1120.68	33.	7.	0.003	167.10	1.777s
Eu-154	10193.17	1274.42	30.	-3.	-0.001	504.53	1.909s
Co-60	10658.10	1332.49	20.	-3.	-0.001	410.12	1.957s
Bi-214	11022.77	1378.04	6.	11.	0.004	87.74	1.994s
K-40	11686.20	1460.89	18.	551.	0.204	8.38	1.504s
Bi-214	14121.49	1764.93	6.	12.	0.004	80.11	2.306s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	2.0478E-01					3.65E+11	
			911.07	2.048E-01	?(P	8.387E-02	2.60E+01	2.90E+01 G
			968.90	2.319E-01	? P	1.716E-01	5.05E+01	1.75E+01 GA
			338.40	1.773E-01	? P	1.328E-01	4.65E+01	1.20E+01 GA
			964.77	2.089E-01	?	6.514E-01	1.95E+02	4.99E+00 GA
			463.00	-5.967E-02	% P	3.805E-01	1.33E+03	4.40E+00 GA
			794.95	3.978E-01	? P	4.466E-01	7.47E+01	4.25E+00 GA
			270.25	4.333E-01	?	4.410E-01	6.68E+01	3.46E+00 GA
Am-241	I	-4.4241E-03					3.65E+11	
			59.54	-4.424E-03	%(	1.852E-01	2.54E+03	3.63E+01 G
Bi-214	N	4.1040E-01					3.65E+11	
			609.69	4.104E-01	(P	3.067E-02	9.69E+00	4.61E+01 G
			1764.51	2.657E-01	- P	1.243E-01	4.01E+01	1.59E+01 GA
			1120.28	1.231E-01	- P	2.199E-01	8.35E+01	1.50E+01 GA
			768.36	-2.162E-01	- P	5.230E-01	1.82E+02	4.89E+00 GA
			1377.65	7.725E-01	+	4.001E-01	4.39E+01	4.02E+00 GA
			934.05	0.000E+00	-	1.604E-01	1.00E+03	3.17E+00 GA
			1407.98	-2.237E-03	% P	2.779E-01	1.00E+03	2.48E+00 GA
			1509.19	0.000E+00	-	3.329E-01	1.00E+03	2.19E+00 GA
			665.45	0.000E+00	-	1.064E+00	1.00E+03	1.56E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	-1.2599E-03					3.65E+11	
			1173.24	-1.260E-03	%(	2.774E-02	1.34E+03	9.99E+01 G
			1332.50	-9.014E-03	+	2.929E-02	2.05E+02	1.00E+02 G
Cs-137	I	-1.6747E-04					3.65E+11	
			661.66	-1.675E-04	%(	2.443E-02	8.86E+03	8.46E+01 G
Eu-154	I	-2.4452E-02					3.65E+11	
			1274.80	-2.445E-02	?(	9.908E-02	2.52E+02	3.55E+01 G
			123.10	1.017E-03	%	4.146E-02	2.48E+03	4.05E+01 GA
			723.30	-4.777E-02	+	1.168E-01	1.55E+02	1.97E+01 GA
K-40	N	1.5692E+01					3.65E+11	
			1460.80	1.569E+01	(P	2.815E-01	4.19E+00	1.07E+01 G
Pb-212	N	3.2561E-01					3.65E+11	
			238.63	3.256E-01	(P	2.959E-02	1.03E+01	4.31E+01 G
			77.11	4.375E-01	+	2.055E-01	3.18E+01	1.75E+01 GA
			74.81	3.530E-01	P	4.171E-01	6.58E+01	9.60E+00 GA
			87.20	5.686E-01	+ P	3.971E-01	4.18E+01	6.30E+00 GA
			300.09	2.575E-01	-	4.329E-01	1.08E+02	3.27E+00 GA
Pb-214	N	2.9804E-01					3.65E+11	
			351.79	2.980E-01	(P	3.643E-02	1.26E+01	3.71E+01 G
			295.22	2.942E-01	P	6.222E-02	1.80E+01	1.92E+01 GA
			241.92	3.428E-02	- P	2.355E-01	1.44E+02	7.47E+00 GA
Ra-226	N	2.8541E-01					3.65E+11	
			186.20	2.854E-01	(	4.638E-01	1.03E+02	3.60E+00 G
Th-234	N	3.1162E-01					3.65E+11	
			92.60	3.116E-01	?(	3.908E-01	8.02E+01	5.60E+00 G
Tl-208	N	1.2352E-01					3.65E+11	
			583.14	1.235E-01	(P	1.647E-02	1.43E+01	8.60E+01 G
			860.47	1.850E-01	?	1.758E-01	6.52E+01	1.20E+01 GA
U-235	N	3.4655E-02					3.65E+11	
			185.70	3.466E-02	(	2.959E-02	5.59E+01	5.40E+01 G
			143.76	6.397E-02		1.444E-01	1.41E+02	1.05E+01 GA
			163.35	-3.257E-02	-	2.849E-01	5.36E+02	4.70E+00 GA

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_011.An1

? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Pa-234	98.40	61.	3.	0.001	689.27	1.346E-02
Eu-154	725.15	29.	-5.	-0.002	309.61	-4.777E-02
Bi-212	785.80	27.	3.	0.001	452.47	3.243E-01
Pa-234	946.17	29.	-2.	-0.001	631.24	-4.522E-02
Eu-154	1274.42	30.	-3.	-0.001	504.53	-2.445E-02
Co-60	1332.49	20.	-3.	-0.001	410.12	-9.014E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.0478E-01	2.0478E-01	1.2418E-01	1.2500E-01	8.387E-02
Am-241 #A	-4.4241E-03	-4.4241E-03	2.2515E-01	2.2515E-01	1.852E-01
Bi-212 #A	0.0000E+00	0.0000E+00	1.8666E-01	1.8666E-01	2.732E-01
Bi-214	4.1040E-01	4.1040E-01	8.6130E-02	9.0845E-02	3.067E-02
Co-60 #A	-1.2599E-03	-1.2599E-03	3.3872E-02	3.3872E-02	2.774E-02
Cs-137 #A	-1.6747E-04	-1.6747E-04	2.9679E-02	2.9679E-02	2.443E-02
Eu-152 #A	0.0000E+00	0.0000E+00	3.6977E-02	3.6977E-02	8.117E-02
Eu-154 #A	-2.4452E-02	-2.4452E-02	1.2337E-01	1.2338E-01	9.908E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_011.An1

K-40	1.5692E+01	1.5692E+01	1.3586E+00	1.7473E+00	2.815E-01
Pa-234 #A	0.0000E+00	0.0000E+00	6.8524E-02	6.8524E-02	3.259E-02
Pb-212	3.2561E-01	3.2561E-01	6.9474E-02	7.3732E-02	2.959E-02
Pb-214	2.9804E-01	2.9804E-01	8.2244E-02	8.4887E-02	3.643E-02
Ra-226 A	2.8541E-01	2.8541E-01	5.8587E-01	5.8627E-01	4.638E-01
Th-234 #A	3.1162E-01	3.1162E-01	5.0004E-01	5.0082E-01	3.908E-01
Tl-208	1.2352E-01	1.2352E-01	3.8976E-02	3.9927E-02	1.647E-02
U-235	3.4655E-02	3.4655E-02	3.8769E-02	3.8857E-02	2.959E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (230.4 to 2041.3 keV) 1.709E+01 pCi/g
Total Decayed Activity (230.4 to 2041.3 keV) 1.7088575E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614011949010
File : 12_20140108_010
Cal : 08-JAN-2014 07:54:39,03-JAN-2014 19:51:11
IDF : 1.0
PDF : 1.0

Lab ID : 251449-005
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 03-JAN-2014
Sample Amount : 323.67 g

Client ID : 04-PD-D0034-05
Acct : ITSI (JG)
Time : 08-JAN-2014 17:03
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.19 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.108	0.332		.41068	.41079	-0.040	u
Bismuth-212	0.00242	0.222		.26927	.26927	-0.0025	u
Bismuth-214	0.240	0.0486		.079497	.081265	-0.052	u
Cesium-137	-0.00638	0.0234	0.07	.029327	.029331	-0.0069	u
Cobalt-60	0.00113	0.0339		.0022892	.0022905	0	u
Europium-152	-0.000966	0.0582		.070779	.070779	-0.00031	u
Europium-154	-0.0358	0.102		.12854	.12857	-0.013	u
Lead-212	0.296	0.0361		.07706	.080271	-0.016	u
Lead-214	0.321	0.0475		.10083	.10335	-0.0040	u
Potassium-40	18.5	0.263		1.5038	1.9857	-0.36	u
Protactinium-234	0.0152	0.154		.18952	.18953	0.015	u
Radium-226	0.566	0.465	1.3	.60924	.61074	-0.082	u
Thallium-208	0.141	0.0151		.039135	.04037	0.0020	u
Thorium-232 (By Actinium-228)	0.140	0.0826		.11337	.11379	0.019	u
Thorium-234	0.0434	0.481		.58677	.58678	-0.034	u
Uranium-235	0.0205	0.0323		.040737	.040767	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-05
Sample Description: 251449-005, 206637

Detector: HPGE12 50-TP32731A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:53
Acquisition Time: 1/8/2014 17:03:26
Analysis Time: 1/8/2014 17:48
Analysis Quantity: 3.237E+02 g

Spectrum ID: 12_20140108_010
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2705 sec
Dead Time: 0.19 %

Efficiency: HPGE12 S23325 12_20140103002_EffCal
Efficiency Cal Date: 1/3/2014 19:51
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		1.398E-01	1.134E-01	1.138E-01	8.262E-02
Am-241	#AB	-1.076E-01	4.107E-01	4.108E-01	3.316E-01
Bi-212	#AB	2.425E-03	2.693E-01	2.693E-01	2.216E-01
Bi-214	#	2.395E-01	7.950E-02	8.126E-02	4.859E-02
Co-60	#AB	1.131E-03	2.289E-03	2.290E-03	3.386E-02
Cs-137	#AB	-6.376E-03	2.933E-02	2.933E-02	2.340E-02
Eu-152	#AB	-9.663E-04	7.078E-02	7.078E-02	5.821E-02
Eu-154	#AB	-3.583E-02	1.285E-01	1.286E-01	1.021E-01
K-40		1.852E+01	1.504E+00	1.986E+00	2.628E-01
Pa-234	#AB	1.518E-02	1.895E-01	1.895E-01	1.542E-01
Pb-212		2.964E-01	7.706E-02	8.027E-02	3.608E-02
Pb-214		3.213E-01	1.008E-01	1.033E-01	4.745E-02
Ra-226		5.655E-01	6.092E-01	6.107E-01	4.654E-01
Th-234	#AB	4.344E-02	5.868E-01	5.868E-01	4.806E-01
Tl-208		1.413E-01	3.914E-02	4.037E-02	1.512E-02
U-235	AB	2.047E-02	4.074E-02	4.077E-02	3.226E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.031E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:48:38
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_010.An1

Sample description
     251449-005, 206637


Spectrum Filename: C:\User\SPC\Det12\12_20140108_010.An1

Acquisition information
       Start time:                 1/8/2014 17:03:26
       Live time:               2700
       Real time:               2705
       Dead time:                  0.19 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_Soil 250ml TunaCan_01-03-2014.Clb
     HPGE12 S23325 12_20140103002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:54:39
            Zero offset:           0.094 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.482E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 19:51:11
            Type:                  Polynomial
            Uncertainty:           1.037 %
            Coefficients:         -0.383371  -4.365972   0.460548
                                  -0.057677   0.002462  -0.000050

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2042.47keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2367E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2367E+02) =
                                   8.3502E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:48:38
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_010.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:53:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	12_2014-01-04_2135.PBC 1/4/2014 21:35:44
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0622

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.90	15.	98.68	0.85	1.432E-02	74.81	9.600	PBC<MDA	Pb212
77.20	26.	57.96	0.85	1.568E-02	77.11	17.500	2.908E-01	Pb212
87.11	23.	54.05	0.86	2.134E-02	87.20	6.300	5.229E-01	Pb212
93.06	2.	675.37	0.87	2.405E-02	92.60	5.600	PBC<MDA	Th234
97.61	5.	238.51	0.87	2.667E-02	98.44	25.100	PBC<MDA	Pa234
122.00	8.	132.72	0.90	3.399E-02	121.87	28.590	PBC<MDA	Eu152
					121.87	28.590	2.589E-02	Eu152
144.63	11.	105.21	0.92	3.704E-02	143.76	10.500	PBC<MDA	U235
161.91	2.	439.65	0.93	3.780E-02	163.35	4.700	PBC<MDA	U235
185.68	13.	99.52	0.95	3.737E-02	185.70	54.000	PBC<MDA	U235
186.18	25.	53.86	0.95	3.735E-02	186.20	3.600	5.655E-01	Ra226
238.62	141.	13.00	0.93	3.424E-02	238.63	43.100	2.964E-01	Pb212
241.50	8.	94.60	1.01	3.401E-02	241.92	7.470	PBC<MDA	Pb214
270.95	18.	54.68	1.03	3.207E-02	270.25	3.460	5.060E-01	Ac228
295.25	85.	16.84	0.20	3.045E-02	295.22	19.200	4.161E-01	Pb214
300.04	7.	121.18	1.06	3.014E-02	300.09	3.270	PBC<MDA	Pb212
338.23	20.	41.32	1.09	2.791E-02	338.40	12.010	1.805E-01	Ac228
351.90	130.	14.05	0.61	2.720E-02	351.79	37.100	3.577E-01	Pb214
463.23	9.	81.74	1.20	2.250E-02	463.00	4.400	PBC<MDA	Ac228
583.13	75.	12.62	1.10	1.911E-02	583.14	86.000	1.413E-01	Tl208
609.30	90.	12.47	0.60	1.853E-02	609.69	46.090	2.826E-01	Bi214
667.74	3.	246.77	1.36	1.740E-02	665.45	1.560	PBC<MDA	Bi214
722.96	4.	189.18	1.40	1.640E-02	723.30	19.700	PBC<MDA	Eu154
					723.30	19.700	4.036E-02	Eu154
769.00	4.	209.32	1.44	1.571E-02	768.36	4.890	PBC<MDA	Bi214
785.24	5.	134.95	1.45	1.546E-02	785.42	2.000	PBC<MDA	Bi212
794.64	10.	65.57	1.46	1.533E-02	794.95	4.250	4.840E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:48:38
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_010.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
861.38	9.	79.59	1.51	1.448E-02	860.47	12.000	PBC<MDA	Tl208
883.53	1.	624.14	1.52	1.421E-02	883.24	15.000	PBC<MDA	Pa234
911.53	42.	15.43	0.50	1.389E-02	911.07	29.000	2.736E-01	Ac228
934.04	2.	185.02	1.56	1.365E-02	934.05	3.170	PBC<MDA	Bi214
946.11	7.	85.65	1.57	1.352E-02	946.00	12.000	PBC<MDA	Pa234
968.88	11.	70.97	1.58	1.329E-02	968.90	17.460	PBC<MDA	Ac228
1120.35	10.	65.65	1.68	1.193E-02	1120.28	15.040	PBC<MDA	Bi214
1333.36	5.	113.12	1.82	1.043E-02	1332.50	99.980	PBC<MDA	Co60
1379.20	1.	426.94	1.84	1.016E-02	1377.65	4.020	PBC<MDA	Bi214
1408.99	1.	442.31	1.86	9.982E-03	1407.98	2.480	1.540E-01	Bi214
					1408.08	21.210	1.800E-02	Eu152
					1408.08	21.210	1.800E-02	Eu152
1409.40	1.	450.30	1.86	9.983E-03	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	1.720E-02	Eu152
1460.95	635.	3.97	1.70	9.686E-03	1460.80	10.700	1.852E+01	K40

No unknown peaks passed sensitivity test.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	473.62	59.28	84.	-7.	-0.003	381.63	0.837s
Pb-212	598.61	74.90	100.	15.	0.006	197.36	0.851
Pb-212	616.98	77.20	99.	26.	0.010	115.91	0.854s
Pb-212	696.30	87.11	64.	23.	0.008	108.09	0.863
Th-234	743.91	93.06	81.	2.	0.001	1350.73	0.868s
Pa-234	780.35	97.61	56.	5.	0.002	477.03	0.874s
Eu-152	975.50	122.00	54.	8.	0.003	265.45	0.896s
Eu-154	982.48	122.87	66.	-4.	-0.001	617.52	0.897s
U-235	1156.59	144.63	62.	11.	0.004	210.42	0.916
U-235	1294.82	161.91	43.	2.	0.001	879.30	0.934s
U-235	1485.19	185.70	82.	13.	0.005	199.04	0.955D
Ra-226	1489.19	186.20	75.	25.	0.009	107.73	0.955D
Pb-212	1908.66	238.62	55.	141.	0.052	26.00	0.929
Pb-214	1931.65	241.50	90.	8.	0.003	189.20	1.005s
Ac-228	2167.31	270.95	52.	18.	0.007	109.35	1.031
Pb-214	2361.76	295.25	30.	79.	0.029	33.69	0.202s
Pb-212	2400.05	300.04	32.	7.	0.003	242.35	1.057s
Ac-228	2705.63	338.23	37.	20.	0.007	82.63	1.091
Pb-214	2815.24	351.93	44.	105.	0.039	27.93	0.605s
Eu-152	3289.70	411.23	39.	-2.	-0.001	798.34	1.153s
Ac-228	3705.72	463.23	28.	9.	0.003	163.47	1.197
Tl-208	4664.92	583.13	12.	75.	0.028	25.24	1.096
Bi-214	4874.47	609.32	33.	66.	0.024	28.08	1.317s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:48:38
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_010.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cs-137	5302.43	662.81	23.	-3.	-0.001	459.99	1.357s
Bi-214	5341.81	667.74	22.	3.	0.001	493.55	1.360s
Eu-154	5783.56	722.96	30.	4.	0.002	378.36	1.405s
Bi-214	6151.85	769.00	37.	4.	0.002	418.64	1.439s
Eu-152	6235.36	779.44	22.	-1.	0.000	1192.02	1.447s
Bi-212	6281.77	785.24	21.	5.	0.002	269.89	1.452s
Ac-228	6356.95	794.64	17.	10.	0.004	131.13	1.459
Tl-208	6890.85	861.38	20.	9.	0.003	159.19	1.507s
Pa-234	7068.05	883.53	21.	1.	0.000	1248.27	1.523s
Ac-228	7291.74	911.50	21.	18.	0.007	60.14	1.543s
Bi-214	7472.08	934.04	20.	2.	0.001	370.04	1.559s
Pa-234	7568.58	946.11	14.	7.	0.003	171.29	1.568s
Ac-228	7733.84	966.77	48.	-8.	-0.003	293.67	1.581s
Ac-228	7750.72	968.88	31.	11.	0.004	141.95	1.583
Bi-214	8962.28	1120.35	32.	10.	0.004	131.29	1.685s
Co-60	9377.81	1172.31	29.	-5.	-0.002	335.88	1.719s
Eu-154	10201.07	1275.24	30.	-4.	-0.002	358.81	1.782s
Co-60	10665.85	1333.36	14.	5.	0.002	226.25	1.817s
Bi-214	11032.43	1379.20	17.	1.	0.001	853.87	1.843s
Bi-214	11273.94	1409.40	13.	1.	0.000	900.61	1.860s
Eu-152	11270.74	1408.99	14.	1.	0.000	884.62	1.860s
K-40	11686.26	1460.95	14.	621.	0.230	7.94	1.696

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.3979E-01				3.65E+11	
			911.07	1.398E-01	&(P	8.262E-02 3.01E+01	2.90E+01 G
			968.90	1.412E-01	P	1.725E-01 7.10E+01	1.75E+01 GA
			338.40	1.805E-01	P	1.310E-01 4.13E+01	1.20E+01 GA
			964.77	-3.931E-01	& P	7.537E-01 1.47E+02	4.99E+00 GA
			463.00	2.768E-01	P	3.849E-01 8.17E+01	4.40E+00 GA
			794.95	4.840E-01		4.594E-01 6.56E+01	4.25E+00 GA
			270.25	5.060E-01	P	4.675E-01 5.47E+01	3.46E+00 GA
Am-241	I	-1.0761E-01				3.65E+11	
			59.54	-1.076E-01	?(	3.316E-01 1.91E+02	3.63E+01 G
Bi-212	N	2.4247E-03				3.65E+11	
			727.17	2.425E-03	%(	2.216E-01 5.55E+03	1.18E+01 G
			1620.56	0.000E+00	-	2.952E-01 1.00E+03	2.75E+00 GA
			785.42	5.101E-01	&	1.071E+00 1.35E+02	2.00E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:48:38
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_010.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	2.3953E-01					3.65E+11	
			609.69	2.395E-01	?(P	4.859E-02	1.40E+01	4.61E+01 G
			1764.51	-8.742E-02	% P	1.058E-01	1.00E+03	1.59E+01 GA
			1120.28	1.788E-01	? P	2.264E-01	6.56E+01	1.50E+01 GA
			768.36	1.711E-01	-	5.741E-01	2.09E+02	4.89E+00 GA
			1377.65	1.061E-01	-	7.316E-01	4.27E+02	4.02E+00 GA
			934.05	1.653E-01	& P	7.472E-01	1.85E+02	3.17E+00 GA
			1407.98	1.471E-01	-	1.068E+00	4.50E+02	2.48E+00 GA
			1509.19	4.610E-02	%	1.108E+00	1.47E+03	2.19E+00 GA
			665.45	3.184E-01	?	1.256E+00	2.47E+02	1.56E+00 GA
Co-60	T	1.1306E-03					3.65E+11	
			1173.24	-1.272E-02	?(	3.386E-02	1.68E+02	9.99E+01 G
			1332.50	1.497E-02	?(	2.565E-02	1.13E+02	1.00E+02 G
Cs-137	I	-6.3757E-03					3.65E+11	
			661.66	-6.376E-03	?(	2.340E-02	2.30E+02	8.46E+01 G
Eu-152	I	-9.6629E-04					3.65E+11	
			344.30	-9.663E-04	%(	5.821E-02	3.66E+03	2.70E+01 G
			121.87	2.589E-02	?	5.460E-02	1.33E+02	2.86E+01 GA
			1408.08	1.800E-02	?	1.285E-01	4.42E+02	2.12E+01 GA
			964.05	1.115E-03	%	1.646E-01	8.97E+03	1.46E+01 GA
			778.90	-1.739E-02	&	1.686E-01	5.96E+02	1.30E+01 GA
			411.09	-1.251E-01	+	8.110E-01	3.99E+02	2.26E+00 GA
Eu-154	I	-3.5825E-02					3.65E+11	
			1274.80	-3.583E-02	?(	1.021E-01	1.79E+02	3.55E+01 G
			123.10	-8.426E-03	+	4.226E-02	3.09E+02	4.05E+01 GA
			723.30	4.036E-02	?	1.215E-01	1.89E+02	1.97E+01 GA
K-40	N	1.8520E+01					3.65E+11	
			1460.80	1.852E+01	(P	2.628E-01	3.97E+00	1.07E+01 G
Pa-234	N	1.5183E-02					3.65E+11	
			883.24	1.518E-02	?(	1.542E-01	6.24E+02	1.50E+01 G
			98.44	2.084E-02	&	8.029E-02	2.39E+02	2.51E+01 GA
			946.00	1.329E-01	?	1.682E-01	8.56E+01	1.20E+01 GA
Pb-212	N	2.9636E-01					3.65E+11	
			238.63	2.964E-01	(	3.608E-02	1.30E+01	4.31E+01 G
			77.11	2.908E-01	?	2.611E-01	5.80E+01	1.75E+01 GA
			74.81	3.344E-01		5.246E-01	9.87E+01	9.60E+00 GA
			87.20	5.229E-01	+	4.291E-01	5.40E+01	6.30E+00 GA
			300.09	2.187E-01	-	4.147E-01	1.21E+02	3.27E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:48:38
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_010.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   3.2126E-01                                     3.65E+11
                           351.79 3.213E-01  (P 4.745E-02 1.40E+01 3.71E+01 G
                           295.22 4.161E-01   P 6.791E-02 1.68E+01 1.92E+01 GA
                           241.92 1.003E-01 - P 2.685E-01 9.46E+01 7.47E+00 GA

Ra-226   N   5.6554E-01                                     3.65E+11
                           186.20 5.655E-01  (  4.654E-01 5.39E+01 3.60E+00 G

Th-234   N   4.3441E-02                                     3.65E+11
                            92.60 4.344E-02 ?(  4.806E-01 6.75E+02 5.60E+00 G

Tl-208   N   1.4130E-01                                     3.65E+11
                           583.14 1.413E-01  (P 1.512E-02 1.26E+01 8.60E+01 G
                           860.47 1.556E-01 ?   1.847E-01 7.96E+01 1.20E+01 GA

U-235    N   2.0467E-02                                     3.65E+11
                           185.70 2.047E-02  (  3.226E-02 9.95E+01 5.40E+01 G
                           143.76 8.773E-02     1.457E-01 1.05E+02 1.05E+01 GA
                           163.35 3.710E-02 ?   2.655E-01 4.40E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:48:38
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_010.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.28	84.	-7.	-0.003	381.63	-1.076E-01
Th-234	93.06	81.	2.	0.001	1350.73	4.344E-02
Pa-234	97.61	56.	5.	0.002	477.03	2.084E-02
Eu-152	122.00	54.	8.	0.003	265.45	2.589E-02
Eu-154	122.87	66.	-4.	-0.001	617.52	-8.426E-03
Eu-152	411.23	39.	-2.	-0.001	798.34	-1.251E-01
Cs-137	662.81	23.	-3.	-0.001	459.99	-6.376E-03
Eu-154	722.96	30.	4.	0.002	378.36	4.036E-02
Eu-152	779.44	22.	-1.	0.000	1192.02	-1.739E-02
Bi-212	785.24	21.	5.	0.002	269.89	5.101E-01
Pa-234	883.53	21.	1.	0.000	1248.27	1.518E-02
Pa-234	946.11	14.	7.	0.003	171.29	1.329E-01
Co-60	1172.31	29.	-5.	-0.002	335.88	-1.272E-02
Eu-154	1275.24	30.	-4.	-0.002	358.81	-3.583E-02
Co-60	1333.36	14.	5.	0.002	226.25	1.497E-02
Eu-152	1408.99	14.	1.	0.000	884.62	1.800E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.3979E-01	1.3979E-01	1.1337E-01	1.1379E-01	8.262E-02
Am-241 #A	-1.0761E-01	-1.0761E-01	4.1068E-01	4.1079E-01	3.316E-01
Bi-212 #A	2.4247E-03	2.4247E-03	2.6927E-01	2.6927E-01	2.216E-01
Bi-214 #	2.3953E-01	2.3953E-01	7.9497E-02	8.1265E-02	4.859E-02
Co-60 #A	1.1306E-03	1.1306E-03	2.2892E-03	2.2905E-03	3.386E-02
Cs-137 #A	-6.3757E-03	-6.3757E-03	2.9327E-02	2.9331E-02	2.340E-02
Eu-152 #A	-9.6629E-04	-9.6629E-04	7.0779E-02	7.0779E-02	5.821E-02
Eu-154 #A	-3.5825E-02	-3.5825E-02	1.2854E-01	1.2857E-01	1.021E-01
K-40	1.8520E+01	1.8520E+01	1.5038E+00	1.9857E+00	2.628E-01
Pa-234 #A	1.5183E-02	1.5183E-02	1.8952E-01	1.8953E-01	1.542E-01
Pb-212	2.9636E-01	2.9636E-01	7.7060E-02	8.0271E-02	3.608E-02
Pb-214	3.2126E-01	3.2126E-01	1.0083E-01	1.0335E-01	4.745E-02
Ra-226	5.6554E-01	5.6554E-01	6.0924E-01	6.1074E-01	4.654E-01
Th-234 #A	4.3441E-02	4.3441E-02	5.8677E-01	5.8678E-01	4.806E-01
Tl-208	1.4130E-01	1.4130E-01	3.9135E-02	4.0370E-02	1.512E-02
U-235 A	2.0467E-02	2.0467E-02	4.0737E-02	4.0767E-02	3.226E-02

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:48:38
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_010.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.5 to  2042.5 keV)     2.008E+01  pCi/g
 Total Decayed Activity (  238.5 to  2042.5 keV) 2.0084314E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE06
Seqnum : 1554011902012
File : 6_20140108_012
Cal : 08-JAN-2014 06:45:06,06-JAN-2014 16:42:07
IDF : 1.0
PDF : 1.0

Lab ID : 251449-006
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 06-JAN-2014
Sample Amount : 340.92 g

Client ID : 04-PD-D0034-06
Acct : ITSI (JG)
Time : 08-JAN-2014 17:53
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0812	0.126		.15945	.15961	-0.040	u
Bismuth-212	0.150	0.152		.20384	.20412	-0.0025	u
Bismuth-214	0.318	0.0323		.073906	.07723	-0.052	u
Cesium-137	0.00582	0.0203	0.07	.025451	.025454	-0.0069	u
Cobalt-60	-0.00184	0.0280		.064534	.064534	0	u
Europium-152	-0.00269	0.0489		.059628	.059628	-0.00031	u
Europium-154	0	0.167		.018091	.018091	-0.013	u
Lead-212	0.378	0.0283		.066497	.07242	-0.016	u
Lead-214	0.370	0.0347		.08809	.091874	-0.0040	u
Potassium-40	14.4	0.289		1.2196	1.5846	-0.36	u
Protactinium-234	-0.0236	0.127		.15739	.1574	0.015	u
Radium-226	0.459	0.412	1.3	.5328	.53393	-0.082	u
Thallium-208	0.109	0.0134		.030453	.031406	0.0020	u
Thorium-232 (By Actinium-228)	0.508	0.0143		.11153	.11702	0.019	u
Thorium-234	0.117	0.374		.46198	.4621	-0.034	u
Uranium-235	0.0330	0.0264		.034459	.03455	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-06
Sample Description: 251449-006, 206637

Detector: HPGE06 51-TP32744A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:55
Acquisition Time: 1/8/2014 17:53:25
Analysis Time: 1/8/2014 18:38
Analysis Quantity: 3.409E+02 g

Spectrum ID: 6_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE06 S23325 6_20140104002_EffCal
Efficiency Cal Date: 1/6/2014 16:42
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		5.080E-01	1.115E-01	1.170E-01	1.426E-02
Am-241	#AB	8.123E-02	1.594E-01	1.596E-01	1.255E-01
Bi-212	#AB	1.505E-01	2.038E-01	2.041E-01	1.515E-01
Bi-214		3.185E-01	7.391E-02	7.723E-02	3.233E-02
Co-60	#AB	-1.836E-03	6.453E-02	6.453E-02	2.800E-02
Cs-137	#AB	5.818E-03	2.545E-02	2.545E-02	2.032E-02
Eu-152	#AB	-2.691E-03	5.963E-02	5.963E-02	4.887E-02
Eu-154	#AB	0.000E+00	1.809E-02	1.809E-02	1.668E-01
K-40		1.445E+01	1.220E+00	1.585E+00	2.892E-01
Pa-234	#AB	-2.363E-02	1.574E-01	1.574E-01	1.268E-01
Pb-212		3.782E-01	6.650E-02	7.242E-02	2.828E-02
Pb-214		3.700E-01	8.809E-02	9.187E-02	3.472E-02
Ra-226	#	4.592E-01	5.328E-01	5.339E-01	4.123E-01
Th-234	AB	1.170E-01	4.620E-01	4.621E-01	3.742E-01
Tl-208	#	1.095E-01	3.045E-02	3.141E-02	1.340E-02
U-235	#	3.299E-02	3.446E-02	3.455E-02	2.641E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.698E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:38:35
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_012.An1

Sample description
     251449-006, 206637


Spectrum Filename: C:\User\SPC\Det6\6_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 17:53:25
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_Soil 250ml TunaCan_01-04-2014.Clb
     HPGE06 S23325 6_20140104002_EffCal


       Energy Calibration
            Created:               1/8/2014 06:45:06
            Zero offset:           0.078 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.421E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 16:42:07
            Type:                  Polynomial
            Uncertainty:           1.262 %
            Coefficients:         -0.387239  -4.158640   0.426222
                                  -0.050686   0.002155  -0.000042

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2041.45keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4092E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4092E+02) =
                                   7.9277E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:35
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:55:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	6_2014-01-07_0843.PBC 1/7/2014 08:43:34
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1094

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.61	22.	30.46	0.23	0.000E+00				
59.73	12.	98.14	0.80	1.193E-02	59.54	36.300	PBC<MDA	Am241
74.96	68.	18.41	0.81	2.409E-02	74.81	9.600	8.656E-01	Pb212
77.17	87.	15.71	0.82	2.566E-02	77.11	17.500	5.648E-01	Pb212
87.30	45.	30.31	0.23	3.202E-02	87.20	6.300	6.609E-01	Pb212
92.54	8.	197.39	0.83	3.489E-02	92.60	5.600	PBC<MDA	Th234
93.45	29.	41.04	0.42	3.530E-02				
121.77	3.	395.48	0.86	4.418E-02	121.87	28.590	PBC<MDA	Eu152
123.23	9.	140.93	0.86	4.438E-02	123.10	40.460	PBC<MDA	Eu154
186.01	27.	52.23	0.93	4.488E-02	185.70	54.000	3.299E-02	U235
					186.20	3.600	4.952E-01	Ra226
					185.70	54.000	3.299E-02	U235
186.04	25.	58.02	0.93	4.485E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	4.592E-01	Ra226
238.55	231.	8.53	0.58	4.039E-02	238.63	43.100	3.782E-01	Pb212
239.66	9.	175.64	0.99	4.010E-02	241.92	7.470	PBC<MDA	Pb214
270.19	51.	27.92	0.61	3.767E-02	270.25	3.460	1.140E+00	Ac228
295.12	112.	14.87	0.58	3.571E-02	295.22	19.200	4.806E-01	Pb214
299.51	6.	131.45	1.05	3.534E-02	300.09	3.270	PBC<MDA	Pb212
305.36	12.	44.72	0.13	3.495E-02				
338.28	55.	27.01	0.51	3.270E-02	338.40	12.010	4.127E-01	Ac228
351.72	149.	11.90	0.29	3.187E-02	351.79	37.100	3.700E-01	Pb214
463.10	10.	91.17	1.21	2.644E-02	463.00	4.400	PBC<MDA	Ac228
583.26	112.	9.45	0.52	2.255E-02	583.14	86.000	1.696E-01	Tl208
609.26	109.	10.20	0.23	2.187E-02	609.69	46.090	3.185E-01	Bi214
661.71	3.	218.74	1.39	2.067E-02	661.66	84.620	PBC<MDA	Cs137
727.58	12.	67.72	1.45	1.936E-02	727.17	11.800	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:35
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
768.09	11.	67.58	1.49	1.864E-02	768.36	4.890	3.507E-01	Bi214
777.51	4.	143.35	1.49	1.846E-02	778.90	12.990	PBC<MDA	Eu152
795.23	6.	136.19	1.51	1.820E-02	794.95	4.250	PBC<MDA	Ac228
859.82	2.	314.15	1.56	1.722E-02	860.47	12.000	PBC<MDA	Tl208
911.11	83.	10.98	0.38	1.654E-02	911.07	29.000	5.080E-01	Ac228
964.75	7.	135.65	1.65	1.589E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.612E-01	Ac228
964.79	7.	147.37	1.65	1.588E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.446E-01	Ac228
969.64	18.	53.46	1.65	1.583E-02	968.90	17.460	1.917E-01	Ac228
1120.29	12.	69.74	1.77	1.425E-02	1120.28	15.040	PBC<MDA	Bi214
1173.67	-1.	429.05	1.82	1.377E-02	1173.24	99.860	PBC<MDA	Co60
1378.63	10.	50.22	1.96	1.217E-02	1377.65	4.020	5.879E-01	Bi214
1408.32	7.	62.12	1.98	1.196E-02	1407.98	2.480	6.798E-01	Bi214
					1408.08	21.210	7.949E-02	Eu152
1460.90	634.	4.07	1.64	1.161E-02	1460.80	10.700	1.445E+01	K40

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
244.15	30.61	10.	22.	0.000E+00	60.92	0.228	-	s
746.11	93.45	65.	41.	1.154E+03	64.27	0.833	TH-234	D
2441.28	305.36	7.	12.	3.433E+02	89.44	0.128	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	477.00	59.73	63.	12.	0.004	196.29	0.796s
Pb-212	598.78	74.96	36.	75.	0.028	34.80	1.131s
Pb-212	616.41	77.17	49.	92.	0.034	33.59	0.658
Pb-212	697.43	87.30	54.	45.	0.017	60.63	0.232s
Th-234	739.81	92.60	114.	8.	0.003	394.79	0.832D
Eu-152	973.04	121.77	86.	3.	0.001	790.96	0.863s
Eu-154	984.76	123.23	82.	9.	0.003	281.85	0.864s
U-235	1136.69	142.23	82.	-14.	-0.005	187.83	0.886s
U-235	1305.69	163.36	101.	-16.	-0.006	189.30	0.906s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:35
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1486.77	186.01	88.	27.	0.010	104.46	0.930s
Ra-226	1487.06	186.04	95.	25.	0.009	116.03	0.930s
Pb-212	1906.92	238.55	52.	224.	0.083	17.07	0.576s
Pb-214	1915.82	239.66	115.	9.	0.003	351.29	0.987s
Ac-228	2160.00	270.19	32.	51.	0.019	55.85	0.608s
Pb-214	2359.38	295.12	31.	112.	0.042	29.75	0.584s
Pb-212	2394.48	299.51	37.	6.	0.002	262.90	1.046s
Ac-228	2704.59	338.28	29.	55.	0.020	54.01	0.506s
Pb-214	2812.06	351.72	36.	149.	0.055	23.81	0.289s
Ac-228	3702.88	463.10	33.	10.	0.004	182.33	1.206s
Tl-208	4665.13	583.39	14.	72.	0.027	27.82	1.320s
Bi-214	4872.12	609.26	23.	109.	0.040	20.39	0.231s
Cs-137	5291.65	661.71	27.	3.	0.001	437.48	1.391s
Eu-154	5801.71	725.46	36.	-6.	-0.002	300.36	1.446s
Bi-212	5818.68	727.58	26.	12.	0.004	135.45	1.450s
Bi-214	6142.80	768.09	22.	11.	0.004	135.17	1.486s
Eu-152	6218.12	777.51	15.	4.	0.001	286.70	1.495s
Ac-228	6359.91	795.23	29.	6.	0.002	272.38	1.509s
Tl-208	6876.71	859.82	28.	2.	0.001	628.29	1.565s
Pa-234	7073.14	884.37	22.	-2.	-0.001	665.97	1.584s
Ac-228	7287.12	911.11	0.	83.	0.031	21.95	0.378s
Eu-152	7716.31	964.75	42.	7.	0.003	271.30	1.651s
Ac-228	7716.64	964.79	44.	7.	0.002	294.74	1.651s
Ac-228	7755.47	969.64	38.	18.	0.007	106.92	1.655s
Bi-214	8961.09	1120.29	30.	12.	0.004	139.48	1.775s
Bi-214	11028.78	1378.63	7.	10.	0.004	100.44	1.964s
Eu-152	11266.49	1408.32	6.	7.	0.003	124.23	1.985s
K-40	11687.40	1460.90	28.	611.	0.226	8.14	1.640

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	5.0803E-01				3.65E+11	
			911.07	5.080E-01	(	1.426E-02 1.10E+01 2.90E+01	G
			968.90	1.917E-01	-	1.516E-01 5.35E+01 1.75E+01	GA
			338.40	4.127E-01		9.348E-02 2.70E+01 1.20E+01	GA
			964.77	2.446E-01	-	5.727E-01 1.47E+02 4.99E+00	GA
			463.00	2.421E-01	-	3.401E-01 9.12E+01 4.40E+00	GA
			794.95	2.215E-01	-	4.736E-01 1.36E+02 4.25E+00	GA
			270.25	1.140E+00	+	2.987E-01 2.79E+01 3.46E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:35
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_012.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	8.1233E-02					3.65E+11	
			59.54	8.123E-02	?(	1.255E-01	9.81E+01	3.63E+01 G
Bi-212	N	1.5049E-01					3.65E+11	
			727.17	1.505E-01	?(	1.515E-01	6.77E+01	1.18E+01 G
			1620.56	0.000E+00	-	2.335E-01	1.00E+03	2.75E+00 GA
			785.42	0.000E+00	&	8.524E-01	1.00E+03	2.00E+00 GA
Bi-214	N	3.1847E-01					3.65E+11	
			609.69	3.185E-01	(P	3.233E-02	1.02E+01	4.61E+01 G
			1764.51	-1.364E-01	% P	1.175E-01	1.00E+03	1.59E+01 GA
			1120.28	1.580E-01	- P	1.749E-01	6.97E+01	1.50E+01 GA
			768.36	3.507E-01	?	3.490E-01	6.76E+01	4.89E+00 GA
			1377.65	5.879E-01	+	3.753E-01	5.02E+01	4.02E+00 GA
			934.05	-2.687E-02	%	6.694E-01	1.52E+03	3.17E+00 GA
			1407.98	0.000E+00	-	2.306E-01	1.00E+03	2.48E+00 GA
			1509.19	-2.397E-02	% P	2.763E-01	1.00E+03	2.19E+00 GA
			665.45	-2.372E-01	% P	1.256E+00	3.90E+03	1.56E+00 GA
Co-60	T	-1.8357E-03					3.65E+11	
			1173.24	-1.836E-03	%(P	2.800E-02	4.29E+02	9.99E+01 G
			1332.50	-4.201E-03	% P	3.697E-02	1.00E+03	1.00E+02 G
Cs-137	I	5.8175E-03					3.65E+11	
			661.66	5.818E-03	?(	2.032E-02	2.19E+02	8.46E+01 G
Eu-152	I	-2.6911E-03					3.65E+11	
			344.30	-2.691E-03	%(	4.887E-02	1.11E+03	2.70E+01 G
			121.87	7.783E-03	?	5.022E-02	3.95E+02	2.86E+01 GA
			1408.08	7.949E-02	?	6.420E-02	6.21E+01	2.12E+01 GA
			964.05	8.934E-02	&	1.918E-01	1.36E+02	1.46E+01 GA
			778.90	4.958E-02	?	1.098E-01	1.43E+02	1.30E+01 GA
			411.09	-1.889E-03	%	6.778E-01	2.18E+04	2.26E+00 GA
K-40	N	1.4447E+01					3.65E+11	
			1460.80	1.445E+01	(P	2.892E-01	4.07E+00	1.07E+01 G
Pa-234	N	-2.3633E-02					3.65E+11	
			883.24	-2.363E-02	?(	1.268E-01	3.33E+02	1.50E+01 G
			98.44	0.000E+00	+	7.418E-02	1.00E+03	2.51E+01 GA
			946.00	0.000E+00	+	3.195E-01	1.00E+03	1.20E+01 GA
Pb-212	N	3.7821E-01					3.65E+11	
			238.63	3.782E-01	(P	2.828E-02	8.53E+00	4.31E+01 G
			77.11	5.994E-01	+ P	1.073E-01	1.68E+01	1.75E+01 GA
			74.81	9.606E-01	+	1.776E-01	1.74E+01	9.60E+00 GA
			87.20	6.609E-01	+ P	2.482E-01	3.03E+01	6.30E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:38:35
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          300.09 1.579E-01 - P 3.617E-01 1.31E+02 3.27E+00 GA

Pb-214   N   3.7000E-01                                     3.65E+11
                          351.79 3.700E-01  (  3.472E-02 1.19E+01 3.71E+01 G
                          295.22 4.806E-01     5.539E-02 1.49E+01 1.92E+01 GA
                          241.92 8.628E-02 &   2.450E-01 1.76E+02 7.47E+00 GA

Ra-226   N   4.5919E-01                                     3.65E+11
                          186.20 4.592E-01 &(  4.123E-01 5.80E+01 3.60E+00 G

Th-234   N   1.1702E-01                                     3.65E+11
                           92.60 1.170E-01  (  3.742E-01 1.97E+02 5.60E+00 G

Tl-208   N   1.0945E-01                                     3.65E+11
                          583.14 1.094E-01 ?(  1.340E-02 1.39E+01 8.60E+01 G
                          860.47 3.464E-02 &   1.755E-01 3.14E+02 1.20E+01 GA

U-235    N   3.2987E-02                                     3.65E+11
                          185.70 3.299E-02 ?(  2.641E-02 5.22E+01 5.40E+01 G
                          143.76-8.581E-02 -   1.274E-01 9.39E+01 1.05E+01 GA
                          163.35-2.111E-01 -   3.172E-01 9.46E+01 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:35
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_012.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.73	63.	12.	0.004	196.29	8.123E-02
Eu-152	121.77	86.	3.	0.001	790.96	7.783E-03
Eu-154	123.23	82.	9.	0.003	281.85	1.527E-02
U-235	142.23	82.	-14.	-0.005	187.83	-8.581E-02
U-235	163.36	101.	-16.	-0.006	189.30	-2.111E-01
U-235	186.01	88.	27.	0.010	104.46	3.299E-02
Ra-226	186.04	95.	25.	0.009	116.03	4.592E-01
Cs-137	661.71	27.	3.	0.001	437.48	5.818E-03
Eu-154	725.46	36.	-6.	-0.002	300.36	-4.504E-02
Bi-212	727.58	26.	12.	0.004	135.45	1.505E-01
Eu-152	777.51	15.	4.	0.001	286.70	4.958E-02
Pa-234	884.37	22.	-2.	-0.001	665.97	-2.363E-02
Eu-152	964.75	42.	7.	0.003	271.30	8.934E-02
Eu-152	1408.32	6.	7.	0.003	124.23	7.949E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	5.0803E-01	5.0803E-01	1.1153E-01	1.1702E-01	1.426E-02
Am-241 #A	8.1233E-02	8.1233E-02	1.5945E-01	1.5961E-01	1.255E-01
Bi-212 #A	1.5049E-01	1.5049E-01	2.0384E-01	2.0412E-01	1.515E-01
Bi-214	3.1847E-01	3.1847E-01	7.3906E-02	7.7230E-02	3.233E-02
Co-60 #A	-1.8357E-03	-1.8357E-03	6.4534E-02	6.4534E-02	2.800E-02
Cs-137 #A	5.8175E-03	5.8175E-03	2.5451E-02	2.5454E-02	2.032E-02
Eu-152 #A	-2.6911E-03	-2.6911E-03	5.9628E-02	5.9628E-02	4.887E-02
Eu-154 #A	0.0000E+00	0.0000E+00	1.8091E-02	1.8091E-02	1.668E-01
K-40	1.4447E+01	1.4447E+01	1.2196E+00	1.5846E+00	2.892E-01
Pa-234 #A	-2.3633E-02	-2.3633E-02	1.5739E-01	1.5740E-01	1.268E-01
Pb-212	3.7821E-01	3.7821E-01	6.6497E-02	7.2420E-02	2.828E-02
Pb-214	3.7000E-01	3.7000E-01	8.8090E-02	9.1874E-02	3.472E-02
Ra-226 #	4.5919E-01	4.5919E-01	5.3280E-01	5.3393E-01	4.123E-01
Th-234 A	1.1702E-01	1.1702E-01	4.6198E-01	4.6210E-01	3.742E-01
Tl-208 #	1.0945E-01	1.0945E-01	3.0453E-02	3.1406E-02	1.340E-02
U-235 #	3.2987E-02	3.2987E-02	3.4459E-02	3.4550E-02	2.641E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:38:35
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_012.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.6 to  2041.5 keV)     1.613E+01  pCi/g
 Total Decayed Activity (  238.6 to  2041.5 keV) 1.6131016E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574011955013
File : 8_20140108_013
Cal : 08-JAN-2014 07:40:12,08-APR-2013 11:06:59
IDF : 1.0
PDF : 1.0

Lab ID : 251449-007
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 08-APR-2013
Sample Amount : 339.57 g

Client ID : 04-PD-D0034-07
Acct : ITSI (JG)
Time : 08-JAN-2014 17:52
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.13 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0161	0.198		.24109	.24109	-0.040	u
Bismuth-212	0.141	0.163		.2154	.21561	-0.0025	u
Bismuth-214	0.226	0.0455		.071745	.073326	-0.052	u
Cesium-137	0.0171	0.0207	0.07	.027367	.027392	-0.0069	u
Cobalt-60	-0.00645	0.0284		.035234	.035237	0	u
Europium-152	-0.0318	0.0618		.07782	.07785	-0.00031	u
Europium-154	0.00305	0.0762		.092961	.092961	-0.013	u
Lead-212	0.356	0.0295		.06707	.072202	-0.016	u
Lead-214	0.355	0.0357		.071666	.07565	-0.0040	u
Potassium-40	18.2	0.285		1.3977	1.8921	-0.36	u
Protactinium-234	-0.00116	0.151		.18279	.18279	0.015	u
Radium-226	0.255	0.425	1.3	.53406	.5344	-0.082	u
Thallium-208	0.0600	0.0240		.03432	.034552	0.0020	u
Thorium-232 (By Actinium-228)	0.329	0.0795		.13232	.13416	0.019	u
Thorium-234	0.460	0.412		.53081	.53241	-0.034	u
Uranium-235	0.0307	0.0279		.036016	.036091	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-07
Sample Description: 251449-007, 206637

Detector: HPGE08 50-TP42229A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:57
Acquisition Time: 1/8/2014 17:52:22
Analysis Time: 1/8/2014 18:37
Analysis Quantity: 3.396E+02 g

Spectrum ID: 8_20140108_013
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2704 sec
Dead Time: 0.13 %

Efficiency: HPGE08 S22147 8_20130407002_EffCal
Efficiency Cal Date: 4/8/2013 11:06
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	3.285E-01	1.323E-01	1.342E-01	7.954E-02
Am-241	#AB	-1.614E-02	2.411E-01	2.411E-01	1.975E-01
Bi-212	#AB	1.405E-01	2.154E-01	2.156E-01	1.628E-01
Bi-214	#	2.265E-01	7.175E-02	7.333E-02	4.552E-02
Co-60	#AB	-6.453E-03	3.523E-02	3.524E-02	2.836E-02
Cs-137	#AB	1.709E-02	2.737E-02	2.739E-02	2.071E-02
Eu-152	#AB	-3.181E-02	7.782E-02	7.785E-02	6.175E-02
Eu-154	#AB	3.052E-03	9.296E-02	9.296E-02	7.623E-02
K-40		1.822E+01	1.398E+00	1.892E+00	2.846E-01
Pa-234	AB	-1.164E-03	1.828E-01	1.828E-01	1.505E-01
Pb-212		3.558E-01	6.707E-02	7.220E-02	2.950E-02
Pb-214		3.552E-01	7.167E-02	7.565E-02	3.572E-02
Ra-226	AB	2.546E-01	5.341E-01	5.344E-01	4.249E-01
Th-234	#	4.599E-01	5.308E-01	5.324E-01	4.119E-01
Tl-208	#	6.005E-02	3.432E-02	3.455E-02	2.395E-02
U-235		3.073E-02	3.602E-02	3.609E-02	2.786E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.045E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:37:32
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_013.An1

Sample description
     251449-007, 206637


Spectrum Filename: C:\User\SPC\Det8\8_20140108_013.An1

Acquisition information
       Start time:                 1/8/2014 17:52:22
       Live time:               2700
       Real time:               2704
       Dead time:                  0.13 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_04-07-2013.Clb
     HPGE08 S22147 8_20130407002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:40:12
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.420E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/8/2013 11:06:59
            Type:                  Polynomial
            Uncertainty:           1.344 %
            Coefficients:         -0.359632  -4.215465   0.446712
                                  -0.054338   0.002307  -0.000047

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3957E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3957E+02) =
                                   7.9592E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:37:32
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:57:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2013-12-28_0941.PBC 12/28/2013 09:41:06
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 18 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0509

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.72	39.	36.29	0.81	1.906E-02	74.81	9.600	6.224E-01	Pb212
77.02	85.	16.54	0.82	2.071E-02				
84.16	54.	32.95	0.29	2.552E-02				
86.95	82.	23.99	0.29	2.741E-02	87.20	6.300	1.408E+00	Pb212
92.86	27.	57.71	0.83	3.050E-02	92.60	5.600	4.599E-01	Th234
98.66	2.	723.70	0.84	3.343E-02	98.44	25.100	PBC<MDA	Pa234
132.10	14.	67.09	0.22	4.296E-02				
144.08	14.	103.17	0.89	4.408E-02	143.76	10.500	PBC<MDA	U235
163.19	2.	660.53	0.91	4.451E-02	163.35	4.700	PBC<MDA	U235
185.75	25.	58.61	0.93	4.366E-02	185.70	54.000	3.073E-02	U235
186.25	14.	104.89	0.93	4.363E-02	186.20	3.600	PBC<MDA	Ra226
214.63	13.	56.07	0.19	4.160E-02				
238.59	218.	8.91	0.80	3.964E-02	238.63	43.100	3.558E-01	Pb212
241.88	70.	21.17	0.90	3.936E-02	241.92	7.470	7.066E-01	Pb214
266.09	49.	22.21	0.14	3.738E-02				
270.45	14.	71.28	1.02	3.705E-02	270.25	3.460	PBC<MDA	Ac228
					270.25	3.460	3.267E-01	Ac228
294.97	97.	17.43	0.51	3.516E-02	295.22	19.200	3.769E-01	Pb214
300.06	10.	103.19	1.05	3.479E-02	300.09	3.270	PBC<MDA	Pb212
338.20	13.	89.16	1.08	3.221E-02	338.40	12.010	PBC<MDA	Ac228
					338.40	12.010	9.820E-02	Ac228
349.47	13.	71.41	1.09	3.153E-02				
351.83	154.	9.26	1.10	3.139E-02	351.79	37.100	3.552E-01	Pb214
438.61	10.	44.67	0.15	2.702E-02				
462.89	17.	51.15	1.20	2.603E-02	463.00	4.400	4.405E-01	Ac228
					463.00	4.400	4.405E-01	Ac228
503.33	20.	34.40	0.19	2.457E-02				

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:37:32
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
516.77	34.	17.15	0.46	2.413E-02				
583.11	39.	25.93	1.30	2.220E-02	583.14	86.000	6.004E-02	Tl208
609.41	129.	10.57	0.73	2.154E-02	609.69	46.090	3.339E-01	Bi214
661.65	10.	80.08	1.37	2.035E-02	661.66	84.620	PBC<MDA	Cs137
701.00	25.	20.00	0.16	1.956E-02				
727.41	11.	76.65	1.42	1.907E-02	727.17	11.800	PBC<MDA	Bi212
768.20	25.	29.75	0.15	1.836E-02				
768.80	2.	138.21	1.45	1.836E-02	768.36	4.890	PBC<MDA	Bi214
785.44	3.	216.87	1.46	1.809E-02	785.42	2.000	PBC<MDA	Bi212
795.00	7.	111.89	1.47	1.794E-02	794.95	4.250	PBC<MDA	Ac228
					794.95	4.250	2.720E-01	Ac228
860.25	4.	175.18	1.52	1.698E-02	860.47	12.000	PBC<MDA	Tl208
911.15	85.	12.12	0.47	1.632E-02	911.07	29.000	5.288E-01	Ac228
					911.07	29.000	5.288E-01	Ac228
933.62	7.	109.28	1.57	1.604E-02	934.05	3.170	PBC<MDA	Bi214
964.41	8.	110.35	1.59	1.568E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	3.097E-01	Ac228
					964.77	4.990	3.097E-01	Ac228
964.48	10.	84.13	1.59	1.569E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	3.824E-01	Ac228
969.08	14.	68.62	1.59	1.563E-02	968.90	17.460	PBC<MDA	Ac228
					968.90	17.460	1.470E-01	Ac228
1120.33	9.	70.31	1.68	1.410E-02	1120.28	15.040	PBC<MDA	Bi214
1133.68	11.	30.15	0.19	1.398E-02				
1460.92	790.	3.69	1.92	1.156E-02	1460.80	10.700	1.847E+01	K40
1764.34	22.	24.64	1.95	9.913E-03	1764.51	15.920	4.181E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
616.04	77.06	57.	85.	3.669E+03	33.07	0.817	-	lD
673.13	84.16	75.	54.	2.116E+03	65.89	0.290	TH-231	sM
1056.58	132.10	35.	14.	3.305E+02	134.18	0.221	-	sM
1716.72	214.63	20.	13.	3.173E+02	112.14	0.190	-	s
2128.29	266.09	17.	49.	1.300E+03	44.41	0.141	-	s
2795.66	349.49	34.	13.	4.042E+02	141.47	1.093	-	sc
3508.23	438.61	5.	10.	3.775E+02	89.34	0.150	-	s
4025.94	503.33	8.	20.	8.220E+02	68.80	0.193	-	s
4133.43	516.77	0.	34.	1.409E+03	34.30	0.458	-	s
5607.11	701.00	0.	25.	1.278E+03	40.00	0.156	-	s
6144.62	768.20	8.	25.	1.356E+03	59.50	0.149	BI-214	l
7288.17	911.15	57.	32.	1.972E+03	75.02	0.472	AC-228	s
9068.36	1133.68	0.	11.	7.866E+02	60.30	0.188	-	s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:37:32
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_013.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	478.99	59.89	68.	-2.	-0.001	1494.07	0.798s
Pb-212	596.79	74.61	124.	26.	0.010	125.50	0.814s
Pb-212	606.38	75.81	130.	-15.	-0.006	319.22	0.817s
Pb-212	695.47	86.95	79.	82.	0.031	47.98	0.293s
Th-234	742.72	92.86	105.	27.	0.010	115.42	0.834s
Pa-234	789.08	98.66	77.	2.	0.001	1447.40	0.840
Eu-154	984.77	123.12	85.	-4.	-0.002	631.11	0.866s
U-235	1152.40	144.08	94.	14.	0.005	206.33	0.888
U-235	1305.23	163.19	89.	2.	0.001	1321.05	0.908
U-235	1485.29	185.70	91.	25.	0.009	117.22	0.931D
Ra-226	1489.29	186.20	94.	14.	0.005	209.79	0.932D
Pb-212	1908.32	238.59	54.	206.	0.076	17.83	0.799
Pb-214	1934.63	241.88	58.	70.	0.026	42.35	0.901s
Ac-228	2163.19	270.45	44.	14.	0.005	142.57	1.017s
Pb-214	2360.19	295.08	62.	98.	0.036	37.07	0.510s
Pb-212	2400.02	300.06	44.	10.	0.004	206.39	1.046s
Ac-228	2705.03	338.20	60.	13.	0.005	178.33	1.083s
Eu-152	2749.84	343.80	60.	-9.	-0.003	244.67	1.088s
Pb-214	2813.77	351.79	37.	140.	0.052	18.43	1.096D
Eu-152	3284.75	410.67	46.	-5.	-0.002	401.56	1.151s
Ac-228	3702.44	462.89	30.	17.	0.006	102.31	1.198s
Tl-208	4664.07	583.11	44.	39.	0.014	51.86	1.302s
Bi-214	4874.78	609.45	43.	76.	0.028	25.92	1.324s
Cs-137	5292.33	661.65	27.	10.	0.004	160.16	1.366s
Bi-214	5321.63	665.31	47.	-8.	-0.003	246.69	1.369s
Eu-154	5790.46	723.92	40.	-5.	-0.002	364.03	1.415s
Bi-212	5818.33	727.41	28.	11.	0.004	153.31	1.418s
Bi-214	6149.42	768.80	39.	2.	0.001	276.41	1.449s
Bi-212	6282.53	785.44	20.	3.	0.001	433.73	1.462s
Ac-228	6359.04	795.00	27.	7.	0.003	223.78	1.469s
Tl-208	6881.02	860.25	28.	4.	0.002	350.35	1.516s
Ac-228	7287.18	911.03	30.	53.	0.020	40.28	1.551s
Bi-214	7467.88	933.62	23.	7.	0.002	218.56	1.566s
Pa-234	7573.31	946.80	33.	-6.	-0.002	297.58	1.574
Eu-152	7714.74	964.48	31.	10.	0.004	168.26	1.586s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:37:32
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	7714.20	964.41	37.	8.	0.003	220.70	1.586s
Ac-228	7751.54	969.08	37.	14.	0.005	137.25	1.589s
Bi-214	8961.54	1120.33	37.	9.	0.003	140.61	1.682s
Co-60	9384.89	1173.25	32.	-3.	-0.001	545.97	1.712s
Co-60	10687.04	1336.02	12.	-2.	-0.001	502.62	1.794s
Bi-214	11264.25	1408.17	21.	-2.	-0.001	857.32	1.829s
Eu-152	11265.50	1408.32	22.	-2.	-0.001	699.25	1.829s
K-40	11686.47	1460.95	26.	765.	0.283	7.53	1.919
Bi-214	14113.76	1764.34	10.	22.	0.008	49.28	1.955s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	3.2853E-01					3.65E+11	
			911.07	3.285E-01	(	7.954E-02	2.01E+01	2.90E+01 G
			968.90	1.470E-01	-	1.527E-01	6.86E+01	1.75E+01 GA
			338.40	9.820E-02	-	1.370E-01	8.92E+01	1.20E+01 GA
			964.77	3.097E-01	?	5.343E-01	1.10E+02	4.99E+00 GA
			463.00	4.405E-01		3.272E-01	5.12E+01	4.40E+00 GA
			794.95	2.720E-01	?	4.721E-01	1.12E+02	4.25E+00 GA
			270.25	3.267E-01	?	3.561E-01	7.13E+01	3.46E+00 GA
Am-241	I	-1.6136E-02					3.65E+11	
			59.54	-1.614E-02	?(	1.975E-01	7.47E+02	3.63E+01 G
Bi-212	N	1.4050E-01					3.65E+11	
			727.17	1.405E-01	?(	1.628E-01	7.67E+01	1.18E+01 G
			1620.56	2.263E-02	%	6.206E-01	1.68E+03	2.75E+00 GA
			785.42	2.483E-01	&	8.557E-01	2.17E+02	2.00E+00 GA
Bi-214	N	2.2649E-01					3.65E+11	
			609.69	2.265E-01	?(P	4.552E-02	1.30E+01	4.61E+01 G
			1764.51	4.181E-01	+ P	1.406E-01	2.46E+01	1.59E+01 GA
			1120.28	1.284E-01	- P	1.967E-01	7.03E+01	1.50E+01 GA
			768.36	6.883E-02	- P	4.753E-01	1.38E+02	4.89E+00 GA
			1377.65	-1.166E-01	% P	9.698E-01	1.00E+03	4.02E+00 GA
			934.05	3.835E-01	+	6.452E-01	1.09E+02	3.17E+00 GA
			1407.98	-1.546E-01	-	1.072E+00	4.29E+02	2.48E+00 GA
			1509.19	0.000E+00	-	2.782E-01	1.00E+03	2.19E+00 GA
			665.45	-7.603E-01	-	1.482E+00	1.23E+02	1.56E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:37:32
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_013.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	-6.4534E-03					3.65E+11	
			1173.24	-6.453E-03	?(	2.836E-02	2.73E+02	9.99E+01 G
			1332.50	-4.917E-03	+	1.957E-02	2.51E+02	1.00E+02 G
Cs-137	I	1.7087E-02					3.65E+11	
			661.66	1.709E-02	&(	2.071E-02	8.01E+01	8.46E+01 G
Eu-152	I	-3.1806E-02					3.65E+11	
			344.30	-3.181E-02	?(	6.175E-02	1.22E+02	2.70E+01 G
			121.87	-2.792E-03	%	4.962E-02	1.08E+03	2.86E+01 GA
			1408.08	-2.248E-02	+	1.267E-01	3.50E+02	2.12E+01 GA
			964.05	1.308E-01	?	1.682E-01	8.41E+01	1.46E+01 GA
			778.90	6.839E-04	%	1.393E-01	1.24E+04	1.30E+01 GA
			411.09	-2.271E-01	+	7.320E-01	2.01E+02	2.26E+00 GA
Eu-154	I	3.0516E-03					3.65E+11	
			1274.80	3.052E-03	&(	7.623E-02	1.52E+03	3.55E+01 G
			123.10	-7.329E-03	&	3.764E-02	3.16E+02	4.05E+01 GA
			723.30	-3.943E-02	+	1.146E-01	1.82E+02	1.97E+01 GA
K-40	N	1.8216E+01					3.65E+11	
			1460.80	1.822E+01	(P	2.846E-01	3.76E+00	1.07E+01 G
Pa-234	N	-1.1639E-03					3.65E+11	
			883.24	-1.164E-03	%(	1.505E-01	7.85E+03	1.50E+01 G
			98.44	6.057E-03		7.181E-02	7.24E+02	2.51E+01 GA
			946.00	-8.764E-02	+	2.061E-01	1.49E+02	1.20E+01 GA
Pb-212	N	3.5580E-01					3.65E+11	
			238.63	3.558E-01	(P	2.950E-02	8.91E+00	4.31E+01 G
			77.11	-1.231E-01	- P	2.159E-01	1.60E+02	1.75E+01 GA
			74.81	4.243E-01	?	4.170E-01	6.28E+01	9.60E+00 GA
			87.20	1.408E+00	+ P	3.524E-01	2.40E+01	6.30E+00 GA
			300.09	2.482E-01	-	4.007E-01	1.03E+02	3.27E+00 GA
Pb-214	N	3.5518E-01					3.65E+11	
			351.79	3.552E-01	(P	3.572E-02	9.22E+00	3.71E+01 G
			295.22	4.263E-01	P	8.044E-02	1.85E+01	1.92E+01 GA
			241.92	7.066E-01	+ P	1.772E-01	2.12E+01	7.47E+00 GA
Ra-226	N	2.5457E-01					3.65E+11	
			186.20	2.546E-01	(	4.249E-01	1.05E+02	3.60E+00 G
Th-234	N	4.5990E-01					3.65E+11	
			92.60	4.599E-01	?(	4.119E-01	5.77E+01	5.60E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:37:32
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Tl-208   N   6.0045E-02                                      3.65E+11
                           583.14 6.004E-02 ?(P 2.395E-02 2.59E+01 8.60E+01 G
                           860.47 6.408E-02 ?   1.780E-01 1.75E+02 1.20E+01 GA

U-235    N   3.0726E-02                                      3.65E+11
                           185.70 3.073E-02  (  2.786E-02 5.86E+01 5.40E+01 G
                           143.76 8.768E-02     1.438E-01 1.03E+02 1.05E+01 GA
                           163.35 2.855E-02     3.089E-01 6.61E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
 ____________________________________________________________________________
 Am-241      59.89        68.        -2.    -0.001  1494.07  -1.614E-02
 Eu-154     123.12        85.        -4.    -0.002   631.11  -7.329E-03
 Ac-228     270.45        44.        14.     0.005   142.57   3.267E-01
 Ac-228     338.20        60.        13.     0.005   178.33   9.820E-02
 Eu-152     343.80        60.        -9.    -0.003   244.67  -3.181E-02
 Eu-152     410.67        46.        -5.    -0.002   401.56  -2.271E-01
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:37:32
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	462.89	30.	17.	0.006	102.31	4.405E-01	
Cs-137	661.65	27.	10.	0.004	160.16	1.709E-02	
Eu-154	723.92	40.	-5.	-0.002	364.03	-3.943E-02	
Bi-212	727.41	28.	11.	0.004	153.31	1.405E-01	
Bi-212	785.44	20.	3.	0.001	433.73	2.483E-01	
Ac-228	795.00	27.	7.	0.003	223.78	2.720E-01	
Ac-228	911.03	30.	53.	0.020	40.28	3.285E-01	
Eu-152	964.48	31.	10.	0.004	168.26	1.308E-01	
Ac-228	964.41	37.	8.	0.003	220.70	3.097E-01	
Ac-228	969.08	37.	14.	0.005	137.25	1.470E-01	
Co-60	1173.25	32.	-3.	-0.001	545.97	-6.453E-03	
Co-60	1336.02	12.	-2.	-0.001	502.62	-4.917E-03	
Eu-152	1408.32	22.	-2.	-0.001	699.25	-2.248E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	3.2853E-01	3.2853E-01	1.3232E-01	1.3416E-01	7.954E-02
Am-241 #A	-1.6136E-02	-1.6136E-02	2.4109E-01	2.4109E-01	1.975E-01
Bi-212 #A	1.4050E-01	1.4050E-01	2.1540E-01	2.1561E-01	1.628E-01
Bi-214 #	2.2649E-01	2.2649E-01	7.1745E-02	7.3326E-02	4.552E-02
Co-60 #A	-6.4534E-03	-6.4534E-03	3.5234E-02	3.5237E-02	2.836E-02
Cs-137 #A	1.7087E-02	1.7087E-02	2.7367E-02	2.7392E-02	2.071E-02
Eu-152 #A	-3.1806E-02	-3.1806E-02	7.7820E-02	7.7850E-02	6.175E-02
Eu-154 #A	3.0516E-03	3.0516E-03	9.2961E-02	9.2961E-02	7.623E-02
K-40	1.8216E+01	1.8216E+01	1.3977E+00	1.8921E+00	2.846E-01
Pa-234 A	-1.1639E-03	-1.1639E-03	1.8279E-01	1.8279E-01	1.505E-01
Pb-212	3.5580E-01	3.5580E-01	6.7070E-02	7.2202E-02	2.950E-02
Pb-214	3.5518E-01	3.5518E-01	7.1666E-02	7.5650E-02	3.572E-02
Ra-226 A	2.5457E-01	2.5457E-01	5.3406E-01	5.3440E-01	4.249E-01
Th-234 #	4.5990E-01	4.5990E-01	5.3081E-01	5.3241E-01	4.119E-01
Tl-208 #	6.0045E-02	6.0045E-02	3.4320E-02	3.4552E-02	2.395E-02
U-235	3.0726E-02	3.0726E-02	3.6016E-02	3.6091E-02	2.786E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:37:32
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_013.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  438.6 to  2042.1 keV)     1.970E+01  pCi/g
 Total Decayed Activity (  438.6 to  2042.1 keV) 1.9704317E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564011942011
File : 7_20140108_011
Cal : 08-JAN-2014 07:13:44,21-FEB-2013 11:46:56
IDF : 1.0
PDF : 1.0

Lab ID : 251449-008
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 21-FEB-2013
Sample Amount : 330.01 g

Client ID : 04-PD-D0034-08
Acct : ITSI (JG)
Time : 08-JAN-2014 17:51
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0	0.198		.19663	.19663	-0.040	u
Bismuth-212	0.0110	0.153		.18141	.18141	-0.0025	u
Bismuth-214	0.320	0.0359		.079028	.081866	-0.052	u
Cesium-137	0.00688	0.0229	0.07	.028547	.02855	-0.0069	u
Cobalt-60	0.00135	0.0223		.027261	.027261	0	u
Europium-152	-0.00802	0.0441		.054469	.054471	-0.00031	u
Europium-154	0.0109	0.0755		.093123	.093126	-0.013	u
Lead-212	0.334	0.0332		.070268	.074624	-0.016	u
Lead-214	0.347	0.0422		.090392	.093437	-0.0040	u
Potassium-40	17.0	0.218		1.2668	1.7373	-0.36	u
Protactinium-234	-0.0721	0.163		.20637	.20643	0.015	u
Radium-226	0.0443	0.396	1.3	.48385	.48386	-0.082	u
Thallium-208	0.0575	0.0232		.032786	.033009	0.0020	u
Thorium-232 (By Actinium-228)	0.211	0.0811		.11948	.12033	0.019	u
Thorium-234	-0.331	0.381		.48433	.48523	-0.034	u
Uranium-235	0.0375	0.0236		.031606	.031733	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-08
Sample Description: 251449-008, 206637

Detector: HPGE07 51-TP32743A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:59
Acquisition Time: 1/8/2014 17:51:37
Analysis Time: 1/8/2014 18:36
Analysis Quantity: 3.300E+02 g

Spectrum ID: 7_20140108_011
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE07 S21603 7_20130220002_EffCal
Efficiency Cal Date: 2/21/2013 11:46
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.114E-01	1.195E-01	1.203E-01	8.113E-02
Am-241	#AB	0.000E+00	1.966E-01	1.966E-01	1.976E-01
Bi-212	#AB	1.105E-02	1.814E-01	1.814E-01	1.534E-01
Bi-214		3.196E-01	7.903E-02	8.187E-02	3.589E-02
Co-60	#AB	1.351E-03	2.726E-02	2.726E-02	2.228E-02
Cs-137	#AB	6.877E-03	2.855E-02	2.855E-02	2.285E-02
Eu-152	#AB	-8.020E-03	5.447E-02	5.447E-02	4.407E-02
Eu-154	#AB	1.090E-02	9.312E-02	9.313E-02	7.549E-02
K-40		1.698E+01	1.267E+00	1.737E+00	2.176E-01
Pa-234	#AB	-7.208E-02	2.064E-01	2.064E-01	1.633E-01
Pb-212		3.343E-01	7.027E-02	7.462E-02	3.320E-02
Pb-214		3.469E-01	9.039E-02	9.344E-02	4.223E-02
Ra-226	AB	4.428E-02	4.838E-01	4.839E-01	3.959E-01
Th-234	#AB	-3.306E-01	4.843E-01	4.852E-01	3.805E-01
Tl-208	#	5.750E-02	3.279E-02	3.301E-02	2.319E-02
U-235		3.747E-02	3.161E-02	3.173E-02	2.361E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.836E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:36:52
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_011.An1

Sample description
     251449-008, 206637


Spectrum Filename: C:\User\SPC\Det7\7_20140108_011.An1

Acquisition information
       Start time:                 1/8/2014 17:51:37
       Live time:               2700
       Real time:               2702
       Dead time:                  0.06 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3001E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3001E+02) =
                                   8.1898E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:36:52
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:59:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2013-12-28_0940.PBC 12/28/2013 09:40:25
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 18 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1407

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.37	26.	32.04	0.31	0.000E+00				
35.18	29.	39.28	0.24	0.000E+00				
74.61	21.	83.44	0.84	2.213E-02	74.81	9.600	PBC<MDA	Pb212
77.04	76.	22.79	0.61	2.378E-02	77.11	17.500	5.263E-01	Pb212
87.55	65.	23.16	0.36	3.062E-02	87.20	6.300	1.027E+00	Pb212
122.86	12.	105.22	0.89	4.503E-02	123.10	40.460	PBC<MDA	Eu154
144.58	25.	55.05	0.91	4.783E-02	143.76	10.500	1.524E-01	U235
163.47	5.	250.52	0.93	4.834E-02	163.35	4.700	PBC<MDA	U235
185.71	32.	42.17	0.95	4.747E-02	185.70	54.000	3.747E-02	U235
186.21	2.	546.40	0.96	4.744E-02	186.20	3.600	PBC<MDA	Ra226
238.60	214.	10.08	0.95	4.312E-02	238.63	43.100	3.343E-01	Pb212
270.02	25.	45.71	1.04	4.027E-02	270.25	3.460	5.380E-01	Ac228
					270.25	3.460	5.380E-01	Ac228
295.22	100.	17.80	0.88	3.816E-02	295.22	19.200	3.720E-01	Pb214
300.55	2.	305.46	1.07	3.777E-02	300.09	3.270	PBC<MDA	Pb212
338.10	31.	33.36	1.11	3.490E-02	338.40	12.010	2.231E-01	Ac228
					338.40	12.010	2.231E-01	Ac228
352.04	162.	11.60	0.56	3.398E-02	351.79	37.100	3.469E-01	Pb214
463.09	14.	61.22	1.23	2.803E-02	463.00	4.400	PBC<MDA	Ac228
					463.00	4.400	PBC<MDA	Ac228
511.61	3.	497.11	0.00	2.611E-02				
583.08	93.	13.80	0.59	2.379E-02	583.14	86.000	1.278E-01	Tl208
609.26	129.	10.75	1.02	2.306E-02	609.69	46.090	3.196E-01	Bi214
661.65	4.	207.54	1.42	2.175E-02	661.66	84.620	PBC<MDA	Cs137
668.04	4.	177.98	1.42	2.166E-02	665.45	1.560	PBC<MDA	Bi214
723.29	5.	162.04	1.47	2.042E-02	723.30	19.700	PBC<MDA	Eu154
728.89	1.	159.54	1.48	2.034E-02	727.17	11.800	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:36:52
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
768.91	4.	193.56	1.51	1.957E-02	768.36	4.890	PBC<MDA	Bi214
786.04	5.	154.98	1.53	1.927E-02	785.42	2.000	PBC<MDA	Bi212
794.90	8.	93.43	1.53	1.911E-02	794.95	4.250	PBC<MDA	Ac228
					794.95	4.250	3.062E-01	Ac228
860.99	6.	132.17	1.59	1.807E-02	860.47	12.000	PBC<MDA	Tl208
911.62	35.	25.63	1.63	1.735E-02	911.07	29.000	2.114E-01	Ac228
					911.07	29.000	2.114E-01	Ac228
933.98	9.	82.73	1.65	1.705E-02	934.05	3.170	PBC<MDA	Bi214
1120.55	10.	61.94	1.80	1.497E-02	1120.28	15.040	PBC<MDA	Bi214
1274.99	2.	427.19	1.91	1.361E-02	1274.80	35.500	PBC<MDA	Eu154
1377.22	0.	452.77	0.10	1.283E-02	1377.65	4.020	PBC<MDA	Bi214
1407.80	3.	184.54	2.01	1.262E-02	1407.98	2.480	2.798E-01	Bi214
					1408.08	21.210	3.272E-02	Eu152
1407.86	3.	194.11	2.01	1.262E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	3.154E-02	Eu152
1460.94	751.	3.65	1.34	1.226E-02	1460.80	10.700	1.698E+01	K40
1509.51	5.	110.55	2.08	1.196E-02	1509.19	2.190	PBC<MDA	Bi214
1765.09	6.	47.88	2.23	1.053E-02	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
242.89	30.37	16.	26.	0.000E+00	64.08	0.307	-	s
281.28	35.18	34.	29.	0.000E+00	78.56	0.238	-	s
4092.00	511.61	62.	3.	1.111E+02	994.23	0.000	-	sc

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	596.64	74.61	138.	21.	0.008	166.88	0.838s
Pb-212	616.11	77.04	75.	72.	0.027	45.59	0.605s
Pb-212	700.11	87.55	54.	65.	0.024	46.33	0.360s
Th-234	725.92	90.77	104.	-21.	-0.008	146.50	0.857s
Eu-152	973.68	121.75	92.	-9.	-0.003	299.24	0.888s
Eu-154	982.53	122.86	73.	12.	0.004	210.45	0.889s
U-235	1156.23	144.58	84.	25.	0.009	110.09	0.911s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:36:52
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1307.28	163.47	68.	5.	0.002	501.04	0.931
U-235	1485.10	185.70	73.	32.	0.012	84.34	0.955D
Ra-226	1489.10	186.20	92.	2.	0.001	1092.81	0.955D
Pb-212	1908.20	238.60	76.	205.	0.076	20.16	0.953
Pb-214	1942.76	242.92	101.	-12.	-0.004	536.20	1.013s
Ac-228	2159.47	270.02	58.	25.	0.009	91.41	1.042s
Pb-214	2360.65	295.17	66.	51.	0.019	42.57	1.067
Pb-212	2403.67	300.55	62.	2.	0.001	610.92	1.072s
Ac-228	2704.07	338.10	47.	31.	0.011	66.73	1.110
Eu-152	2755.43	344.52	34.	-2.	-0.001	679.19	1.116s
Pb-214	2815.52	352.04	57.	144.	0.053	23.20	0.559s
Ac-228	3703.90	463.09	39.	14.	0.005	122.44	1.232s
Tl-208	4664.55	583.18	45.	39.	0.014	48.70	1.345s
Bi-214	4873.26	609.26	29.	112.	0.041	21.50	1.021s
Cs-137	5292.36	661.65	35.	4.	0.002	415.08	1.417s
Bi-214	5343.54	668.04	30.	4.	0.002	355.96	1.420
Eu-154	5785.53	723.29	28.	5.	0.002	324.09	1.472s
Bi-212	5830.38	728.89	27.	1.	0.000	319.09	1.475s
Bi-214	6150.55	768.91	31.	4.	0.002	387.12	1.511s
Bi-212	6287.67	786.04	27.	5.	0.002	309.96	1.526s
Ac-228	6358.54	794.90	25.	8.	0.003	186.86	1.534s
Tl-208	6887.37	860.99	26.	6.	0.002	264.33	1.590s
Pa-234	7061.35	882.73	38.	-6.	-0.002	286.31	1.609s
Ac-228	7292.49	911.62	33.	35.	0.013	51.26	1.632s
Bi-214	7471.43	933.98	26.	9.	0.004	165.46	1.651s
Ac-228	7733.56	966.73	68.	-11.	-0.004	234.32	1.676s
Bi-214	8964.56	1120.55	40.	10.	0.004	123.88	1.799s
Eu-154	10200.71	1274.99	27.	2.	0.001	854.37	1.915s
Bi-214	11019.00	1377.22	2.	0.	0.000	905.54	0.104s
Bi-214	11264.32	1407.86	13.	3.	0.001	388.21	2.008s
Eu-152	11263.77	1407.80	13.	3.	0.001	369.08	2.008s
K-40	11689.18	1460.94	16.	735.	0.272	7.30	1.340s
Bi-214	12078.08	1509.51	12.	5.	0.002	221.10	2.076s
Bi-214	14124.38	1765.09	18.	6.	0.002	95.75	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.1140E-01					3.65E+11
			911.07	2.114E-01	?(P	8.113E-02 2.56E+01 2.90E+01	G
			968.90	-3.916E-02	% P	2.050E-01 1.00E+03 1.75E+01	GA
			338.40	2.231E-01	P	1.161E-01 3.34E+01 1.20E+01	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:36:52
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			964.77	-4.142E-01	- P	7.012E-01	1.17E+02	4.99E+00 GA
			463.00	3.340E-01	? P	3.578E-01	6.12E+01	4.40E+00 GA
			794.95	3.062E-01	?	4.372E-01	9.34E+01	4.25E+00 GA
			270.25	5.380E-01	& P	3.847E-01	4.57E+01	3.46E+00 GA
Bi-212	N	1.1049E-02					3.65E+11	
			727.17	1.105E-02	?(P	1.534E-01	1.60E+02	1.18E+01 G
			1620.56	0.000E+00	-	1.775E+00	1.00E+03	2.75E+00 GA
			785.42	3.890E-01	?	9.505E-01	1.55E+02	2.00E+00 GA
Bi-214	N	3.1961E-01					3.65E+11	
			609.69	3.196E-01	(P	3.589E-02	1.08E+01	4.61E+01 G
			1764.51	1.008E-01	- P	1.791E-01	4.79E+01	1.59E+01 GA
			1120.28	1.405E-01	- P	1.986E-01	6.19E+01	1.50E+01 GA
			768.36	1.335E-01	-	4.121E-01	1.94E+02	4.89E+00 GA
			1377.65	2.352E-02	-	1.733E-01	4.53E+02	4.02E+00 GA
			934.05	5.325E-01	&	6.676E-01	8.27E+01	3.17E+00 GA
			1407.98	2.697E-01	?	8.204E-01	1.94E+02	2.48E+00 GA
			1509.19	5.651E-01	+	9.390E-01	1.11E+02	2.19E+00 GA
			665.45	3.999E-01	P	1.141E+00	1.78E+02	1.56E+00 GA
Co-60	T	1.3511E-03					3.65E+11	
			1173.24	1.351E-03	%(	2.228E-02	1.01E+03	9.99E+01 G
			1332.50	0.000E+00	-	6.208E-02	1.00E+03	1.00E+02 G
Cs-137	I	6.8773E-03					3.65E+11	
			661.66	6.877E-03	?(	2.285E-02	2.08E+02	8.46E+01 G
Eu-152	I	-8.0196E-03					3.65E+11	
			344.30	-8.020E-03	&(	4.407E-02	3.40E+02	2.70E+01 G
			121.87	-2.202E-02	+	5.295E-02	1.50E+02	2.86E+01 GA
			1408.08	3.272E-02	&	9.427E-02	1.85E+02	2.12E+01 GA
			964.05	3.875E-03	%	9.952E-02	1.57E+03	1.46E+01 GA
			778.90	-4.023E-03	%	1.543E-01	2.33E+03	1.30E+01 GA
			411.09	2.194E-02	%	5.554E-01	1.54E+03	2.26E+00 GA
Eu-154	I	1.0900E-02					3.65E+11	
			1274.80	1.090E-02	?(	7.549E-02	4.27E+02	3.55E+01 G
			123.10	1.983E-02	&	3.305E-02	1.05E+02	4.05E+01 GA
			723.30	3.616E-02	?	9.262E-02	1.62E+02	1.97E+01 GA
K-40	N	1.6980E+01					3.65E+11	
			1460.80	1.698E+01	(P	2.176E-01	3.65E+00	1.07E+01 G
Pa-234	N	-7.2079E-02					3.65E+11	
			883.24	-7.208E-02	?(	1.633E-01	1.43E+02	1.50E+01 G
			98.44	-1.362E-03	&	6.928E-02	3.09E+03	2.51E+01 GA
			946.00	0.000E+00	+	2.536E-01	1.00E+03	1.20E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:36:52
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   3.3431E-01                                     3.65E+11
                           238.63 3.343E-01  (P 3.320E-02 1.01E+01 4.31E+01 G
                            77.11 5.263E-01 + P 1.464E-01 2.28E+01 1.75E+01 GA
                            74.81 2.950E-01 ?   3.912E-01 8.34E+01 9.60E+00 GA
                            87.20 1.027E+00 + P 2.685E-01 2.32E+01 6.30E+00 GA
                           300.09 4.237E-02 & P 4.518E-01 3.05E+02 3.27E+00 GA

Pb-214   N   3.4687E-01                                     3.65E+11
                           351.79 3.469E-01  (P 4.223E-02 1.16E+01 3.71E+01 G
                           295.22 2.118E-01 - P 7.836E-02 2.13E+01 1.92E+01 GA
                           241.92-1.119E-01 & P 2.225E-01 2.68E+02 7.47E+00 GA

Ra-226   N   4.4276E-02                                     3.65E+11
                           186.20 4.428E-02  (  3.959E-01 5.46E+02 3.60E+00 G

Th-234   N  -3.3061E-01                                     3.65E+11
                            92.60-3.306E-01 ?(  3.805E-01 7.32E+01 5.60E+00 G

Tl-208   N   5.7498E-02                                     3.65E+11
                           583.14 5.750E-02 ?(P 2.319E-02 2.43E+01 8.60E+01 G
                           860.47 8.078E-02 ?   1.670E-01 1.32E+02 1.20E+01 GA

U-235    N   3.7473E-02                                     3.65E+11
                           185.70 3.747E-02  (  2.361E-02 4.22E+01 5.40E+01 G
                           143.76 1.524E-01 ?   1.288E-01 5.50E+01 1.05E+01 GA
                           163.35 6.308E-02     2.559E-01 2.51E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:36:52
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_011.An1

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Th-234	90.77	104.	-21.	-0.008	146.50	-3.306E-01	
Eu-152	121.75	92.	-9.	-0.003	299.24	-2.202E-02	
Eu-154	122.86	73.	12.	0.004	210.45	1.983E-02	
Ac-228	270.02	58.	25.	0.009	91.41	5.380E-01	P
Ac-228	338.10	47.	31.	0.011	66.73	2.231E-01	P
Eu-152	344.52	34.	-2.	-0.001	679.19	-8.020E-03	
Ac-228	463.09	39.	14.	0.005	122.44	3.340E-01	P
Eu-154	723.29	28.	5.	0.002	324.09	3.616E-02	
Bi-212	728.89	27.	1.	0.000	319.09	1.105E-02	P
Bi-212	786.04	27.	5.	0.002	309.96	3.890E-01	
Ac-228	794.90	25.	8.	0.003	186.86	3.062E-01	
Pa-234	882.73	38.	-6.	-0.002	286.31	-7.208E-02	
Ac-228	911.62	33.	35.	0.013	51.26	2.114E-01	P
Ac-228	966.73	68.	-11.	-0.004	234.32	-4.142E-01	P
Eu-154	1274.99	27.	2.	0.001	854.37	1.090E-02	
Eu-152	1407.80	13.	3.	0.001	369.08	3.272E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.1140E-01	2.1140E-01	1.1948E-01	1.2033E-01	8.113E-02
Am-241 #A	0.0000E+00	0.0000E+00	1.9663E-01	1.9663E-01	1.976E-01
Bi-212 #A	1.1049E-02	1.1049E-02	1.8141E-01	1.8141E-01	1.534E-01
Bi-214	3.1961E-01	3.1961E-01	7.9028E-02	8.1866E-02	3.589E-02
Co-60 #A	1.3511E-03	1.3511E-03	2.7261E-02	2.7261E-02	2.228E-02
Cs-137 #A	6.8773E-03	6.8773E-03	2.8547E-02	2.8550E-02	2.285E-02
Eu-152 #A	-8.0196E-03	-8.0196E-03	5.4469E-02	5.4471E-02	4.407E-02
Eu-154 #A	1.0900E-02	1.0900E-02	9.3123E-02	9.3126E-02	7.549E-02
K-40	1.6980E+01	1.6980E+01	1.2668E+00	1.7373E+00	2.176E-01
Pa-234 #A	-7.2079E-02	-7.2079E-02	2.0637E-01	2.0643E-01	1.633E-01
Pb-212	3.3431E-01	3.3431E-01	7.0268E-02	7.4624E-02	3.320E-02
Pb-214	3.4687E-01	3.4687E-01	9.0392E-02	9.3437E-02	4.223E-02
Ra-226 A	4.4276E-02	4.4276E-02	4.8385E-01	4.8386E-01	3.959E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:36:52
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_011.An1

 Th-234 #A   -3.3061E-01   -3.3061E-01   4.8433E-01    4.8523E-01  3.805E-01
 Tl-208 #     5.7498E-02    5.7498E-02   3.2786E-02    3.3009E-02  2.319E-02
 U-235        3.7473E-02    3.7473E-02   3.1606E-02    3.1733E-02  2.361E-02

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.6 to  2041.3 keV)     1.808E+01  pCi/g
 Total Decayed Activity (  238.6 to  2041.3 keV) 1.8076267E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE09	Lab ID	: 251449-009	Client ID	: 04-PD-D0034-09
Seqnum	: 1584011944011	Matrix	: Soil	Acct	: ITSI (JG)
File	: 9_20140108_011	Batch	: 206637	Time	: 08-JAN-2014 17:53
Cal	: 08-JAN-2014 07:26:14,30-DEC-2013 12:17:54	Caldate	: 08-JAN-2014, 30-DEC-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 345.27 g	Live Time	: 2700 sec
				Dead Time	: 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0847	0.226		.28145	.28155	-0.040	u
Bismuth-212	0.100	0.172		.22104	.22115	-0.0025	u
Bismuth-214	0.305	0.0335		.079357	.082211	-0.052	u
Cesium-137	-0.0106	0.0249	0.07	.031334	.031343	-0.0069	u
Cobalt-60	0	0.00498		.006045	.006045	0	u
Europium-152	0.0117	0.0383		.048183	.04819	-0.00031	u
Europium-154	-0.0208	0.0874		.10859	.1086	-0.013	u
Lead-212	0.283	0.0291		.060468	.064163	-0.016	u
Lead-214	0.349	0.0340		.080796	.084468	-0.0040	u
Potassium-40	19.5	0.215		1.375	1.9394	-0.36	u
Protactinium-234	-0.00979	0.158		.19266	.19266	0.015	u
Radium-226	0.569	0.372	1.3	.49595	.49782	-0.082	u
Thallium-208	0.0741	0.0176		.030004	.030451	0.0020	u
Thorium-232 (By Actinium-228)	0.153	0.0751		.10967	.11018	0.019	u
Thorium-234	0.0107	0.383		.46613	.46613	-0.034	u
Uranium-235	0.0375	0.0238		.031952	.032078	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-09
Sample Description: 251449-009, 206637

Detector: HPGE09 50-TP42232A
Spectrum ID: 9_20140108_011
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 14:01
Live Time: 2700 sec
Acquisition Time: 1/8/2014 17:53:46
Real Time: 2702 sec
Analysis Time: 1/8/2014 18:38
Dead Time: 0.06 %
Analysis Quantity: 3.453E+02 g

Efficiency: HPGE09 S23325 9_20131229002_EffCal
Efficiency Cal Date: 12/30/2013 12:17
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		1.526E-01	1.097E-01	1.102E-01	7.505E-02
Am-241	#AB	-8.474E-02	2.815E-01	2.816E-01	2.263E-01
Bi-212	#AB	1.001E-01	2.210E-01	2.211E-01	1.723E-01
Bi-214		3.051E-01	7.936E-02	8.221E-02	3.348E-02
Co-60	#AB	0.000E+00	6.045E-03	6.045E-03	4.980E-03
Cs-137	#AB	-1.063E-02	3.133E-02	3.134E-02	2.486E-02
Eu-152	#AB	1.172E-02	4.818E-02	4.819E-02	3.833E-02
Eu-154	#AB	-2.085E-02	1.086E-01	1.086E-01	8.740E-02
K-40		1.953E+01	1.375E+00	1.939E+00	2.148E-01
Pa-234	#AB	-9.786E-03	1.927E-01	1.927E-01	1.577E-01
Pb-212		2.830E-01	6.047E-02	6.416E-02	2.908E-02
Pb-214		3.493E-01	8.080E-02	8.447E-02	3.399E-02
Ra-226		5.691E-01	4.959E-01	4.978E-01	3.719E-01
Th-234	#AB	1.066E-02	4.661E-01	4.661E-01	3.833E-01
Tl-208	#	7.408E-02	3.000E-02	3.045E-02	1.756E-02
U-235		3.747E-02	3.195E-02	3.208E-02	2.382E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.143E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:38:55
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_011.An1

Sample description
     251449-009, 206637


Spectrum Filename: C:\User\SPC\Det9\9_20140108_011.An1

Acquisition information
       Start time:                 1/8/2014 17:53:46
       Live time:               2700
       Real time:               2702
       Dead time:                  0.06 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:26:14
            Zero offset:           0.095 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.675E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.11keV )
       Stop channel:           16336 (  2041.83keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4527E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4527E+02) =
                                   7.8278E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:55
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:01:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	9_2013-12-31_0939.PBC 12/31/2013 09:39:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1538

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
75.04	13.	125.32	0.84	1.819E-02	74.81	9.600	PBC<MDA	Pb212
77.11	52.	33.55	0.38	1.984E-02	77.11	17.500	4.357E-01	Pb212
98.98	6.	205.83	0.86	3.272E-02	98.44	25.100	PBC<MDA	Pa234
					98.44	25.100	2.066E-02	Pa234
123.35	4.	316.82	0.88	4.097E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	6.413E-03	Eu154
142.86	9.	143.01	0.90	4.372E-02	143.76	10.500	PBC<MDA	U235
185.76	30.	42.64	0.94	4.351E-02	185.70	54.000	3.747E-02	U235
186.26	31.	43.58	0.94	4.348E-02	186.20	3.600	5.691E-01	Ra226
238.55	177.	10.07	0.79	3.967E-02	238.63	43.100	2.830E-01	Pb212
270.14	30.	36.26	0.17	3.716E-02	270.25	3.460	6.857E-01	Ac228
294.98	78.	18.15	0.20	3.530E-02				
295.14	46.	23.86	1.05	3.528E-02	295.22	19.200	1.953E-01	Pb214
302.64	4.	167.74	1.05	3.494E-02	300.09	3.270	PBC<MDA	Pb212
338.33	82.	19.21	0.46	3.240E-02	338.40	12.010	6.125E-01	Ac228
342.45	24.	23.81	0.17	3.215E-02				
343.05	3.	205.61	1.09	3.204E-02	344.30	27.000	PBC<MDA	Eu152
351.61	151.	10.83	0.28	3.160E-02	351.79	37.100	3.493E-01	Pb214
409.31	4.	196.35	1.15	2.848E-02	411.09	2.264	PBC<MDA	Eu152
583.36	49.	20.25	1.31	2.240E-02	583.14	86.000	7.408E-02	Tl208
609.42	115.	11.94	0.60	2.173E-02	609.69	46.090	3.051E-01	Bi214
665.22	8.	99.72	1.38	2.044E-02	665.45	1.560	PBC<MDA	Bi214
726.64	3.	231.89	1.43	1.929E-02	723.30	19.700	PBC<MDA	Eu154
727.43	8.	110.41	1.43	1.922E-02	727.17	11.800	PBC<MDA	Bi212
779.12	2.	490.82	1.48	1.831E-02	778.90	12.990	PBC<MDA	Eu152
794.97	9.	91.43	1.49	1.805E-02	794.95	4.250	PBC<MDA	Ac228
860.56	10.	82.67	1.55	1.706E-02	860.47	12.000	PBC<MDA	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:55
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
911.62	69.	14.01	0.52	1.637E-02	911.07	29.000	4.187E-01	Ac228
934.43	5.	132.49	1.61	1.609E-02	934.05	3.170	PBC<MDA	Bi214
969.23	13.	70.74	1.64	1.567E-02	968.90	17.460	PBC<MDA	Ac228
1120.40	14.	43.57	1.76	1.407E-02	1120.28	15.040	1.959E-01	Bi214
1377.69	7.	95.94	1.96	1.197E-02	1377.65	4.020	PBC<MDA	Bi214
1408.40	2.	231.29	1.98	1.176E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	2.069E-02	Eu152
1460.92	837.	3.46	1.72	1.140E-02	1460.80	10.700	1.953E+01	K40
1764.82	11.	40.34	2.23	9.660E-03	1764.51	15.920	2.134E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
2159.26	270.14	36.	22.	5.977E+02	87.21	0.168	AC-228	sM
2704.52	338.33	73.	38.	1.158E+03	72.39	0.455	AC-228	sM
2737.47	342.45	6.	21.	6.502E+02	55.04	0.165	-	sM

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	484.76	60.73	76.	-8.	-0.003	332.13	0.821s
Pb-212	599.24	75.04	135.	13.	0.005	250.64	0.835
Pb-212	615.78	77.11	84.	52.	0.019	67.11	0.382s
Pa-234	790.61	98.98	70.	6.	0.002	411.66	0.858s
Eu-154	985.49	123.35	66.	4.	0.001	633.64	0.882s
U-235	1141.51	142.86	73.	9.	0.003	286.03	0.902
U-235	1484.03	185.70	69.	30.	0.011	85.28	0.942D
Ra-226	1488.03	186.20	74.	31.	0.011	87.15	0.943D
Pb-212	1906.68	238.55	54.	167.	0.062	20.14	0.793
Pb-214	1930.65	241.55	129.	-6.	-0.002	783.11	0.996s
Ac-228	2159.19	270.13	58.	8.	0.003	263.29	1.022
Pb-214	2359.16	295.14	67.	46.	0.017	47.71	1.046s
Pb-212	2419.14	302.64	21.	4.	0.001	335.49	1.050s
Ac-228	2704.08	338.27	36.	45.	0.017	48.52	1.086
Eu-152	2742.33	343.05	24.	3.	0.001	411.23	1.091s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:55
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-214	2810.80	351.61	35.	141.	0.052	21.66	0.278s
Eu-152	3272.17	409.31	29.	4.	0.001	392.69	1.153s
Tl-208	4664.26	583.36	25.	49.	0.018	40.50	1.308s
Bi-214	4872.66	609.42	25.	105.	0.039	23.87	0.595s
Cs-137	5286.80	661.19	41.	-6.	-0.002	294.80	1.377s
Bi-214	5319.04	665.22	25.	8.	0.003	199.44	1.380
Eu-154	5810.30	726.64	25.	3.	0.001	463.78	1.430s
Bi-212	5816.61	727.43	33.	8.	0.003	220.82	1.433s
Eu-152	6230.11	779.12	38.	2.	0.001	981.64	1.478s
Ac-228	6356.95	794.97	26.	9.	0.003	182.86	1.491
Tl-208	6881.68	860.56	26.	10.	0.004	165.34	1.547s
Pa-234	7067.85	883.83	34.	-1.	0.000	1968.65	1.566s
Ac-228	7288.73	911.44	28.	25.	0.009	71.85	1.589s
Bi-214	7472.64	934.43	23.	5.	0.002	264.99	1.608s
Pa-234	7558.40	945.15	28.	-1.	0.000	1219.18	1.618s
Eu-152	7709.85	964.08	44.	-4.	-0.001	535.32	1.633s
Ac-228	7725.74	966.07	55.	-5.	-0.002	429.61	1.633s
Ac-228	7751.03	969.23	34.	13.	0.005	141.48	1.637s
Bi-214	8960.62	1120.40	31.	14.	0.005	87.15	1.759s
Eu-154	10182.39	1273.09	34.	-3.	-0.001	520.91	1.879s
Bi-214	11019.54	1377.69	20.	7.	0.003	191.89	1.957s
Bi-214	11265.27	1408.40	8.	2.	0.001	462.59	1.980s
K-40	11685.66	1460.92	15.	822.	0.304	6.91	1.724
Bi-212	12969.41	1621.31	13.	-4.	-0.001	304.27	2.134s
Bi-214	14118.17	1764.82	14.	11.	0.004	80.67	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	1.5263E-01					3.65E+11
			911.07	1.526E-01	?(	7.505E-02	3.59E+01 2.90E+01 G
			968.90	1.343E-01	&	1.436E-01	7.07E+01 1.75E+01 GA
			338.40	3.329E-01		1.047E-01	2.43E+01 1.20E+01 GA
			964.77	-1.853E-01	-	6.415E-01	2.15E+02 4.99E+00 GA
			463.00	-3.576E-03	%	3.737E-01	6.35E+03 4.40E+00 GA
			794.95	3.230E-01		4.513E-01	9.14E+01 4.25E+00 GA
			270.25	1.913E-01		4.006E-01	1.32E+02 3.46E+00 GA
Am-241	I	-8.4740E-02					3.65E+11
			59.54	-8.474E-02	&(	2.263E-01	1.66E+02 3.63E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:55
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-212	N	1.0010E-01					3.65E+11	
			727.17	1.001E-01	?(	1.723E-01	1.10E+02	1.18E+01 G
			1620.56	-3.555E-01	+	8.346E-01	1.52E+02	2.75E+00 GA
			785.42	0.000E+00	-	3.214E-01	1.00E+03	2.00E+00 GA
Bi-214	N	3.0513E-01					3.65E+11	
			609.69	3.051E-01	(P	3.348E-02	1.19E+01	4.61E+01 G
			1764.51	2.134E-01	- P	1.648E-01	4.03E+01	1.59E+01 GA
			1120.28	1.959E-01	- P	1.784E-01	4.36E+01	1.50E+01 GA
			768.36	0.000E+00	-	4.731E-01	1.00E+03	4.89E+00 GA
			1377.65	4.229E-01	? P	6.264E-01	9.59E+01	4.02E+00 GA
			934.05	2.937E-01	? P	6.289E-01	1.32E+02	3.17E+00 GA
			1407.98	1.770E-01	-	6.379E-01	2.31E+02	2.48E+00 GA
			1509.19	0.000E+00	&	2.781E-01	1.00E+03	2.19E+00 GA
			665.45	6.910E-01	+	1.057E+00	9.97E+01	1.56E+00 GA
Cs-137	I	-1.0629E-02					3.65E+11	
			661.66	-1.063E-02	?(	2.486E-02	1.47E+02	8.46E+01 G
Eu-152	I	1.1717E-02					3.65E+11	
			344.30	1.172E-02	?(	3.833E-02	2.06E+02	2.70E+01 G
			121.87	-9.607E-05	%	4.396E-02	2.78E+04	2.86E+01 GA
			1408.08	0.000E+00	-	1.861E-01	1.00E+03	2.12E+01 GA
			964.05	-4.537E-02	+	1.961E-01	2.68E+02	1.46E+01 GA
			778.90	2.187E-02	&	1.748E-01	4.91E+02	1.30E+01 GA
			411.09	1.809E-01	?	5.659E-01	1.96E+02	2.26E+00 GA
Eu-154	I	-2.0846E-02					3.65E+11	
			1274.80	-2.085E-02	?(	8.740E-02	2.60E+02	3.55E+01 G
			123.10	6.413E-03	&	3.302E-02	3.17E+02	4.05E+01 GA
			723.30	2.403E-02	&	8.907E-02	2.32E+02	1.97E+01 GA
K-40	N	1.9532E+01					3.65E+11	
			1460.80	1.953E+01	(P	2.148E-01	3.46E+00	1.07E+01 G
Pa-234	N	-9.7862E-03					3.65E+11	
			883.24	-9.786E-03	?(	1.577E-01	9.84E+02	1.50E+01 G
			98.44	2.066E-02	?	6.862E-02	2.06E+02	2.51E+01 GA
			946.00	-1.869E-02	+	1.856E-01	6.10E+02	1.20E+01 GA
Pb-212	N	2.8295E-01					3.65E+11	
			238.63	2.830E-01	(P	2.908E-02	1.01E+01	4.31E+01 G
			77.11	4.357E-01	+ P	1.781E-01	3.36E+01	1.75E+01 GA
			74.81	2.227E-01	-	4.487E-01	1.25E+02	9.60E+00 GA
			87.20	-1.428E-02	% P	3.574E-01	1.85E+03	6.30E+00 GA
			300.09	1.025E-01	-	2.705E-01	1.68E+02	3.27E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:38:55
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   3.4933E-01                                     3.65E+11
                           351.79 3.493E-01  (P 3.399E-02 1.08E+01 3.71E+01 G
                           295.22 1.953E-01 - P 8.152E-02 2.39E+01 1.92E+01 GA
                           241.92-5.540E-02 & P 2.602E-01 3.92E+02 7.47E+00 GA

Ra-226   N   5.6906E-01                                     3.65E+11
                           186.20 5.691E-01  (  3.719E-01 4.36E+01 3.60E+00 G

Th-234   N   1.0656E-02                                     3.65E+11
                            92.60 1.066E-02 %(  3.833E-01 2.19E+03 5.60E+00 G

Tl-208   N   7.4080E-02                                     3.65E+11
                           583.14 7.408E-02 ?(  1.756E-02 2.03E+01 8.60E+01 G
                           860.47 1.351E-01 +   1.693E-01 8.27E+01 1.20E+01 GA

U-235    N   3.7468E-02                                     3.65E+11
                           185.70 3.747E-02  (  2.382E-02 4.26E+01 5.40E+01 G
                           143.76 5.507E-02     1.261E-01 1.43E+02 1.05E+01 GA
                           163.35 0.000E+00 -   3.523E-01 1.00E+03 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:38:55
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_011.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	60.73	76.	-8.	-0.003	332.13	-8.474E-02
Pa-234	98.98	70.	6.	0.002	411.66	2.066E-02
Eu-154	123.35	66.	4.	0.001	633.64	6.413E-03
Eu-152	343.05	24.	3.	0.001	411.23	1.172E-02
Eu-152	409.31	29.	4.	0.001	392.69	1.809E-01
Cs-137	661.19	41.	-6.	-0.002	294.80	-1.063E-02
Eu-154	726.64	25.	3.	0.001	463.78	2.403E-02
Bi-212	727.43	33.	8.	0.003	220.82	1.001E-01
Eu-152	779.12	38.	2.	0.001	981.64	2.187E-02
Pa-234	883.83	34.	-1.	0.000	1968.65	-9.786E-03
Pa-234	945.15	28.	-1.	0.000	1219.18	-1.869E-02
Eu-152	964.08	44.	-4.	-0.001	535.32	-4.537E-02
Eu-154	1273.09	34.	-3.	-0.001	520.91	-2.085E-02
Bi-212	1621.31	13.	-4.	-0.001	304.27	-3.555E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.5263E-01	1.5263E-01	1.0967E-01	1.1018E-01	7.505E-02
Am-241 #A	-8.4740E-02	-8.4740E-02	2.8145E-01	2.8155E-01	2.263E-01
Bi-212 #A	1.0010E-01	1.0010E-01	2.2104E-01	2.2115E-01	1.723E-01
Bi-214	3.0513E-01	3.0513E-01	7.9357E-02	8.2211E-02	3.348E-02
Co-60 #A	0.0000E+00	0.0000E+00	6.0450E-03	6.0450E-03	4.980E-03
Cs-137 #A	-1.0629E-02	-1.0629E-02	3.1334E-02	3.1343E-02	2.486E-02
Eu-152 #A	1.1717E-02	1.1717E-02	4.8183E-02	4.8190E-02	3.833E-02
Eu-154 #A	-2.0846E-02	-2.0846E-02	1.0859E-01	1.0860E-01	8.740E-02
K-40	1.9532E+01	1.9532E+01	1.3750E+00	1.9394E+00	2.148E-01
Pa-234 #A	-9.7862E-03	-9.7862E-03	1.9266E-01	1.9266E-01	1.577E-01
Pb-212	2.8295E-01	2.8295E-01	6.0468E-02	6.4163E-02	2.908E-02
Pb-214	3.4933E-01	3.4933E-01	8.0796E-02	8.4468E-02	3.399E-02
Ra-226	5.6906E-01	5.6906E-01	4.9595E-01	4.9782E-01	3.719E-01
Th-234 #A	1.0656E-02	1.0656E-02	4.6613E-01	4.6613E-01	3.833E-01
Tl-208 #	7.4080E-02	7.4080E-02	3.0004E-02	3.0451E-02	1.756E-02
U-235	3.7468E-02	3.7468E-02	3.1952E-02	3.2078E-02	2.382E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:38:55
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_011.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.6 to  2041.8 keV)     2.115E+01  pCi/g
 Total Decayed Activity (  238.6 to  2041.8 keV) 2.1150221E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE10
Seqnum : 1594011971012
File : 10_20140108_012
Cal : 08-JAN-2014 07:52:53,30-DEC-2013 19:08:15
IDF : 1.0
PDF : 1.0

Lab ID : 251449-010
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 30-DEC-2013
Sample Amount : 327.83 g

Client ID : 04-PD-D0034-10
Acct : ITSI (JG)
Time : 08-JAN-2014 17:54
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.09 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.652	0.226		.4081	.41215	-0.040	u
Bismuth-212	0.184	0.184		.24626	.24661	-0.0025	u
Bismuth-214	0.237	0.0469		.077565	.079336	-0.052	u
Cesium-137	0.0115	0.0236	0.07	.030145	.030155	-0.0069	u
Cobalt-60	0.00134	0.0299		.036493	.036494	0	u
Europium-152	0.0126	0.0565		.069944	.06995	-0.00031	u
Europium-154	0.0244	0.0839		.10528	.10529	-0.013	u
Lead-212	0.406	0.0396		.091318	.09638	-0.016	u
Lead-214	0.391	0.0322		.082733	.087216	-0.0040	u
Potassium-40	18.7	0.263		1.4538	1.9578	-0.36	u
Protactinium-234	-0.0598	0.182		.22771	.22775	0.015	u
Radium-226	0.558	0.430	1.3	.56483	.56641	-0.082	u
Thallium-208	0.128	0.0173		.041159	.04212	0.0020	u
Thorium-232 (By Actinium-228)	0.241	0.0732		.12121	.12237	0.019	u
Thorium-234	0.387	0.496		.62983	.63078	-0.034	u
Uranium-235	0.0344	0.0295		.038439	.038527	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-10
Sample Description: 251449-010, 206637

Detector: HPGE10 51-TP42231A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:03
Acquisition Time: 1/8/2014 17:54:42
Analysis Time: 1/8/2014 18:39
Analysis Quantity: 3.278E+02 g

Spectrum ID: 10_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.09 %

Efficiency: HPGE10 S23325 10_20131230002_EffCal
Efficiency Cal Date: 12/30/2013 19:08
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.412E-01	1.212E-01	1.224E-01	7.315E-02
Am-241	#	6.519E-01	4.081E-01	4.121E-01	2.256E-01
Bi-212	#	1.845E-01	2.463E-01	2.466E-01	1.838E-01
Bi-214		2.368E-01	7.756E-02	7.934E-02	4.686E-02
Co-60	#AB	1.336E-03	3.649E-02	3.649E-02	2.991E-02
Cs-137	#AB	1.148E-02	3.014E-02	3.016E-02	2.359E-02
Eu-152	#AB	1.263E-02	6.994E-02	6.995E-02	5.647E-02
Eu-154	#AB	2.437E-02	1.053E-01	1.053E-01	8.385E-02
K-40		1.873E+01	1.454E+00	1.958E+00	2.633E-01
Pa-234	#AB	-5.977E-02	2.277E-01	2.278E-01	1.817E-01
Pb-212		4.065E-01	9.132E-02	9.638E-02	3.957E-02
Pb-214		3.914E-01	8.273E-02	8.722E-02	3.224E-02
Ra-226	#	5.580E-01	5.648E-01	5.664E-01	4.295E-01
Th-234	#AB	3.866E-01	6.298E-01	6.308E-01	4.963E-01
Tl-208		1.275E-01	4.116E-02	4.212E-02	1.733E-02
U-235	#	3.438E-02	3.844E-02	3.853E-02	2.951E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.200E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:39:52
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_012.An1

Sample description
     251449-010, 206637


Spectrum Filename: C:\User\SPC\Det10\10_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 17:54:42
       Live time:               2700
       Real time:               2702
       Dead time:                  0.09 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:52:53
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.220E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.73keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2783E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2783E+02) =
                                   8.2442E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:39:52
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:03:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_2014-01-01_0202.PBC 1/1/2014 02:02:27
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0987

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.27	34.	31.30	0.31	4.361E-03	59.54	36.300	6.519E-01	Am241
77.32	46.	27.82	0.17	1.539E-02	77.11	17.500	5.207E-01	Pb212
87.51	37.	32.25	0.68	2.198E-02	87.20	6.300	8.208E-01	Pb212
92.62	18.	81.46	0.88	2.495E-02	92.60	5.600	PBC<MDA	Th234
143.69	11.	119.86	0.92	3.987E-02	143.76	10.500	PBC<MDA	U235
185.94	26.	50.61	0.96	4.008E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	5.580E-01	Ra226
185.95	24.	55.90	0.96	4.010E-02	185.70	54.000	3.438E-02	U235
					186.20	3.600	5.160E-01	Ra226
238.51	210.	11.23	1.08	3.661E-02	238.63	43.100	4.065E-01	Pb212
270.32	17.	65.54	1.03	3.426E-02	270.25	3.460	PBC<MDA	Ac228
295.02	114.	15.67	0.33	3.252E-02	295.22	19.200	5.200E-01	Pb214
299.62	10.	95.37	1.06	3.218E-02	300.09	3.270	PBC<MDA	Pb212
338.32	22.	43.22	1.09	2.981E-02	338.40	12.010	1.913E-01	Ac228
344.94	3.	276.91	1.10	2.947E-02	344.30	27.000	PBC<MDA	Eu152
351.80	146.	10.00	0.54	2.905E-02	351.79	37.100	3.914E-01	Pb214
463.30	13.	64.59	1.19	2.407E-02	463.00	4.400	3.707E-01	Ac228
577.78	13.	35.90	0.15	2.062E-02				
583.23	74.	15.22	0.22	2.049E-02	583.14	86.000	1.275E-01	Tl208
609.08	71.	14.62	1.31	1.986E-02	609.69	46.090	2.368E-01	Bi214
660.99	6.	131.28	1.35	1.875E-02	661.66	84.620	PBC<MDA	Cs137
726.95	13.	66.75	1.40	1.754E-02	727.17	11.800	1.845E-01	Bi212
768.63	10.	67.42	1.44	1.687E-02	768.36	4.890	PBC<MDA	Bi214
779.70	1.	832.40	1.44	1.670E-02	778.90	12.990	PBC<MDA	Eu152
786.89	1.	586.30	1.45	1.660E-02	785.42	2.000	PBC<MDA	Bi212
795.33	5.	168.63	1.46	1.646E-02	794.95	4.250	PBC<MDA	Ac228
860.30	4.	164.29	1.50	1.555E-02	860.47	12.000	PBC<MDA	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:39:52
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
911.55	34.	25.12	1.54	1.493E-02	911.07	29.000	2.412E-01	Ac228
947.01	2.	403.89	1.57	1.452E-02	946.00	12.000	PBC<MDA	Pa234
962.14	5.	156.63	1.58	1.432E-02	964.05	14.580	PBC<MDA	Eu152
969.22	15.	58.82	1.58	1.427E-02	968.90	17.460	1.841E-01	Ac228
1120.05	6.	65.92	1.69	1.281E-02	1120.28	15.040	PBC<MDA	Bi214
1224.44	13.	31.71	0.49	1.196E-02				
1275.87	3.	215.98	1.80	1.158E-02	1274.80	35.500	PBC<MDA	Eu154
1377.82	11.	56.71	1.86	1.088E-02	1377.65	4.020	7.905E-01	Bi214
1407.63	2.	341.10	1.88	1.069E-02	1407.98	2.480	1.848E-01	Bi214
					1408.08	21.210	2.161E-02	Eu152
1460.91	697.	3.79	1.21	1.036E-02	1460.80	10.700	1.873E+01	K40
1508.81	10.	43.24	1.95	1.008E-02	1509.19	2.190	1.379E+00	Bi214
1764.12	13.	30.33	2.10	8.775E-03	1764.51	15.920	2.936E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
699.53	87.51	72.	1.	6.785E+01	1612.52	0.682	-	
4620.46	577.78	3.	13.	6.208E+02	71.81	0.146	-	s
9794.10	1224.44	1.	13.	1.054E+03	63.41	0.495	-	sM

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	473.78	59.27	25.	34.	0.013	62.60	0.306s
Pb-212	618.05	77.32	42.	46.	0.017	55.64	0.170s
Pb-212	699.43	87.50	66.	35.	0.013	73.09	0.874
Th-234	740.41	92.62	95.	18.	0.007	162.92	0.879s
Pa-234	787.92	98.56	73.	-3.	-0.001	801.08	0.884s
Eu-152	972.80	121.68	81.	-3.	-0.001	955.98	0.905s
Eu-154	987.63	123.54	83.	-5.	-0.002	534.71	0.906s
U-235	1148.79	143.69	79.	11.	0.004	239.73	0.924s
U-235	1307.53	163.54	91.	-10.	-0.004	270.98	0.941s
U-235	1486.69	185.95	81.	24.	0.009	111.81	0.961s
Ra-226	1486.67	185.94	76.	26.	0.010	101.22	0.961s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:39:52
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	1907.05	238.51	77.	210.	0.078	22.47	1.076
Ac-228	2161.43	270.32	51.	17.	0.006	131.07	1.034s
Pb-214	2358.97	295.02	45.	106.	0.039	31.34	0.332s
Pb-212	2395.71	299.62	43.	10.	0.004	190.75	1.059s
Ac-228	2705.23	338.32	36.	22.	0.008	86.44	1.092s
Eu-152	2758.22	344.94	40.	3.	0.001	553.82	1.097s
Pb-214	2813.06	351.80	24.	138.	0.051	20.00	0.542s
Ac-228	3704.78	463.30	28.	13.	0.005	129.19	1.195s
Tl-208	4664.05	583.23	18.	74.	0.027	30.45	0.219s
Bi-214	4870.82	609.08	36.	71.	0.026	29.23	1.313s
Cs-137	5286.04	660.99	28.	6.	0.002	262.56	1.354s
Eu-154	5790.80	724.09	44.	-8.	-0.003	246.02	1.401s
Bi-212	5813.68	726.95	29.	13.	0.005	133.49	1.404s
Bi-214	6147.17	768.63	29.	10.	0.004	134.84	1.436
Eu-152	6235.71	779.70	30.	1.	0.000	1664.80	1.444s
Bi-212	6293.21	786.89	27.	1.	0.000	1172.59	1.449s
Ac-228	6360.75	795.33	29.	5.	0.002	337.26	1.456s
Tl-208	6880.49	860.30	27.	4.	0.002	328.58	1.505s
Pa-234	7067.00	883.61	34.	-4.	-0.002	380.97	1.522s
Ac-228	7290.49	911.55	20.	34.	0.013	50.24	1.542s
Bi-214	7459.29	932.65	16.	-3.	-0.001	409.83	1.559
Pa-234	7574.19	947.01	28.	2.	0.001	807.79	1.568s
Eu-152	7695.29	962.14	27.	5.	0.002	313.25	1.581s
Ac-228	7751.89	969.22	32.	15.	0.006	117.65	1.584s
Bi-214	8958.78	1120.05	26.	6.	0.002	131.83	1.691
Eu-154	10205.68	1275.87	23.	3.	0.001	431.96	1.796s
Bi-214	11021.50	1377.82	16.	11.	0.004	113.43	1.863
Eu-152	11260.09	1407.63	14.	2.	0.001	682.19	1.882s
K-40	11686.51	1460.91	17.	680.	0.252	7.58	1.208s
Bi-214	12069.89	1508.81	4.	10.	0.004	86.48	1.946
Bi-214	14113.54	1764.12	8.	13.	0.005	60.66	2.097

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.4124E-01					3.65E+11
			911.07	2.412E-01	?(	7.315E-02 2.51E+01 2.90E+01	G
			968.90	1.841E-01	?	1.603E-01 5.88E+01 1.75E+01	GA
			338.40	1.913E-01	?	1.188E-01 4.32E+01 1.20E+01	GA
			964.77	3.096E-02	%	7.254E-01 1.43E+03 4.99E+00	GA
			463.00	3.707E-01	?	3.559E-01 6.46E+01 4.40E+00	GA
			794.95	2.039E-01	?	5.448E-01 1.69E+02 4.25E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:39:52
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_012.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			270.25	4.288E-01	?	4.294E-01	6.55E+01	3.46E+00 GA
Am-241	I	6.5192E-01					3.65E+11	
			59.54	6.519E-01	(	2.256E-01	3.13E+01	3.63E+01 G
Bi-212	N	1.8448E-01					3.65E+11	
			727.17	1.845E-01	?(	1.838E-01	6.67E+01	1.18E+01 G
			1620.56	0.000E+00	-	2.730E-01	1.00E+03	2.75E+00 GA
			785.42	1.165E-01	?	1.112E+00	5.86E+02	2.00E+00 GA
Bi-214	N	2.3682E-01					3.65E+11	
			609.69	2.368E-01	?(P	4.686E-02	1.46E+01	4.61E+01 G
			1764.51	2.936E-01	P	1.460E-01	3.03E+01	1.59E+01 GA
			1120.28	1.000E-01	- P	1.877E-01	6.59E+01	1.50E+01 GA
			768.36	3.601E-01	P	4.664E-01	6.74E+01	4.89E+00 GA
			1377.65	7.905E-01	+ P	6.508E-01	5.67E+01	4.02E+00 GA
			934.05	-1.885E-01	-	6.095E-01	2.05E+02	3.17E+00 GA
			1407.98	0.000E+00	-	2.684E-01	1.00E+03	2.48E+00 GA
			1509.19	1.379E+00	+	6.691E-01	4.32E+01	2.19E+00 GA
			665.45	-1.690E-01	% P	1.395E+00	1.66E+03	1.56E+00 GA
Co-60	T	1.3362E-03					3.65E+11	
			1173.24	1.336E-03	%(	2.991E-02	1.37E+03	9.99E+01 G
			1332.50	0.000E+00	-	6.365E-03	1.00E+03	1.00E+02 G
Cs-137	I	1.1481E-02					3.65E+11	
			661.66	1.148E-02	&(	2.359E-02	1.31E+02	8.46E+01 G
Eu-152	I	1.2629E-02					3.65E+11	
			344.30	1.263E-02	&(	5.647E-02	2.77E+02	2.70E+01 G
			121.87	-7.848E-03	+	6.130E-02	4.78E+02	2.86E+01 GA
			1408.08	2.161E-02	&	1.182E-01	3.41E+02	2.12E+01 GA
			964.05	7.121E-02	&	1.759E-01	1.57E+02	1.46E+01 GA
			778.90	1.319E-02	?	1.795E-01	8.32E+02	1.30E+01 GA
			411.09	-1.116E-03	%	7.228E-01	3.93E+04	2.26E+00 GA
Eu-154	I	2.4373E-02					3.65E+11	
			1274.80	2.437E-02	?(	8.385E-02	2.16E+02	3.55E+01 G
			123.10	-1.001E-02	+	4.344E-02	2.67E+02	4.05E+01 GA
			723.30	-7.036E-02	&	1.366E-01	1.23E+02	1.97E+01 GA
K-40	N	1.8727E+01					3.65E+11	
			1460.80	1.873E+01	(P	2.633E-01	3.79E+00	1.07E+01 G
Pa-234	N	-5.9772E-02					3.65E+11	
			883.24	-5.977E-02	?(	1.817E-01	1.90E+02	1.50E+01 G
			98.44	-1.325E-02	+	8.656E-02	4.01E+02	2.51E+01 GA
			946.00	3.325E-02	?	2.176E-01	4.04E+02	1.20E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:39:52
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   4.0646E-01                                     3.65E+11
                          238.63 4.065E-01  (  3.957E-02 1.12E+01 4.31E+01 G
                           77.11 5.207E-01     1.738E-01 2.78E+01 1.75E+01 GA
                           74.81 0.000E+00 -   7.881E-01 1.00E+03 9.60E+00 GA
                           87.20 7.880E-01 +   4.214E-01 3.65E+01 6.30E+00 GA
                          300.09 3.000E-01 -   4.456E-01 9.54E+01 3.27E+00 GA

Pb-214   N   3.9139E-01                                     3.65E+11
                          351.79 3.914E-01  (P 3.224E-02 1.00E+01 3.71E+01 G
                          295.22 5.200E-01 + P 7.621E-02 1.57E+01 1.92E+01 GA
                          241.92 9.939E-03 %   3.335E-01 2.04E+03 7.47E+00 GA

Ra-226   N   5.5801E-01                                     3.65E+11
                          186.20 5.580E-01 ?(  4.295E-01 5.06E+01 3.60E+00 G

Th-234   N   3.8658E-01                                     3.65E+11
                           92.60 3.866E-01 ?(  4.963E-01 8.15E+01 5.60E+00 G

Tl-208   N   1.2751E-01                                     3.65E+11
                          583.14 1.275E-01  (P 1.733E-02 1.52E+01 8.60E+01 G
                          860.47 6.900E-02 & P 1.964E-01 1.64E+02 1.20E+01 GA

U-235    N   3.4379E-02                                     3.65E+11
                          185.70 3.438E-02 ?(  2.951E-02 5.59E+01 5.40E+01 G
                          143.76 7.904E-02     1.510E-01 1.20E+02 1.05E+01 GA
                          163.35-1.635E-01 -   3.551E-01 1.35E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:39:52
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_012.An1

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Pa-234	98.56	73.	-3.	-0.001	801.08	-1.325E-02
Eu-152	121.68	81.	-3.	-0.001	955.98	-7.848E-03
Eu-154	123.54	83.	-5.	-0.002	534.71	-1.001E-02
U-235	143.69	79.	11.	0.004	239.73	7.904E-02
U-235	163.54	91.	-10.	-0.004	270.98	-1.635E-01
U-235	185.95	81.	24.	0.009	111.81	3.438E-02
Ra-226	185.94	76.	26.	0.010	101.22	5.580E-01
Eu-152	344.94	40.	3.	0.001	553.82	1.263E-02
Cs-137	660.99	28.	6.	0.002	262.56	1.148E-02
Eu-154	724.09	44.	-8.	-0.003	246.02	-7.036E-02
Bi-212	726.95	29.	13.	0.005	133.49	1.845E-01
Eu-152	779.70	30.	1.	0.000	1664.80	1.319E-02
Bi-212	786.89	27.	1.	0.000	1172.59	1.165E-01
Pa-234	883.61	34.	-4.	-0.002	380.97	-5.977E-02
Pa-234	947.01	28.	2.	0.001	807.79	3.325E-02
Eu-152	962.14	27.	5.	0.002	313.25	7.121E-02
Eu-154	1275.87	23.	3.	0.001	431.96	2.437E-02
Eu-152	1407.63	14.	2.	0.001	682.19	2.161E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.4124E-01	2.4124E-01	1.2121E-01	1.2237E-01	7.315E-02
Am-241 #	6.5192E-01	6.5192E-01	4.0810E-01	4.1215E-01	2.256E-01
Bi-212 #	1.8448E-01	1.8448E-01	2.4626E-01	2.4661E-01	1.838E-01
Bi-214	2.3682E-01	2.3682E-01	7.7565E-02	7.9336E-02	4.686E-02
Co-60 #A	1.3362E-03	1.3362E-03	3.6493E-02	3.6494E-02	2.991E-02
Cs-137 #A	1.1481E-02	1.1481E-02	3.0145E-02	3.0155E-02	2.359E-02
Eu-152 #A	1.2629E-02	1.2629E-02	6.9944E-02	6.9950E-02	5.647E-02
Eu-154 #A	2.4373E-02	2.4373E-02	1.0528E-01	1.0529E-01	8.385E-02
K-40	1.8727E+01	1.8727E+01	1.4538E+00	1.9578E+00	2.633E-01
Pa-234 #A	-5.9772E-02	-5.9772E-02	2.2771E-01	2.2775E-01	1.817E-01
Pb-212	4.0646E-01	4.0646E-01	9.1318E-02	9.6380E-02	3.957E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:39:52
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_012.An1

Pb-214	3.9139E-01	3.9139E-01	8.2733E-02	8.7216E-02	3.224E-02
Ra-226 #	5.5801E-01	5.5801E-01	5.6483E-01	5.6641E-01	4.295E-01
Th-234 #A	3.8658E-01	3.8658E-01	6.2983E-01	6.3078E-01	4.963E-01
Tl-208	1.2751E-01	1.2751E-01	4.1159E-02	4.2120E-02	1.733E-02
U-235 #	3.4379E-02	3.4379E-02	3.8439E-02	3.8527E-02	2.951E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (87.4 to 2041.7 keV) 2.055E+01 pCi/g
Total Decayed Activity (87.4 to 2041.7 keV) 2.0545246E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE11	Lab ID	: 251449-011	Client ID	: 04-PD-D0034-11
Seqnum	: 1604011948012	Matrix	: Soil	Acct	: ITSI (JG)
File	: 11_20140108_012	Batch	: 206637	Time	: 08-JAN-2014 17:56
Cal	: 08-JAN-2014 07:30:05,03-JAN-2014 14:18:33	Caldate	: 08-JAN-2014, 03-JAN-2014		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 356.36 g	Live Time	: 2700 sec
				Dead Time	: 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0309	0.159		.19606	.19608	-0.040	u
Bismuth-212	0.0945	0.167		.21626	.21636	-0.0025	u
Bismuth-214	0.363	0.0337		.087486	.091142	-0.052	u
Cesium-137	-0.00790	0.0269	0.07	.033609	.033613	-0.0069	u
Cobalt-60	-0.00899	0.0336		.041882	.041886	0	u
Europium-152	-0.0102	0.0619		.076138	.076141	-0.00031	u
Europium-154	-0.0527	0.104		.13156	.1316	-0.013	u
Lead-212	0.337	0.0333		.074466	.078737	-0.016	u
Lead-214	0.223	0.0461		.073311	.074981	-0.0040	u
Potassium-40	17.5	0.301		1.4219	1.879	-0.36	u
Protactinium-234	0.0730	0.110		.14682	.14691	0.015	u
Radium-226	0.632	0.324	1.3	.45762	.46012	-0.082	u
Thallium-208	0.0783	0.0216		.033769	.034212	0.0020	u
Thorium-232 (By Actinium-228)	0.215	0.0823		.12264	.12355	0.019	u
Thorium-234	0.299	0.414		.52481	.5255	-0.034	u
Uranium-235	0.00293	0.0272		.033243	.033243	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-11
Sample Description: 251449-011, 206637

Detector: HPGE11 50-TP50818A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:06
Acquisition Time: 1/8/2014 17:56:12
Analysis Time: 1/8/2014 18:41
Analysis Quantity: 3.564E+02 g

Spectrum ID: 11_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE11 S23325 11_20140102002_EffCal
Efficiency Cal Date: 1/3/2014 14:18
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.147E-01	1.226E-01	1.236E-01	8.229E-02
Am-241	#AB	-3.095E-02	1.961E-01	1.961E-01	1.593E-01
Bi-212	#AB	9.447E-02	2.163E-01	2.164E-01	1.673E-01
Bi-214		3.631E-01	8.749E-02	9.114E-02	3.373E-02
Co-60	#AB	-8.990E-03	4.188E-02	4.189E-02	3.364E-02
Cs-137	#AB	-7.903E-03	3.361E-02	3.361E-02	2.694E-02
Eu-152	#AB	-1.023E-02	7.614E-02	7.614E-02	6.186E-02
Eu-154	#AB	-5.274E-02	1.316E-01	1.316E-01	1.035E-01
K-40		1.754E+01	1.422E+00	1.879E+00	3.009E-01
Pa-234	#AB	7.304E-02	1.468E-01	1.469E-01	1.097E-01
Pb-212		3.373E-01	7.447E-02	7.874E-02	3.334E-02
Pb-214	#	2.231E-01	7.331E-02	7.498E-02	4.609E-02
Ra-226		6.319E-01	4.576E-01	4.601E-01	3.243E-01
Th-234	#AB	2.991E-01	5.248E-01	5.255E-01	4.144E-01
Tl-208	#	7.830E-02	3.377E-02	3.421E-02	2.155E-02
U-235	AB	2.932E-03	3.324E-02	3.324E-02	2.718E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.986E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:41:21
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_012.An1

Sample description
     251449-011, 206637


Spectrum Filename: C:\User\SPC\Det11\11_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 17:56:12
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:30:05
            Zero offset:           0.125 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.054E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.31keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.5636E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.5636E+02) =
                                   7.5842E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:41:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:06:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	11_2014-01-04_0721.PBC 1/4/2014 07:21:07
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.2131

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
52.96	13.	64.68	0.16	5.369E-03				
74.96	47.	25.64	0.81	1.840E-02	74.81	9.600	6.993E-01	Pb212
77.19	73.	18.43	0.82	1.961E-02	77.11	17.500	6.015E-01	Pb212
87.26	16.	78.36	0.83	2.451E-02	87.20	6.300	PBC<MDA	Pb212
93.01	16.	87.74	0.83	2.677E-02	92.60	5.600	PBC<MDA	Th234
185.68	2.	566.85	0.92	3.622E-02	185.70	54.000	PBC<MDA	U235
186.18	29.	36.21	0.92	3.620E-02	186.20	3.600	6.319E-01	Ra226
238.60	176.	10.72	0.80	3.309E-02	238.63	43.100	3.373E-01	Pb212
241.85	8.	95.44	0.98	3.287E-02	241.92	7.470	PBC<MDA	Pb214
269.87	9.	114.44	1.00	3.105E-02	270.25	3.460	PBC<MDA	Ac228
295.04	88.	13.61	0.70	2.955E-02	295.22	19.200	4.109E-01	Pb214
300.06	13.	75.17	1.03	2.926E-02	300.09	3.270	PBC<MDA	Pb212
338.16	37.	29.37	1.07	2.720E-02	338.40	12.010	3.196E-01	Ac228
351.80	104.	13.60	1.41	2.654E-02	351.79	37.100	2.702E-01	Pb214
462.92	9.	72.26	1.19	2.218E-02	463.00	4.400	PBC<MDA	Ac228
583.15	46.	18.69	1.30	1.900E-02	583.14	86.000	7.830E-02	Tl208
609.28	119.	11.08	0.81	1.844E-02	609.69	46.090	3.631E-01	Bi214
665.45	6.	131.83	1.37	1.738E-02	665.45	1.560	PBC<MDA	Bi214
727.63	6.	114.46	1.43	1.636E-02	727.17	11.800	PBC<MDA	Bi212
769.22	7.	109.63	1.47	1.576E-02	768.36	4.890	PBC<MDA	Bi214
795.34	7.	105.18	1.49	1.539E-02	794.95	4.250	PBC<MDA	Ac228
860.98	4.	180.11	1.55	1.457E-02	860.47	12.000	PBC<MDA	Tl208
881.76	6.	100.51	1.57	1.431E-02	883.24	15.000	PBC<MDA	Pa234
911.23	31.	24.90	1.60	1.401E-02	911.07	29.000	2.147E-01	Ac228
963.37	2.	359.25	1.64	1.346E-02	964.05	14.580	PBC<MDA	Eu152
969.21	12.	68.34	1.65	1.341E-02	968.90	17.460	PBC<MDA	Ac228
1377.75	3.	154.03	1.99	1.033E-02	1377.65	4.020	PBC<MDA	Bi214

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:41:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1460.91	676.	3.95	1.50	9.854E-03	1460.80	10.700	1.754E+01	K40
1508.81	3.	187.33	2.10	9.596E-03	1509.19	2.190	PBC<MDA	Bi214
1765.22	16.	28.01	2.31	8.394E-03	1764.51	15.920	3.416E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
422.32	52.96	23.	13.	2.347E+03	129.36	0.160	PB-214	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	477.00	59.81	67.	-4.	-0.001	633.48	0.798s
Pb-212	596.57	74.77	83.	18.	0.007	130.15	0.813s
Pb-212	615.87	77.18	44.	88.	0.033	34.38	0.668s
Pb-212	696.41	87.26	103.	16.	0.006	156.71	0.825
Th-234	742.39	93.01	90.	16.	0.006	175.47	0.830s
Eu-152	971.52	121.67	81.	-4.	-0.001	694.09	0.859s
U-235	1144.56	143.32	78.	-5.	-0.002	521.92	0.881s
U-235	1303.54	163.21	71.	-8.	-0.003	289.19	0.900s
U-235	1483.34	185.70	66.	2.	0.001	1133.71	0.921D
Ra-226	1487.34	186.20	42.	29.	0.011	72.42	0.922D
Pb-212	1906.23	238.60	53.	171.	0.063	21.43	0.795
Pb-214	1932.25	241.85	80.	8.	0.003	190.89	0.976s
Ac-228	2156.21	269.87	44.	9.	0.003	228.88	1.003s
Pb-214	2357.27	295.01	46.	65.	0.024	35.05	1.027s
Pb-212	2397.66	300.06	43.	13.	0.005	150.34	1.032
Ac-228	2702.29	338.16	47.	37.	0.014	58.75	1.069s
Eu-152	2749.08	344.02	47.	-3.	-0.001	743.99	1.074s
Pb-214	2810.88	351.74	48.	78.	0.029	29.38	1.081s
Ac-228	3699.91	462.92	26.	9.	0.003	144.51	1.186s
Tl-208	4661.47	583.15	29.	46.	0.017	37.39	1.298s
Bi-214	4870.48	609.28	19.	110.	0.041	22.16	0.807s
Cs-137	5288.54	661.54	37.	-4.	-0.002	425.26	1.371s
Bi-214	5319.80	665.45	28.	6.	0.002	263.65	1.374
Eu-154	5779.63	722.93	32.	-2.	-0.001	1010.30	1.427s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:41:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-212	5817.19	727.63	24.	6.	0.002	228.92	1.430s
Bi-214	6149.92	769.22	33.	7.	0.002	219.26	1.468s
Eu-152	6224.66	778.56	23.	-2.	-0.001	871.35	1.477s
Ac-228	6358.91	795.34	24.	7.	0.003	210.35	1.491s
Tl-208	6884.09	860.98	24.	4.	0.001	360.23	1.550s
Pa-234	7050.41	881.76	13.	6.	0.002	201.01	1.570s
Ac-228	7286.19	911.23	26.	31.	0.011	49.79	1.595s
Eu-152	7703.43	963.37	33.	2.	0.001	718.51	1.642s
Ac-228	7750.15	969.21	30.	12.	0.005	136.69	1.646s
Co-60	9380.64	1172.92	36.	-4.	-0.001	465.88	1.823s
Eu-154	10211.62	1276.72	38.	-7.	-0.003	249.44	1.909s
Bi-214	11020.46	1377.75	10.	3.	0.001	308.06	1.994s
K-40	11686.36	1460.91	24.	658.	0.244	7.89	1.496s
Bi-214	12069.99	1508.81	10.	3.	0.001	374.65	2.102s
Bi-214	14123.76	1765.22	2.	16.	0.006	56.03	2.306s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g		COMMENTS
Ac-228	N	2.1466E-01					3.65E+11	
			911.07	2.147E-01	?(P	8.229E-02	2.49E+01	2.90E+01 G
			968.90	1.476E-01	? P	1.519E-01	6.83E+01	1.75E+01 GA
			338.40	3.196E-01	? P	1.377E-01	2.94E+01	1.20E+01 GA
			964.77	0.000E+00	-	5.969E-01	1.00E+03	4.99E+00 GA
			463.00	2.697E-01	? P	3.434E-01	7.23E+01	4.40E+00 GA
			794.95	2.953E-01	? P	4.901E-01	1.05E+02	4.25E+00 GA
			270.25	2.250E-01	?	4.049E-01	1.14E+02	3.46E+00 GA
Am-241	I	-3.0949E-02					3.65E+11	
			59.54	-3.095E-02	?(	1.593E-01	3.17E+02	3.63E+01 G
Bi-212	N	9.4468E-02					3.65E+11	
			727.17	9.447E-02	?(	1.673E-01	1.14E+02	1.18E+01 G
			1620.56	0.000E+00	-	2.632E-01	1.00E+03	2.75E+00 GA
			785.42	-1.839E-02	%	9.207E-01	3.05E+03	2.00E+00 GA
Bi-214	N	3.6307E-01					3.65E+11	
			609.69	3.631E-01	(P	3.373E-02	1.11E+01	4.61E+01 G
			1764.51	3.416E-01	? P	7.718E-02	2.80E+01	1.59E+01 GA
			1120.28	-3.974E-02	% P	2.223E-01	1.00E+03	1.50E+01 GA
			768.36	2.450E-01	& P	4.858E-01	1.10E+02	4.89E+00 GA
			1377.65	2.088E-01	-	4.923E-01	1.54E+02	4.02E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:41:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_012.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			934.05	-2.167E-02	%	7.478E-01	2.10E+03	3.17E+00 GA
			1407.98	-2.092E-03	% P	1.796E+00	1.00E+03	2.48E+00 GA
			1509.19	3.433E-01	?	9.991E-01	1.87E+02	2.19E+00 GA
			665.45	6.221E-01	+	1.285E+00	1.32E+02	1.56E+00 GA
Co-60	T	-8.9897E-03					3.65E+11	
			1173.24	-8.990E-03	?(	3.364E-02	2.33E+02	9.99E+01 G
			1332.50	6.086E-04	%	2.317E-02	2.32E+03	1.00E+02 G
Cs-137	I	-7.9031E-03					3.65E+11	
			661.66	-7.903E-03	?(	2.694E-02	2.13E+02	8.46E+01 G
Eu-152	I	-1.0234E-02					3.65E+11	
			344.30	-1.023E-02	?(	6.186E-02	3.72E+02	2.70E+01 G
			121.87	-1.058E-02	+	5.979E-02	3.47E+02	2.86E+01 GA
			1408.08	0.000E+00	+	2.106E-01	1.00E+03	2.12E+01 GA
			964.05	3.277E-02	&	1.907E-01	3.59E+02	1.46E+01 GA
			778.90	-2.179E-02	+	1.538E-01	4.36E+02	1.30E+01 GA
			411.09	-1.294E-02	%	7.295E-01	3.43E+03	2.26E+00 GA
Eu-154	I	-5.2742E-02					3.65E+11	
			1274.80	-5.274E-02	?(	1.035E-01	1.25E+02	3.55E+01 G
			123.10	4.826E-04	%	4.260E-02	5.36E+03	4.05E+01 GA
			723.30	-1.389E-02	+	1.142E-01	5.05E+02	1.97E+01 GA
K-40	N	1.7542E+01					3.65E+11	
			1460.80	1.754E+01	(P	3.009E-01	3.95E+00	1.07E+01 G
Pa-234	N	7.3043E-02					3.65E+11	
			883.24	7.304E-02	?(	1.097E-01	1.01E+02	1.50E+01 G
			98.44	-4.898E-03	&	8.347E-02	1.04E+03	2.51E+01 GA
			946.00	0.000E+00	&	2.900E-01	1.00E+03	1.20E+01 GA
Pb-212	N	3.3728E-01					3.65E+11	
			238.63	3.373E-01	(P	3.334E-02	1.07E+01	4.31E+01 G
			77.11	7.218E-01	+	1.268E-01	1.72E+01	1.75E+01 GA
			74.81	2.851E-01	? P	3.381E-01	6.51E+01	9.60E+00 GA
			87.20	2.922E-01	P	4.303E-01	7.84E+01	6.30E+00 GA
			300.09	3.874E-01		4.464E-01	7.52E+01	3.27E+00 GA
Pb-214	N	2.2311E-01					3.65E+11	
			351.79	2.231E-01	?(P	4.609E-02	1.47E+01	3.71E+01 G
			295.22	3.204E-01	? P	7.818E-02	1.75E+01	1.92E+01 GA
			241.92	9.299E-02	- P	2.383E-01	9.54E+01	7.47E+00 GA
Ra-226	N	6.3187E-01					3.65E+11	
			186.20	6.319E-01	(	3.243E-01	3.62E+01	3.60E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:41:21
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   2.9909E-01                                      3.65E+11
                            92.60 2.991E-01 ?(  4.144E-01 8.77E+01 5.60E+00 G

Tl-208   N   7.8300E-02                                      3.65E+11
                           583.14 7.830E-02 ?(P 2.155E-02 1.87E+01 8.60E+01 G
                           860.47 6.431E-02 &   1.833E-01 1.80E+02 1.20E+01 GA

U-235    N   2.9322E-03                                      3.65E+11
                           185.70 2.932E-03  (  2.718E-02 5.67E+02 5.40E+01 G
                           143.76-3.562E-02 +   1.508E-01 2.61E+02 1.05E+01 GA
                           163.35-1.370E-01 &   3.170E-01 1.45E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:41:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_012.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.81	67.	-4.	-0.001	633.48	-3.095E-02
Th-234	93.01	90.	16.	0.006	175.47	2.991E-01
Eu-152	121.67	81.	-4.	-0.001	694.09	-1.058E-02
Eu-152	344.02	47.	-3.	-0.001	743.99	-1.023E-02
Cs-137	661.54	37.	-4.	-0.002	425.26	-7.903E-03
Eu-154	722.93	32.	-2.	-0.001	1010.30	-1.389E-02
Bi-212	727.63	24.	6.	0.002	228.92	9.447E-02
Eu-152	778.56	23.	-2.	-0.001	871.35	-2.179E-02
Pa-234	881.76	13.	6.	0.002	201.01	7.304E-02
Eu-152	963.37	33.	2.	0.001	718.51	3.277E-02
Co-60	1172.92	36.	-4.	-0.001	465.88	-8.990E-03
Eu-154	1276.72	38.	-7.	-0.003	249.44	-5.274E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.1466E-01	2.1466E-01	1.2264E-01	1.2355E-01	8.229E-02
Am-241 #A	-3.0949E-02	-3.0949E-02	1.9606E-01	1.9608E-01	1.593E-01
Bi-212 #A	9.4468E-02	9.4468E-02	2.1626E-01	2.1636E-01	1.673E-01
Bi-214	3.6307E-01	3.6307E-01	8.7486E-02	9.1142E-02	3.373E-02
Co-60 #A	-8.9897E-03	-8.9897E-03	4.1882E-02	4.1886E-02	3.364E-02
Cs-137 #A	-7.9031E-03	-7.9031E-03	3.3609E-02	3.3613E-02	2.694E-02
Eu-152 #A	-1.0234E-02	-1.0234E-02	7.6138E-02	7.6141E-02	6.186E-02
Eu-154 #A	-5.2742E-02	-5.2742E-02	1.3156E-01	1.3160E-01	1.035E-01
K-40	1.7542E+01	1.7542E+01	1.4219E+00	1.8790E+00	3.009E-01
Pa-234 #A	7.3043E-02	7.3043E-02	1.4682E-01	1.4691E-01	1.097E-01
Pb-212	3.3728E-01	3.3728E-01	7.4466E-02	7.8737E-02	3.334E-02
Pb-214 #	2.2311E-01	2.2311E-01	7.3311E-02	7.4981E-02	4.609E-02
Ra-226	6.3187E-01	6.3187E-01	4.5762E-01	4.6012E-01	3.243E-01
Th-234 #A	2.9909E-01	2.9909E-01	5.2481E-01	5.2550E-01	4.144E-01
Tl-208 #	7.8300E-02	7.8300E-02	3.3769E-02	3.4212E-02	2.155E-02
U-235 A	2.9322E-03	2.9322E-03	3.3243E-02	3.3243E-02	2.718E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:41:21
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_012.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.6 to  2041.3 keV)     1.939E+01  pCi/g
 Total Decayed Activity (  238.6 to  2041.3 keV) 1.9390408E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614011949011
File : 12_20140108_011
Cal : 08-JAN-2014 07:54:39,03-JAN-2014 19:51:11
IDF : 1.0
PDF : 1.0

Lab ID : 251449-012
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 03-JAN-2014
Sample Amount : 343.45 g

Client ID : 04-PD-D0034-12
Acct : ITSI (JG)
Time : 08-JAN-2014 17:56
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.2 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0666	0.244		.30317	.30323	-0.040	u
Bismuth-212	0.0729	0.184		.23345	.2335	-0.0025	u
Bismuth-214	0.130	0.0540		.074207	.074771	-0.052	u
Cesium-137	0.00798	0.0183	0.07	.023632	.023639	-0.0069	u
Cobalt-60	0.00109	0.0348		.042392	.042392	0	u
Europium-152	0.0109	0.0525		.065056	.06506	-0.00031	u
Europium-154	-0.000423	0.0844		.10251	.10251	-0.013	u
Lead-212	0.366	0.0434		.09697	.10086	-0.016	u
Lead-214	0.187	0.0477		.07128	.072492	-0.0040	u
Potassium-40	17.4	0.248		1.4138	1.865	-0.36	u
Protactinium-234	0.0147	0.139		.17096	.17096	0.015	u
Radium-226	0.171	0.431	1.3	.53669	.53685	-0.082	u
Thallium-208	0.0988	0.0186		.03716	.0378	0.0020	u
Thorium-232 (By Actinium-228)	0.133	0.0902		.12043	.12079	0.019	u
Thorium-234	0.407	0.436		.56196	.56314	-0.034	u
Uranium-235	0.0104	0.0293		.036374	.036383	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-12
Sample Description: 251449-012, 206637

Detector: HPGE12 50-TP32731A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:08
Acquisition Time: 1/8/2014 17:56:56
Analysis Time: 1/8/2014 18:42
Analysis Quantity: 3.435E+02 g

Spectrum ID: 12_20140108_011
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2705 sec
Dead Time: 0.20 %

Efficiency: HPGE12 S23325 12_20140103002_EffCal
Efficiency Cal Date: 1/3/2014 19:51
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		1.331E-01	1.204E-01	1.208E-01	9.018E-02
Am-241	#AB	6.660E-02	3.032E-01	3.032E-01	2.444E-01
Bi-212	#AB	7.293E-02	2.334E-01	2.335E-01	1.844E-01
Bi-214		1.301E-01	7.421E-02	7.477E-02	5.395E-02
Co-60	#AB	1.091E-03	4.239E-02	4.239E-02	3.481E-02
Cs-137	#AB	7.976E-03	2.363E-02	2.364E-02	1.834E-02
Eu-152	#AB	1.085E-02	6.506E-02	6.506E-02	5.251E-02
Eu-154	#AB	-4.225E-04	1.025E-01	1.025E-01	8.440E-02
K-40		1.737E+01	1.414E+00	1.865E+00	2.477E-01
Pa-234	#AB	1.471E-02	1.710E-01	1.710E-01	1.389E-01
Pb-212		3.658E-01	9.697E-02	1.009E-01	4.337E-02
Pb-214		1.872E-01	7.128E-02	7.249E-02	4.769E-02
Ra-226	#AB	1.708E-01	5.367E-01	5.368E-01	4.306E-01
Th-234	#AB	4.067E-01	5.620E-01	5.631E-01	4.364E-01
Tl-208		9.876E-02	3.716E-02	3.780E-02	1.861E-02
U-235	#AB	1.042E-02	3.637E-02	3.638E-02	2.927E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.905E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:42:07
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_011.An1

Sample description
     251449-012, 206637


Spectrum Filename: C:\User\SPC\Det12\12_20140108_011.An1

Acquisition information
       Start time:                 1/8/2014 17:56:56
       Live time:               2700
       Real time:               2705
       Dead time:                  0.20 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_Soil 250ml TunaCan_01-03-2014.Clb
     HPGE12 S23325 12_20140103002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:54:39
            Zero offset:           0.094 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.482E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 19:51:11
            Type:                  Polynomial
            Uncertainty:           1.037 %
            Coefficients:         -0.383371  -4.365972   0.460548
                                  -0.057677   0.002462  -0.000050

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2042.47keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4345E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4345E+02) =
                                   7.8693E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:42:07
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:08:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	12_2014-01-04_2135.PBC 1/4/2014 21:35:44
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 18 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0797

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
60.25	5.	227.61	0.84	5.500E-03	59.54	36.300	PBC<MDA	Am241
74.75	20.	71.84	0.85	1.432E-02	74.81	9.600	PBC<MDA	Pb212
77.19	65.	22.65	0.95	1.573E-02	77.11	17.500	6.903E-01	Pb212
92.73	19.	69.08	0.87	2.405E-02	92.60	5.600	PBC<MDA	Th234
121.79	10.	127.78	0.90	3.399E-02	121.87	28.590	PBC<MDA	Eu152
174.73	41.	31.41	0.12	3.770E-02				
185.60	7.	174.52	0.95	3.737E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	1.564E-01	Ra226
					185.70	54.000	1.042E-02	U235
185.69	8.	157.11	0.96	3.735E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	1.708E-01	Ra226
238.55	185.	13.25	0.72	3.424E-02	238.63	43.100	3.658E-01	Pb212
241.82	45.	34.80	0.16	3.401E-02	241.92	7.470	5.162E-01	Pb214
269.79	11.	78.50	1.03	3.207E-02	270.25	3.460	PBC<MDA	Ac228
295.05	90.	14.20	0.55	3.046E-02	295.22	19.200	4.190E-01	Pb214
300.18	6.	163.91	1.06	3.014E-02	300.09	3.270	PBC<MDA	Pb212
338.41	47.	20.32	0.17	2.791E-02	338.40	12.010	4.047E-01	Ac228
344.40	3.	299.79	1.10	2.760E-02	344.30	27.000	PBC<MDA	Eu152
351.78	118.	12.84	0.15	2.720E-02				
352.05	65.	15.87	1.10	2.720E-02	351.79	37.100	1.872E-01	Pb214
356.92	13.	35.86	0.85	2.694E-02				
397.33	26.	24.58	0.21	2.504E-02				
463.14	10.	77.73	1.20	2.250E-02	463.00	4.400	PBC<MDA	Ac228
583.42	56.	16.63	0.56	1.911E-02	583.14	86.000	9.876E-02	Tl208
609.55	38.	21.68	1.32	1.852E-02	609.69	46.090	1.301E-01	Bi214
664.02	4.	148.14	1.36	1.747E-02	661.66	84.620	PBC<MDA	Cs137
726.92	5.	160.06	1.41	1.634E-02	727.17	11.800	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:42:07
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
767.93	6.	123.03	1.44	1.571E-02	768.36	4.890	PBC<MDA	Bi214
785.82	6.	109.05	1.45	1.546E-02	785.42	2.000	PBC<MDA	Bi212
882.62	1.	581.24	1.52	1.421E-02	883.24	15.000	PBC<MDA	Pa234
911.13	18.	33.65	1.54	1.390E-02	911.07	29.000	1.330E-01	Ac228
934.90	0.	903.25	1.56	1.365E-02	934.05	3.170	PBC<MDA	Bi214
942.10	2.	359.02	1.57	1.352E-02	946.00	12.000	PBC<MDA	Pa234
969.15	44.	15.08	0.15	1.329E-02	968.90	17.460	5.367E-01	Ac228
1120.32	15.	45.01	1.68	1.193E-02	1120.28	15.040	2.452E-01	Bi214
1229.74	30.	18.26	0.25	1.111E-02				
1377.53	6.	92.54	1.84	1.016E-02	1377.65	4.020	PBC<MDA	Bi214
1408.12	5.	105.93	1.86	9.983E-03	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	7.115E-02	Eu152
1408.17	5.	103.38	1.86	9.982E-03	1407.98	2.480	6.195E-01	Bi214
					1408.08	21.210	7.244E-02	Eu152
1460.99	632.	3.98	1.72	9.686E-03	1460.80	10.700	1.737E+01	K40
1508.77	4.	84.63	1.92	9.429E-03	1509.19	2.190	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1397.40	174.73	34.	41.	1.098E+03	62.82	0.124	-	s
2814.01	351.78	24.	118.	4.319E+03	25.69	0.147	PB-214	l
2855.15	356.92	4.	13.	4.863E+02	71.72	0.854	-	s
3178.47	397.33	3.	26.	1.026E+03	49.15	0.207	-	s
9837.15	1229.74	0.	30.	2.700E+03	36.51	0.250	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	481.34	60.25	52.	5.	0.002	455.22	0.837s
Pb-212	597.43	74.75	90.	20.	0.007	143.68	0.851
Pb-212	616.31	77.11	91.	44.	0.016	67.65	0.854
Th-234	741.25	92.73	75.	19.	0.007	138.17	0.868s
Eu-152	973.80	121.79	74.	10.	0.004	255.57	0.896s
Eu-154	981.45	122.75	80.	-2.	-0.001	1123.75	0.897s
U-235	1165.98	145.81	67.	-4.	-0.002	556.91	0.916s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:42:07
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1484.41	185.60	76.	7.	0.003	349.04	0.955s
Ra-226	1485.12	185.69	73.	8.	0.003	314.22	0.955s
Pb-212	1908.10	238.55	89.	185.	0.069	26.51	0.717s
Pb-214	1934.19	241.82	72.	45.	0.017	69.60	0.159s
Ac-228	2158.06	269.79	48.	11.	0.004	157.01	1.031s
Pb-214	2360.85	295.14	35.	50.	0.018	37.96	1.053s
Pb-212	2401.16	300.18	41.	6.	0.002	327.83	1.057s
Ac-228	2707.09	338.41	17.	47.	0.017	40.63	0.171s
Eu-152	2754.97	344.40	33.	3.	0.001	599.58	1.096s
Pb-214	2816.20	352.05	50.	65.	0.024	31.74	1.102s
Ac-228	3704.98	463.14	31.	10.	0.004	155.46	1.197s
Tl-208	4667.25	583.42	20.	56.	0.021	33.27	0.561s
Bi-214	4876.35	609.55	46.	38.	0.014	43.35	1.317s
Cs-137	5312.09	664.02	16.	4.	0.001	296.28	1.357s
Bi-214	5322.29	665.30	32.	-3.	-0.001	511.10	1.360s
Eu-154	5776.33	722.05	28.	-4.	-0.001	415.12	1.405s
Bi-212	5815.28	726.92	27.	5.	0.002	320.12	1.408s
Bi-214	6143.34	767.93	21.	6.	0.002	246.07	1.439s
Eu-152	6249.19	781.17	23.	-2.	-0.001	555.29	1.447s
Bi-212	6286.42	785.82	20.	6.	0.002	218.11	1.452s
Pa-234	7060.75	882.62	19.	1.	0.000	1162.47	1.523s
Ac-228	7288.81	911.13	29.	18.	0.007	67.29	1.543s
Pa-234	7536.53	942.10	15.	2.	0.001	718.03	1.568s
Ac-228	7713.79	964.26	35.	-9.	-0.003	233.36	1.581s
Ac-228	7752.75	969.13	21.	16.	0.006	87.29	1.583s
Bi-214	8962.00	1120.32	25.	15.	0.006	90.03	1.685s
Co-60	10657.35	1332.30	21.	-2.	-0.001	760.47	1.817s
Bi-214	11019.13	1377.53	12.	6.	0.002	185.07	1.843s
Bi-214	11263.71	1408.12	12.	5.	0.002	211.85	1.860
Eu-152	11264.14	1408.17	12.	5.	0.002	206.75	1.860s
K-40	11686.54	1460.99	14.	618.	0.229	7.96	1.717
Bi-214	12068.68	1508.77	3.	4.	0.001	169.26	1.916s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.3305E-01					3.65E+11
			911.07	1.330E-01	?(P	9.018E-02 3.36E+01 2.90E+01	G
			968.90	1.985E-01	? P	1.325E-01 4.36E+01 1.75E+01	GA
			338.40	4.047E-01	P	8.461E-02 2.03E+01 1.20E+01	GA
			964.77	-3.950E-01	- P	6.044E-01 1.17E+02 4.99E+00	GA
			463.00	2.929E-01	? P	3.830E-01 7.77E+01 4.40E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:42:07
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_011.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		794.95	0.000E+00	-	4.753E-01	1.00E+03	4.25E+00 GA
		270.25	2.929E-01	& P	4.224E-01	7.85E+01	3.46E+00 GA
Am-241 I	6.6600E-02					3.65E+11	
		59.54	6.660E-02	&(	2.444E-01	2.28E+02	3.63E+01 G
Bi-212 N	7.2925E-02					3.65E+11	
		727.17	7.293E-02	?(	1.844E-01	1.60E+02	1.18E+01 G
		1620.56	0.000E+00	-	2.782E-01	1.00E+03	2.75E+00 GA
		785.42	5.837E-01	&	9.749E-01	1.09E+02	2.00E+00 GA
Bi-214 N	1.3014E-01					3.65E+11	
		609.69	1.301E-01	?(P	5.395E-02	2.17E+01	4.61E+01 G
		1764.51	-8.239E-02	% P	9.972E-02	1.00E+03	1.59E+01 GA
		1120.28	2.452E-01	? P	1.895E-01	4.50E+01	1.50E+01 GA
		768.36	2.140E-01	?	4.075E-01	1.23E+02	4.89E+00 GA
		1377.65	4.278E-01	+	5.853E-01	9.25E+01	4.02E+00 GA
		934.05	-2.478E-02	% P	8.113E-01	9.03E+02	3.17E+00 GA
		1407.98	6.085E-01	+	9.661E-01	1.06E+02	2.48E+00 GA
		1509.19	5.092E-01	+	5.559E-01	8.46E+01	2.19E+00 GA
		665.45	-3.431E-01	-	1.409E+00	2.56E+02	1.56E+00 GA
Co-60 T	1.0907E-03					3.65E+11	
		1173.24	1.091E-03	%(	3.481E-02	1.94E+03	9.99E+01 G
		1332.50	-4.817E-03	+	2.957E-02	3.80E+02	1.00E+02 G
Cs-137 I	7.9764E-03					3.65E+11	
		661.66	7.976E-03	?(	1.834E-02	1.48E+02	8.46E+01 G
Eu-152 I	1.0850E-02					3.65E+11	
		344.30	1.085E-02	&(	5.251E-02	3.00E+02	2.70E+01 G
		121.87	2.948E-02	&	6.010E-02	1.28E+02	2.86E+01 GA
		1408.08	7.244E-02	?	1.119E-01	1.03E+02	2.12E+01 GA
		964.05	0.000E+00	-	4.086E-01	1.00E+03	1.46E+01 GA
		778.90	-3.588E-02	+	1.598E-01	2.78E+02	1.30E+01 GA
		411.09	-3.156E-02	%	7.514E-01	1.45E+03	2.26E+00 GA
Eu-154 I	-4.2251E-04					3.65E+11	
		1274.80	-4.225E-04	%(	8.440E-02	1.21E+04	3.55E+01 G
		123.10	-4.763E-03	+	4.379E-02	5.62E+02	4.05E+01 GA
		723.30	-3.352E-02	&	1.110E-01	2.08E+02	1.97E+01 GA
K-40 N	1.7369E+01					3.65E+11	
		1460.80	1.737E+01	(P	2.477E-01	3.98E+00	1.07E+01 G
Pa-234 N	1.4706E-02					3.65E+11	
		883.24	1.471E-02	?(	1.389E-01	5.81E+02	1.50E+01 G
		98.44	-4.692E-03	&	8.243E-02	1.07E+03	2.51E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 18:42:07
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          946.00 2.811E-02 &   1.621E-01 3.59E+02 1.20E+01 GA

Pb-212   N   3.6580E-01                                     3.65E+11
                          238.63 3.658E-01  (  4.337E-02 1.33E+01 4.31E+01 G
                           77.11 4.716E-01 ?   2.356E-01 3.38E+01 1.75E+01 GA
                           74.81 4.173E-01     4.690E-01 7.18E+01 9.60E+00 GA
                           87.20 0.000E+00 -   6.907E-01 1.00E+03 6.30E+00 GA
                          300.09 1.685E-01 -   4.400E-01 1.64E+02 3.27E+00 GA

Pb-214   N   1.8717E-01                                     3.65E+11
                          351.79 1.872E-01 ?(P 4.769E-02 1.59E+01 3.71E+01 G
                          295.22 2.479E-01 ? P 6.870E-02 1.90E+01 1.92E+01 GA
                          241.92 5.162E-01 + P 2.268E-01 3.48E+01 7.47E+00 GA

Ra-226   N   1.7080E-01                                     3.65E+11
                          186.20 1.708E-01 &(  4.306E-01 1.57E+02 3.60E+00 G

Th-234   N   4.0673E-01                                     3.65E+11
                           92.60 4.067E-01 &(  4.364E-01 6.91E+01 5.60E+00 G

Tl-208   N   9.8764E-02                                     3.65E+11
                          583.14 9.876E-02  (P 1.861E-02 1.66E+01 8.60E+01 G
                          860.47 0.000E+00 -   1.868E-01 1.00E+03 1.20E+01 GA

U-235    N   1.0421E-02                                     3.65E+11
                          185.70 1.042E-02 ?(  2.927E-02 1.75E+02 5.40E+01 G
                          143.76-3.174E-02 +   1.434E-01 2.78E+02 1.05E+01 GA
                          163.35 0.000E+00 -   3.137E-01 1.00E+03 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:42:07
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_011.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	60.25	52.	5.	0.002	455.22	6.660E-02
Th-234	92.73	75.	19.	0.007	138.17	4.067E-01
Eu-152	121.79	74.	10.	0.004	255.57	2.948E-02
Eu-154	122.75	80.	-2.	-0.001	1123.75	-4.763E-03
U-235	145.81	67.	-4.	-0.002	556.91	-3.174E-02
U-235	185.60	76.	7.	0.003	349.04	1.042E-02
Ra-226	185.69	73.	8.	0.003	314.22	1.708E-01
Eu-152	344.40	33.	3.	0.001	599.58	1.085E-02
Cs-137	664.02	16.	4.	0.001	296.28	7.976E-03
Eu-154	722.05	28.	-4.	-0.001	415.12	-3.352E-02
Bi-212	726.92	27.	5.	0.002	320.12	7.293E-02
Eu-152	781.17	23.	-2.	-0.001	555.29	-3.588E-02
Bi-212	785.82	20.	6.	0.002	218.11	5.837E-01
Pa-234	882.62	19.	1.	0.000	1162.47	1.471E-02
Pa-234	942.10	15.	2.	0.001	718.03	2.811E-02
Co-60	1332.30	21.	-2.	-0.001	760.47	-4.817E-03
Eu-152	1408.17	12.	5.	0.002	206.75	7.244E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.3305E-01	1.3305E-01	1.2043E-01	1.2079E-01	9.018E-02
Am-241 #A	6.6600E-02	6.6600E-02	3.0317E-01	3.0323E-01	2.444E-01
Bi-212 #A	7.2925E-02	7.2925E-02	2.3345E-01	2.3350E-01	1.844E-01
Bi-214	1.3014E-01	1.3014E-01	7.4207E-02	7.4771E-02	5.395E-02
Co-60 #A	1.0907E-03	1.0907E-03	4.2392E-02	4.2392E-02	3.481E-02
Cs-137 #A	7.9764E-03	7.9764E-03	2.3632E-02	2.3639E-02	1.834E-02
Eu-152 #A	1.0850E-02	1.0850E-02	6.5056E-02	6.5060E-02	5.251E-02
Eu-154 #A	-4.2251E-04	-4.2251E-04	1.0251E-01	1.0251E-01	8.440E-02
K-40	1.7369E+01	1.7369E+01	1.4138E+00	1.8650E+00	2.477E-01
Pa-234 #A	1.4706E-02	1.4706E-02	1.7096E-01	1.7096E-01	1.389E-01
Pb-212	3.6580E-01	3.6580E-01	9.6970E-02	1.0086E-01	4.337E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 18:42:07
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_011.An1

Pb-214	1.8717E-01	1.8717E-01	7.1280E-02	7.2492E-02	4.769E-02
Ra-226 #A	1.7080E-01	1.7080E-01	5.3669E-01	5.3685E-01	4.306E-01
Th-234 #A	4.0673E-01	4.0673E-01	5.6196E-01	5.6314E-01	4.364E-01
Tl-208	9.8764E-02	9.8764E-02	3.7160E-02	3.7800E-02	1.861E-02
U-235 #A	1.0421E-02	1.0421E-02	3.6374E-02	3.6383E-02	2.927E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2042.5 keV) 1.828E+01 pCi/g
Total Decayed Activity (25.1 to 2042.5 keV) 1.8284273E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE06	Lab ID	: 251449-013	Client ID	: 04-PD-D0034-13
Seqnum	: 1554011902013	Matrix	: Soil	Acct	: ITSI (JG)
File	: 6_20140108_013	Batch	: 206637	Time	: 08-JAN-2014 18:45
Cal	: 08-JAN-2014 06:45:06,06-JAN-2014 16:42:07	Caldate	: 08-JAN-2014, 06-JAN-2014		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 334.92 g	Live Time	: 2700 sec
				Dead Time	: 0.08 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.117	0.134		.17212	.17243	-0.040	u
Bismuth-212	0.155	0.175		.2312	.23147	-0.0025	u
Bismuth-214	0.222	0.0319		.063665	.065547	-0.052	u
Cesium-137	0.00187	0.0205	0.07	.025174	.025174	-0.0069	u
Cobalt-60	-0.0124	0.0350		.11518	.11518	0	u
Europium-152	0	0.0624		.021655	.021655	-0.00031	u
Europium-154	-0.00165	0.0887		.10786	.10786	-0.013	u
Lead-212	0.405	0.0278		.068007	.074608	-0.016	u
Lead-214	0.318	0.0250		.071136	.074598	-0.0040	u
Potassium-40	21.5	0.297		1.4853	2.115	-0.36	u
Protactinium-234	0.0292	0.0867		.11162	.11164	0.015	u
Radium-226	0.469	0.382	1.3	.49975	.50101	-0.082	u
Thallium-208	0.113	0.0132		.035582	.036456	0.0020	u
Thorium-232 (By Actinium-228)	0.249	0.0782		.12337	.12458	0.019	u
Thorium-234	-0.00434	0.392		.47584	.47584	-0.034	u
Uranium-235	-0.00325	0.0335		.040873	.040874	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-13
Sample Description: 251449-013, 206637

Detector: HPGE06 51-TP32744A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:11
Acquisition Time: 1/8/2014 18:45:02
Analysis Time: 1/8/2014 19:30
Analysis Quantity: 3.349E+02 g

Spectrum ID: 6_20140108_013
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.08 %

Efficiency: HPGE06 S23325 6_20140104002_EffCal
Efficiency Cal Date: 1/6/2014 16:42
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.489E-01	1.234E-01	1.246E-01	7.822E-02
Am-241	#AB	1.169E-01	1.721E-01	1.724E-01	1.339E-01
Bi-212	#AB	1.552E-01	2.312E-01	2.315E-01	1.754E-01
Bi-214		2.216E-01	6.367E-02	6.555E-02	3.188E-02
Co-60	#AB	-1.243E-02	1.152E-01	1.152E-01	3.502E-02
Cs-137	#AB	1.873E-03	2.517E-02	2.517E-02	2.053E-02
Eu-152	#AB	0.000E+00	2.165E-02	2.166E-02	6.236E-02
Eu-154	#AB	-1.654E-03	1.079E-01	1.079E-01	8.869E-02
K-40		2.150E+01	1.485E+00	2.115E+00	2.965E-01
Pa-234	#AB	2.918E-02	1.116E-01	1.116E-01	8.673E-02
Pb-212		4.046E-01	6.801E-02	7.461E-02	2.783E-02
Pb-214		3.185E-01	7.114E-02	7.460E-02	2.499E-02
Ra-226	#	4.693E-01	4.997E-01	5.010E-01	3.820E-01
Th-234	#AB	-4.340E-03	4.758E-01	4.758E-01	3.918E-01
Tl-208		1.131E-01	3.558E-02	3.646E-02	1.324E-02
U-235	AB	-3.253E-03	4.087E-02	4.087E-02	3.351E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.358E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:30:10
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_013.An1

Sample description
     251449-013, 206637


Spectrum Filename: C:\User\SPC\Det6\6_20140108_013.An1

Acquisition information
       Start time:                 1/8/2014 18:45:02
       Live time:               2700
       Real time:               2702
       Dead time:                  0.08 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_Soil 250ml TunaCan_01-04-2014.Clb
     HPGE06 S23325 6_20140104002_EffCal


       Energy Calibration
            Created:               1/8/2014 06:45:06
            Zero offset:           0.078 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.421E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 16:42:07
            Type:                  Polynomial
            Uncertainty:           1.262 %
            Coefficients:         -0.387239  -4.158640   0.426222
                                  -0.050686   0.002155  -0.000042

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2041.45keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3492E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3492E+02) =
                                   8.0697E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:30:10
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:11:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	6_2014-01-07_0843.PBC 1/7/2014 08:43:34
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1814

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
46.80	37.	29.18	0.33	2.800E-03				
59.53	17.	73.64	0.80	1.193E-02	59.54	36.300	PBC<MDA	Am241
74.57	60.	23.90	0.81	2.380E-02	74.81	9.600	7.764E-01	Pb212
77.31	75.	18.83	0.82	2.575E-02	77.11	17.500	4.938E-01	Pb212
87.21	56.	26.85	0.26	3.202E-02	87.20	6.300	8.328E-01	Pb212
98.19	15.	100.66	0.84	3.754E-02	98.44	25.100	PBC<MDA	Pa234
121.75	13.	107.66	0.86	4.418E-02	121.87	28.590	PBC<MDA	Eu152
144.00	19.	70.45	0.89	4.622E-02	143.76	10.500	PBC<MDA	U235
185.84	25.	53.24	0.93	4.485E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	4.693E-01	Ra226
201.56	16.	36.44	0.13	4.364E-02				
238.50	242.	8.17	0.76	4.040E-02	238.63	43.100	4.046E-01	Pb212
270.61	6.	171.14	1.02	3.767E-02	270.25	3.460	PBC<MDA	Ac228
					270.25	3.460	1.449E-01	Ac228
294.74	102.	15.58	0.29	3.574E-02				
295.02	81.	18.05	0.28	3.570E-02	295.22	19.200	3.514E-01	Pb214
338.06	18.	55.47	1.08	3.270E-02	338.40	12.010	1.390E-01	Ac228
					338.40	12.010	1.390E-01	Ac228
351.79	126.	11.17	0.95	3.187E-02	351.79	37.100	3.185E-01	Pb214
583.14	73.	15.73	0.55	2.255E-02	583.14	86.000	1.131E-01	Tl208
609.56	90.	11.95	0.45	2.187E-02	609.69	46.090	2.216E-01	Bi214
662.75	1.	671.99	1.39	2.067E-02	661.66	84.620	PBC<MDA	Cs137
667.68	0.	393.18	1.39	2.059E-02	665.45	1.560	PBC<MDA	Bi214
727.08	12.	74.51	1.45	1.936E-02	727.17	11.800	PBC<MDA	Bi212
768.22	4.	225.21	1.49	1.864E-02	768.36	4.890	PBC<MDA	Bi214
785.75	2.	454.17	1.50	1.835E-02	785.42	2.000	PBC<MDA	Bi212
795.27	5.	141.86	1.51	1.820E-02	794.95	4.250	PBC<MDA	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:30:10
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
					794.95	4.250	1.977E-01	Ac228
860.92	14.	56.21	1.56	1.722E-02	860.47	12.000	1.955E-01	Tl208
878.95	2.	191.30	1.58	1.691E-02	883.24	15.000	PBC<MDA	Pa234
911.30	40.	24.78	1.61	1.654E-02	911.07	29.000	2.489E-01	Ac228
					911.07	29.000	2.489E-01	Ac228
934.97	5.	174.55	1.63	1.625E-02	934.05	3.170	PBC<MDA	Bi214
944.60	4.	160.87	1.64	1.611E-02	946.00	12.000	PBC<MDA	Pa234
964.15	7.	126.15	1.65	1.589E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.530E-01	Ac228
					964.77	4.990	2.530E-01	Ac228
969.13	13.	68.25	1.65	1.583E-02	968.90	17.460	PBC<MDA	Ac228
					968.90	17.460	1.404E-01	Ac228
1377.66	1.	192.03	1.97	1.217E-02	1377.65	4.020	PBC<MDA	Bi214
1460.96	916.	3.37	1.42	1.161E-02	1460.80	10.700	2.150E+01	K40
1508.28	2.	226.21	2.05	1.131E-02	1509.19	2.190	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
373.58	46.80	29.	37.	1.328E+04	58.36	0.328	PB-210	s
1611.14	201.56	9.	16.	3.666E+02	72.89	0.125	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	475.34	59.53	69.	17.	0.006	147.28	0.796s
Pb-212	595.59	74.56	73.	81.	0.030	45.64	0.205s
Pb-212	617.07	77.25	111.	52.	0.019	62.71	0.815s
Pb-212	696.69	87.21	59.	56.	0.021	53.70	0.260s
Pa-234	784.55	98.19	100.	15.	0.005	201.32	0.838s
Eu-152	972.94	121.75	86.	13.	0.005	215.32	0.863s
Eu-154	984.42	123.19	107.	-16.	-0.006	184.94	0.864s
U-235	1150.84	144.00	81.	19.	0.007	140.90	0.886
U-235	1310.97	164.03	81.	-4.	-0.002	624.68	0.906s
U-235	1484.30	185.70	136.	-3.	-0.001	1256.68	0.930s
Ra-226	1485.46	185.84	78.	25.	0.009	106.48	0.930

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:30:10
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	1906.58	238.50	48.	236.	0.087	16.34	0.764s
Ac-228	2163.36	270.61	55.	6.	0.002	342.29	1.016s
Pb-214	2358.58	295.02	36.	81.	0.030	36.10	0.280s
Pb-212	2410.53	301.52	40.	-2.	-0.001	1182.89	1.046s
Ac-228	2702.77	338.06	42.	18.	0.007	110.94	1.085s
Pb-214	2812.64	351.79	18.	126.	0.047	22.34	0.948
Tl-208	4663.17	583.14	14.	73.	0.027	31.45	0.552s
Bi-214	4874.47	609.56	21.	75.	0.028	23.91	0.446s
Cs-137	5299.98	662.75	27.	1.	0.000	1343.98	1.391s
Bi-212	5814.62	727.08	33.	12.	0.004	149.01	1.450s
Bi-214	6143.84	768.22	36.	4.	0.001	450.42	1.486
Bi-212	6284.05	785.75	27.	2.	0.001	908.34	1.501s
Ac-228	6360.21	795.27	24.	5.	0.002	283.72	1.509s
Tl-208	6885.49	860.92	22.	14.	0.005	112.42	1.565s
Pa-234	7029.76	878.95	10.	2.	0.001	382.59	1.584s
Ac-228	7288.63	911.30	29.	40.	0.015	49.56	1.607s
Bi-214	7478.01	934.97	31.	5.	0.002	349.10	1.626s
Pa-234	7555.06	944.60	22.	4.	0.002	321.74	1.636s
Eu-152	7711.49	964.15	32.	7.	0.002	252.30	1.651s
Ac-228	7712.86	964.32	40.	-1.	-0.001	1324.51	1.651s
Ac-228	7751.35	969.13	33.	13.	0.005	136.50	1.655s
Co-60	9392.07	1174.14	48.	-6.	-0.002	632.31	1.815s
Co-60	10662.85	1332.91	24.	-3.	-0.001	1095.17	1.932s
Bi-214	11021.00	1377.66	1.	1.	0.000	384.06	0.000s
K-40	11687.86	1460.96	28.	894.	0.331	6.74	1.417s
Bi-214	12066.71	1508.28	8.	2.	0.001	452.43	2.053s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	2.4894E-01					3.65E+11
			911.07	2.489E-01	?(	7.822E-02 2.48E+01	2.90E+01 G
			968.90	1.404E-01	-	1.443E-01 6.83E+01	1.75E+01 GA
			338.40	1.390E-01	-	1.152E-01 5.55E+01	1.20E+01 GA
			964.77	-5.121E-02	-	5.541E-01 6.62E+02	4.99E+00 GA
			463.00	0.000E+00	&	2.912E-01 1.00E+03	4.40E+00 GA
			794.95	1.977E-01	?	4.391E-01 1.42E+02	4.25E+00 GA
			270.25	1.449E-01	-	3.975E-01 1.71E+02	3.46E+00 GA
Am-241	I	1.1687E-01					3.65E+11
			59.54	1.169E-01	&(	1.339E-01 7.36E+01	3.63E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:30:10
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_013.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-212	N 1.5516E-01					3.65E+11	
		727.17	1.552E-01	?(	1.754E-01	7.45E+01	1.18E+01 G
		1620.56	0.000E+00	-	2.377E-01	1.00E+03	2.75E+00 GA
		785.42	1.343E-01	?	9.903E-01	4.54E+02	2.00E+00 GA
Bi-214	N 2.2157E-01					3.65E+11	
		609.69	2.216E-01	(P	3.188E-02	1.20E+01	4.61E+01 G
		1764.51	-1.388E-01	& P	1.196E-01	1.00E+03	1.59E+01 GA
		1120.28	-7.669E-03	% P	1.959E-01	1.00E+03	1.50E+01 GA
		768.36	1.269E-01	-	4.587E-01	2.25E+02	4.89E+00 GA
		1377.65	4.887E-02	-	1.559E-01	1.92E+02	4.02E+00 GA
		934.05	2.714E-01	?	7.527E-01	1.75E+02	3.17E+00 GA
		1407.98	4.735E-02	%	9.623E-01	1.24E+03	2.48E+00 GA
		1509.19	1.949E-01	? P	7.823E-01	2.26E+02	2.19E+00 GA
		665.45	-2.974E-02	% P	1.272E+00	3.93E+02	1.56E+00 GA
Co-60	T -1.2429E-02					3.65E+11	
		1173.24	-1.243E-02	?(P	3.502E-02	3.16E+02	9.99E+01 G
		1332.50	-7.238E-03	+ P	2.739E-02	5.48E+02	1.00E+02 G
Cs-137	I 1.8731E-03					3.65E+11	
		661.66	1.873E-03	?(	2.053E-02	6.72E+02	8.46E+01 G
Eu-154	I -1.6539E-03					3.65E+11	
		1274.80	-1.654E-03	%(	8.869E-02	3.26E+03	3.55E+01 G
		123.10	-2.733E-02	+	4.012E-02	9.25E+01	4.05E+01 GA
		723.30	0.000E+00	+	2.089E-01	1.00E+03	1.97E+01 GA
K-40	N 2.1503E+01					3.65E+11	
		1460.80	2.150E+01	(P	2.965E-01	3.37E+00	1.07E+01 G
Pa-234	N 2.9175E-02					3.65E+11	
		883.24	2.918E-02	?(	8.673E-02	1.91E+02	1.50E+01 G
		98.44	4.620E-02	?	7.397E-02	1.01E+02	2.51E+01 GA
		946.00	6.717E-02	&	1.699E-01	1.61E+02	1.20E+01 GA
Pb-212	N 4.0456E-01					3.65E+11	
		238.63	4.046E-01	(P	2.783E-02	8.17E+00	4.31E+01 G
		77.11	3.435E-01	? P	1.640E-01	3.14E+01	1.75E+01 GA
		74.81	1.054E+00	+	2.581E-01	2.28E+01	9.60E+00 GA
		87.20	8.328E-01	+ P	2.646E-01	2.68E+01	6.30E+00 GA
		300.09	-5.466E-02	& P	3.806E-01	5.91E+02	3.27E+00 GA
Pb-214	N 3.1849E-01					3.65E+11	
		351.79	3.185E-01	(	2.499E-02	1.12E+01	3.71E+01 G
		295.22	3.514E-01		6.129E-02	1.80E+01	1.92E+01 GA
		241.92	-4.749E-03	%	2.246E-01	2.87E+03	7.47E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:30:10
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   4.6934E-01                                     3.65E+11
                           186.20 4.693E-01  (  3.820E-01 5.32E+01 3.60E+00 G

Th-234   N  -4.3403E-03                                     3.65E+11
                            92.60-4.340E-03 %(  3.918E-01 5.48E+03 5.60E+00 G

Tl-208   N   1.1313E-01                                     3.65E+11
                           583.14 1.131E-01  (  1.324E-02 1.57E+01 8.60E+01 G
                           860.47 1.955E-01 +   1.584E-01 5.62E+01 1.20E+01 GA

U-235    N  -3.2525E-03                                     3.65E+11
                           185.70-3.252E-03 ?(  3.351E-02 6.28E+02 5.40E+01 G
                           143.76 1.179E-01     1.295E-01 7.04E+01 1.05E+01 GA
                           163.35-5.699E-02 +   2.896E-01 3.12E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:30:10
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_013.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	59.53	69.	17.	0.006	147.28	1.169E-01	
Pa-234	98.19	100.	15.	0.005	201.32	4.620E-02	
Eu-152	121.75	86.	13.	0.005	215.32	2.994E-02	
Eu-154	123.19	107.	-16.	-0.006	184.94	-2.733E-02	
Ac-228	270.61	55.	6.	0.002	342.29	1.449E-01	
Ac-228	338.06	42.	18.	0.007	110.94	1.390E-01	
Cs-137	662.75	27.	1.	0.000	1343.98	1.873E-03	
Bi-212	727.08	33.	12.	0.004	149.01	1.552E-01	
Bi-212	785.75	27.	2.	0.001	908.34	1.343E-01	
Ac-228	795.27	24.	5.	0.002	283.72	1.977E-01	
Pa-234	878.95	10.	2.	0.001	382.59	2.918E-02	
Ac-228	911.30	29.	40.	0.015	49.56	2.489E-01	
Pa-234	944.60	22.	4.	0.002	321.74	6.717E-02	
Eu-152	964.15	32.	7.	0.002	252.30	8.656E-02	
Ac-228	964.32	40.	-1.	-0.001	1324.51	-5.121E-02	
Ac-228	969.13	33.	13.	0.005	136.50	1.404E-01	
Co-60	1174.14	48.	-6.	-0.002	632.31	-1.243E-02	P
Co-60	1332.91	24.	-3.	-0.001	1095.17	-7.238E-03	P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.4894E-01	2.4894E-01	1.2337E-01	1.2458E-01	7.822E-02
Am-241 #A	1.1687E-01	1.1687E-01	1.7212E-01	1.7243E-01	1.339E-01
Bi-212 #A	1.5516E-01	1.5516E-01	2.3120E-01	2.3147E-01	1.754E-01
Bi-214	2.2157E-01	2.2157E-01	6.3665E-02	6.5547E-02	3.188E-02
Co-60 #A	-1.2429E-02	-1.2429E-02	1.1518E-01	1.1518E-01	3.502E-02
Cs-137 #A	1.8731E-03	1.8731E-03	2.5174E-02	2.5174E-02	2.053E-02
Eu-152 #A	0.0000E+00	0.0000E+00	2.1655E-02	2.1655E-02	6.236E-02
Eu-154 #A	-1.6539E-03	-1.6539E-03	1.0786E-01	1.0786E-01	8.869E-02
K-40	2.1503E+01	2.1503E+01	1.4853E+00	2.1150E+00	2.965E-01
Pa-234 #A	2.9175E-02	2.9175E-02	1.1162E-01	1.1164E-01	8.673E-02
Pb-212	4.0456E-01	4.0456E-01	6.8007E-02	7.4608E-02	2.783E-02
Pb-214	3.1849E-01	3.1849E-01	7.1136E-02	7.4598E-02	2.499E-02
Ra-226 #	4.6934E-01	4.6934E-01	4.9975E-01	5.0101E-01	3.820E-01
Th-234 #A	-4.3403E-03	-4.3403E-03	4.7584E-01	4.7584E-01	3.918E-01
Tl-208	1.1313E-01	1.1313E-01	3.5582E-02	3.6456E-02	1.324E-02
U-235 A	-3.2525E-03	-3.2525E-03	4.0873E-02	4.0874E-02	3.351E-02

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:30:10
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_013.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  201.5 to  2041.5 keV)     2.256E+01  pCi/g
 Total Decayed Activity (  201.5 to  2041.5 keV) 2.2560640E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564011942012
File : 7_20140108_012
Cal : 08-JAN-2014 07:13:44,21-FEB-2013 11:46:56
IDF : 1.0
PDF : 1.0

Lab ID : 251449-014
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 21-FEB-2013

Sample Amount : 306.02 g

Client ID : 04-PD-D0034-14
Acct : ITSI (JG)
Time : 08-JAN-2014 18:44

Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0660	0.173		.21599	.21607	-0.040	u
Bismuth-212	0.0969	0.184		.22935	.22945	-0.0025	u
Bismuth-214	0.355	0.0335		.078399	.08191	-0.052	u
Cesium-137	0	0.0391	0.07	.016675	.016675	-0.0069	u
Cobalt-60	0.0000465	0.0293		.035612	.035612	0	u
Europium-152	0.0279	0.0514		.065481	.065509	-0.00031	u
Europium-154	0.0446	0.0664		.087778	.087829	-0.013	u
Lead-212	0.387	0.0326		.076161	.081527	-0.016	u
Lead-214	0.194	0.0502		.072437	.07364	-0.0040	u
Potassium-40	19.2	0.276		1.4365	1.9664	-0.36	u
Protactinium-234	0	0.227		.049179	.049179	0.015	u
Radium-226	0.462	0.343	1.3	.45632	.45766	-0.082	u
Thallium-208	0.129	0.0147		.037368	.038335	0.0020	u
Thorium-232 (By Actinium-228)	0.132	0.0908		.12229	.12262	0.019	u
Thorium-234	0.234	0.395		.49623	.49668	-0.034	u
Uranium-235	0.0288	0.0219		.029257	.029339	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-14
Sample Description: 251449-014, 206637

Detector: HPGE07 51-TP32743A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:13
Acquisition Time: 1/8/2014 18:44:42
Analysis Time: 1/8/2014 19:29
Analysis Quantity: 3.060E+02 g

Spectrum ID: 7_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE07 S21603 7_20130220002_EffCal
Efficiency Cal Date: 2/21/2013 11:46
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	1.318E-01	1.223E-01	1.226E-01	9.075E-02
Am-241	#AB	-6.600E-02	2.160E-01	2.161E-01	1.734E-01
Bi-212	#AB	9.685E-02	2.294E-01	2.294E-01	1.842E-01
Bi-214		3.548E-01	7.840E-02	8.191E-02	3.350E-02
Co-60	#AB	4.650E-05	3.561E-02	3.561E-02	2.933E-02
Cs-137	#AB	0.000E+00	1.667E-02	1.667E-02	3.905E-02
Eu-152	#AB	2.787E-02	6.548E-02	6.551E-02	5.142E-02
Eu-154	#AB	4.464E-02	8.778E-02	8.783E-02	6.639E-02
K-40		1.918E+01	1.437E+00	1.966E+00	2.756E-01
Pa-234	#AB	0.000E+00	4.918E-02	4.918E-02	2.274E-01
Pb-212		3.871E-01	7.616E-02	8.153E-02	3.258E-02
Pb-214		1.943E-01	7.244E-02	7.364E-02	5.017E-02
Ra-226		4.619E-01	4.563E-01	4.577E-01	3.425E-01
Th-234	#AB	2.345E-01	4.962E-01	4.967E-01	3.951E-01
Tl-208		1.285E-01	3.737E-02	3.834E-02	1.473E-02
U-235		2.884E-02	2.926E-02	2.934E-02	2.193E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.127E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:29:58
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_012.An1

Sample description
     251449-014, 206637


Spectrum Filename: C:\User\SPC\Det7\7_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 18:44:42
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.0602E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.0602E+02) =
                                   8.8318E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:13:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2013-12-28_0940.PBC 12/28/2013 09:40:25
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1186

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
49.80	14.	53.13	0.15	3.178E-03				
77.20	50.	32.04	0.46	2.390E-02	77.11	17.500	3.644E-01	Pb212
87.58	24.	57.92	0.85	3.062E-02	87.20	6.300	4.057E-01	Pb212
92.76	14.	105.83	0.86	3.375E-02	92.60	5.600	PBC<MDA	Th234
163.52	14.	91.88	0.93	4.834E-02	163.35	4.700	PBC<MDA	U235
185.67	23.	50.72	0.95	4.747E-02	185.70	54.000	2.884E-02	U235
186.17	24.	49.39	0.96	4.744E-02	186.20	3.600	4.619E-01	Ra226
209.11	41.	28.95	0.63	4.573E-02				
215.20	10.	104.84	0.00	4.521E-02				
238.56	229.	9.46	1.07	4.312E-02	238.63	43.100	3.871E-01	Pb212
241.98	44.	27.93	0.29	4.281E-02	241.92	7.470	4.470E-01	Pb214
269.53	8.	125.72	1.04	4.027E-02	270.25	3.460	PBC<MDA	Ac228
					270.25	3.460	PBC<MDA	Ac228
282.68	19.	48.50	0.15	3.920E-02				
295.22	87.	16.34	0.18	3.816E-02	295.22	19.200	3.395E-01	Pb214
299.97	2.	314.62	1.07	3.777E-02	300.09	3.270	PBC<MDA	Pb212
338.24	31.	34.25	1.11	3.490E-02	338.40	12.010	2.400E-01	Ac228
					338.40	12.010	2.400E-01	Ac228
344.31	8.	117.49	1.12	3.449E-02	344.30	27.000	PBC<MDA	Eu152
351.87	132.	15.01	0.60	3.399E-02	351.79	37.100	2.960E-01	Pb214
583.16	87.	13.43	0.48	2.378E-02	583.14	86.000	1.285E-01	Tl208
609.34	132.	9.64	0.76	2.305E-02	609.69	46.090	3.548E-01	Bi214
727.30	7.	78.41	1.47	2.034E-02	727.17	11.800	PBC<MDA	Bi212
767.06	7.	119.97	1.51	1.957E-02	768.36	4.890	PBC<MDA	Bi214
795.03	5.	172.31	1.53	1.911E-02	794.95	4.250	PBC<MDA	Ac228
					794.95	4.250	1.923E-01	Ac228
860.07	4.	161.43	1.59	1.807E-02	860.47	12.000	PBC<MDA	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
892.07	12.	28.87	0.25	1.761E-02				
911.53	20.	39.40	1.63	1.735E-02	911.07	29.000	1.318E-01	Ac228
					911.07	29.000	1.318E-01	Ac228
969.17	19.	35.94	1.68	1.661E-02	968.90	17.460	2.087E-01	Ac228
					968.90	17.460	2.087E-01	Ac228
1120.35	6.	87.17	1.80	1.497E-02	1120.28	15.040	PBC<MDA	Bi214
1276.70	7.	98.33	1.91	1.361E-02	1274.80	35.500	PBC<MDA	Eu154
1407.98	0.	420.92	2.01	1.262E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	3.457E-03	Eu152
1408.08	0.	444.66	2.01	1.262E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	2.782E-03	Eu152
1460.90	794.	3.55	1.48	1.226E-02	1460.80	10.700	1.938E+01	K40
1764.66	4.	50.01	2.23	1.053E-02	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
398.21	49.80	20.	14.	4.563E+03	106.26	0.152	-	s
1672.33	209.11	27.	41.	8.965E+02	57.90	0.625	AC-228	s
1721.00	215.20	34.	10.	2.167E+02	209.68	0.000	-	sc
2260.75	282.68	21.	19.	4.923E+02	97.00	0.153	-	s
7136.10	892.07	0.	12.	6.813E+02	57.74	0.250	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	475.91	59.51	69.	-7.	-0.003	327.23	0.821s
Pb-212	616.28	77.07	127.	32.	0.012	96.38	0.840s
Pb-212	700.37	87.58	92.	24.	0.009	115.83	0.851s
Th-234	741.79	92.76	96.	14.	0.005	211.66	0.857s
Pa-234	791.67	99.00	88.	-12.	-0.004	235.71	0.863s
Eu-152	975.14	121.94	77.	-3.	-0.001	791.25	0.888s
U-235	1155.74	144.52	84.	-6.	-0.002	460.21	0.911s
U-235	1307.72	163.52	78.	14.	0.005	183.77	0.931
U-235	1485.10	185.70	54.	23.	0.008	101.45	0.955D
Ra-226	1489.10	186.20	59.	24.	0.009	98.78	0.955D

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	1907.88	238.56	63.	220.	0.081	18.93	1.066
Pb-214	1935.21	241.98	44.	44.	0.016	55.85	0.295s
Ac-228	2155.55	269.53	59.	8.	0.003	251.44	1.042s
Pb-214	2361.68	295.30	34.	58.	0.022	34.41	0.178s
Pb-212	2399.07	299.97	62.	2.	0.001	629.23	1.072s
Ac-228	2705.17	338.24	50.	31.	0.011	68.50	1.110s
Eu-152	2753.75	344.31	39.	8.	0.003	234.97	1.116s
Pb-214	2814.63	351.92	69.	75.	0.028	30.13	1.123s
Tl-208	4664.44	583.16	16.	80.	0.030	26.86	0.483s
Bi-214	4873.85	609.34	22.	115.	0.043	19.28	0.761s
Eu-154	5775.80	722.07	37.	-10.	-0.004	184.36	1.472s
Bi-212	5817.64	727.30	34.	7.	0.003	156.82	1.475s
Bi-214	6135.80	767.06	29.	7.	0.002	239.94	1.511s
Eu-152	6244.24	780.62	32.	-4.	-0.001	457.64	1.520s
Bi-212	6297.18	787.23	28.	-5.	-0.002	289.81	1.526s
Ac-228	6359.59	795.03	31.	5.	0.002	344.61	1.534s
Tl-208	6880.04	860.07	20.	4.	0.002	322.87	1.590s
Ac-228	7291.77	911.53	36.	20.	0.008	78.80	1.632s
Ac-228	7729.53	966.23	52.	-11.	-0.004	208.01	1.676s
Ac-228	7753.03	969.17	25.	19.	0.007	71.88	1.680s
Bi-214	8962.94	1120.35	39.	6.	0.002	174.34	1.799s
Eu-154	10214.41	1276.70	18.	7.	0.002	196.65	1.914s
Co-60	10653.19	1331.52	24.	-2.	-0.001	634.67	1.956s
Bi-214	11265.25	1407.98	49.	0.	0.000	841.83	2.008D
Eu-152	11266.05	1408.08	49.	0.	0.000	889.32	2.008D
K-40	11689.09	1460.92	23.	769.	0.285	7.33	1.477s
Bi-214	12085.64	1510.46	10.	-3.	-0.001	353.63	2.076s
Bi-214	14120.95	1764.66	16.	4.	0.002	100.02	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.3184E-01					3.65E+11
			911.07	1.318E-01	?(P	9.075E-02 3.94E+01	2.90E+01 G
			968.90	2.087E-01	? P	1.303E-01 3.59E+01	1.75E+01 GA
			338.40	2.400E-01	P	1.292E-01 3.43E+01	1.20E+01 GA
			964.77	-4.431E-01	- P	6.598E-01 1.04E+02	4.99E+00 GA
			463.00	-5.011E-02	% P	3.148E-01 1.00E+03	4.40E+00 GA
			794.95	1.923E-01	&	5.264E-01 1.72E+02	4.25E+00 GA
			270.25	1.842E-01	? P	4.207E-01 1.26E+02	3.46E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_012.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	-6.6004E-02					3.65E+11	
			59.54	-6.600E-02	?(	1.734E-01	1.64E+02	3.63E+01 G
Bi-212	N	9.6854E-02					3.65E+11	
			727.17	9.685E-02	&(P	1.842E-01	7.84E+01	1.18E+01 G
			1620.56	0.000E+00	-	1.915E+00	1.00E+03	2.75E+00 GA
			785.42	-4.625E-01	+	1.055E+00	1.45E+02	2.00E+00 GA
Bi-214	N	3.5483E-01					3.65E+11	
			609.69	3.548E-01	(P	3.350E-02	9.64E+00	4.61E+01 G
			1764.51	7.935E-02	- P	1.820E-01	5.00E+01	1.59E+01 GA
			1120.28	8.195E-02	- P	2.109E-01	8.72E+01	1.50E+01 GA
			768.36	2.294E-01	&	4.292E-01	1.20E+02	4.89E+00 GA
			1377.65	0.000E+00	-	1.477E-01	1.00E+03	4.02E+00 GA
			934.05	5.953E-03	%	5.544E-01	5.66E+03	3.17E+00 GA
			1407.98	2.956E-02	}	1.700E+00	4.21E+02	2.48E+00 GA
			1509.19	-3.315E-01	-	9.056E-01	1.77E+02	2.19E+00 GA
			665.45	-3.326E-03	% P	1.233E+00	2.46E+05	1.56E+00 GA
Co-60	T	4.6503E-05					3.65E+11	
			1173.24	4.650E-05	%(	2.933E-02	3.83E+04	9.99E+01 G
			1332.50	-5.510E-03	+	2.816E-02	3.17E+02	1.00E+02 G
Eu-152	I	2.7868E-02					3.65E+11	
			344.30	2.787E-02	?(	5.142E-02	1.17E+02	2.70E+01 G
			121.87	-8.114E-03	-	5.235E-02	3.96E+02	2.86E+01 GA
			1408.08	2.782E-03	}	1.988E-01	4.45E+02	2.12E+01 GA
			964.05	9.265E-05	%	9.218E-02	6.04E+04	1.46E+01 GA
			778.90	-4.695E-02	+	1.723E-01	2.29E+02	1.30E+01 GA
			411.09	1.948E-02	%	6.124E-01	1.91E+03	2.26E+00 GA
Eu-154	I	4.4636E-02					3.65E+11	
			1274.80	4.464E-02	&(	6.639E-02	9.83E+01	3.55E+01 G
			123.10	-1.408E-03	&	3.462E-02	1.50E+03	4.05E+01 GA
			723.30	-8.042E-02	+	1.146E-01	9.22E+01	1.97E+01 GA
K-40	N	1.9179E+01					3.65E+11	
			1460.80	1.918E+01	(P	2.756E-01	3.67E+00	1.07E+01 G
Pb-212	N	3.8710E-01					3.65E+11	
			238.63	3.871E-01	(P	3.258E-02	9.46E+00	4.31E+01 G
			77.11	2.481E-01	- P	2.059E-01	4.82E+01	1.75E+01 GA
			74.81	0.000E+00	-	6.429E-01	1.00E+03	9.60E+00 GA
			87.20	4.057E-01	? P	3.783E-01	5.79E+01	6.30E+00 GA
			300.09	4.269E-02	- P	4.865E-01	3.15E+02	3.27E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:29:58
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   1.9432E-01                                     3.65E+11
                           351.79 1.943E-01 ?(P 5.017E-02 1.51E+01 3.71E+01 G
                           295.22 2.605E-01   P 6.035E-02 1.72E+01 1.92E+01 GA
                           241.92 4.470E-01 + P 1.586E-01 2.79E+01 7.47E+00 GA

Ra-226   N   4.6194E-01                                     3.65E+11
                           186.20 4.619E-01  (  3.425E-01 4.94E+01 3.60E+00 G

Th-234   N   2.3445E-01                                     3.65E+11
                            92.60 2.344E-01 ?(  3.951E-01 1.06E+02 5.60E+00 G

Tl-208   N   1.2854E-01                                     3.65E+11
                           583.14 1.285E-01  (P 1.473E-02 1.34E+01 8.60E+01 G
                           860.47 6.175E-02 &   1.564E-01 1.61E+02 1.20E+01 GA

U-235    N   2.8840E-02                                     3.65E+11
                           185.70 2.884E-02  (  2.193E-02 5.07E+01 5.40E+01 G
                           143.76-3.726E-02 &   1.389E-01 2.30E+02 1.05E+01 GA
                           163.35 2.039E-01     2.954E-01 9.19E+01 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_012.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	59.51	69.	-7.	-0.003	327.23	-6.600E-02	
Pa-234	99.00	88.	-12.	-0.004	235.71	-4.123E-02	
Ac-228	269.53	59.	8.	0.003	251.44	1.842E-01	P
Ac-228	338.24	50.	31.	0.011	68.50	2.400E-01	P
Eu-154	722.07	37.	-10.	-0.004	184.36	-8.042E-02	
Bi-212	727.30	34.	7.	0.003	156.82	9.685E-02	P
Bi-212	787.23	28.	-5.	-0.002	289.81	-4.625E-01	
Ac-228	795.03	31.	5.	0.002	344.61	1.923E-01	
Ac-228	911.53	36.	20.	0.008	78.80	1.318E-01	P
Ac-228	966.23	52.	-11.	-0.004	208.01	-4.431E-01	P
Ac-228	969.17	25.	19.	0.007	71.88	2.087E-01	P
Eu-154	1276.70	18.	7.	0.002	196.65	4.464E-02	
Co-60	1331.52	24.	-2.	-0.001	634.67	-5.510E-03	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	1.3184E-01	1.3184E-01	1.2229E-01	1.2262E-01	9.075E-02
Am-241 #A	-6.6004E-02	-6.6004E-02	2.1599E-01	2.1607E-01	1.734E-01
Bi-212 #A	9.6854E-02	9.6854E-02	2.2935E-01	2.2945E-01	1.842E-01
Bi-214	3.5483E-01	3.5483E-01	7.8399E-02	8.1910E-02	3.350E-02
Co-60 #A	4.6503E-05	4.6503E-05	3.5612E-02	3.5612E-02	2.933E-02
Cs-137 #A	0.0000E+00	0.0000E+00	1.6675E-02	1.6675E-02	3.905E-02
Eu-152 #A	2.7868E-02	2.7868E-02	6.5481E-02	6.5509E-02	5.142E-02
Eu-154 #A	4.4636E-02	4.4636E-02	8.7778E-02	8.7829E-02	6.639E-02
K-40	1.9179E+01	1.9179E+01	1.4365E+00	1.9664E+00	2.756E-01
Pa-234 #A	0.0000E+00	0.0000E+00	4.9179E-02	4.9179E-02	2.274E-01
Pb-212	3.8710E-01	3.8710E-01	7.6161E-02	8.1527E-02	3.258E-02
Pb-214	1.9432E-01	1.9432E-01	7.2437E-02	7.3640E-02	5.017E-02
Ra-226	4.6194E-01	4.6194E-01	4.5632E-01	4.5766E-01	3.425E-01
Th-234 #A	2.3445E-01	2.3445E-01	4.9623E-01	4.9668E-01	3.951E-01
Tl-208	1.2854E-01	1.2854E-01	3.7368E-02	3.8335E-02	1.473E-02
U-235	2.8840E-02	2.8840E-02	2.9257E-02	2.9339E-02	2.193E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:29:58
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_012.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
-----------------------------   S U M M A R Y   -----------------------------
Total Activity ( 1408.1 to  2041.3 keV)     2.073E+01  pCi/g
Total Decayed Activity ( 1408.1 to  2041.3 keV) 2.0734619E+01  pCi/g

Analyzed by: ____________________________________________
                   Technician

Reviewed by: ____________________________________________
                   Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1584011944012
File : 9_20140108_012
Cal : 08-JAN-2014 07:26:14,30-DEC-2013 12:17:54
IDF : 1.0
PDF : 1.0

Lab ID : 251449-015
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 30-DEC-2013
Sample Amount : 329.98 g

Client ID : 04-PD-D0034-15
Acct : ITSI (JG)
Time : 08-JAN-2014 18:47
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.05 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0478	0.207		.25562	.25565	-0.040	u
Bismuth-212	0.0656	0.174		.21946	.21951	-0.0025	u
Bismuth-214	0.353	0.0342		.08703	.090505	-0.052	u
Cesium-137	0.00428	0.0195	0.07	.024315	.024317	-0.0069	u
Cobalt-60	0.00260	0.0274		.0072476	.0072497	0	u
Europium-152	-0.0137	0.0511		.063587	.063595	-0.00031	u
Europium-154	-0.00404	0.0460		.056811	.056811	-0.013	u
Lead-212	0.300	0.0381		.064342	.068237	-0.016	u
Lead-214	0.322	0.0293		.070825	.074377	-0.0040	u
Potassium-40	16.4	0.225		1.292	1.729	-0.36	u
Protactinium-234	0.000178	0.152		.18501	.18501	0.015	u
Radium-226	0.327	0.404	1.3	.51582	.51641	-0.082	u
Thallium-208	0.128	0.0130		.038169	.039213	0.0020	u
Thorium-232 (By Actinium-228)	0.466	0.0149		.10912	.11386	0.019	u
Thorium-234	0.268	0.400		.50512	.50569	-0.034	u
Uranium-235	0.0339	0.0255		.033642	.03374	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-15
Sample Description: 251449-015, 206637

Detector: HPGE09 50-TP42232A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:15
Acquisition Time: 1/8/2014 18:47:17
Analysis Time: 1/8/2014 19:32
Analysis Quantity: 3.300E+02 g

Spectrum ID: 9_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2701 sec
Dead Time: 0.05 %

Efficiency: HPGE09 S23325 9_20131229002_EffCal
Efficiency Cal Date: 12/30/2013 12:17
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.662E-01	1.091E-01	1.139E-01	1.488E-02
Am-241	#AB	-4.783E-02	2.556E-01	2.557E-01	2.070E-01
Bi-212	#AB	6.558E-02	2.195E-01	2.195E-01	1.741E-01
Bi-214		3.529E-01	8.703E-02	9.051E-02	3.424E-02
Co-60	#AB	2.602E-03	7.248E-03	7.250E-03	2.735E-02
Cs-137	#AB	4.283E-03	2.432E-02	2.432E-02	1.952E-02
Eu-152	#AB	-1.374E-02	6.359E-02	6.359E-02	5.112E-02
Eu-154	#AB	-4.040E-03	5.681E-02	5.681E-02	4.601E-02
K-40		1.641E+01	1.292E+00	1.729E+00	2.248E-01
Pa-234	#AB	1.776E-04	1.850E-01	1.850E-01	1.524E-01
Pb-212		2.996E-01	6.434E-02	6.824E-02	3.812E-02
Pb-214		3.220E-01	7.082E-02	7.438E-02	2.928E-02
Ra-226	AB	3.269E-01	5.158E-01	5.164E-01	4.042E-01
Th-234	#AB	2.676E-01	5.051E-01	5.057E-01	3.999E-01
Tl-208		1.282E-01	3.817E-02	3.921E-02	1.302E-02
U-235		3.390E-02	3.364E-02	3.374E-02	2.548E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.868E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:32:25
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_012.An1

Sample description
     251449-015, 206637


Spectrum Filename: C:\User\SPC\Det9\9_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 18:47:17
       Live time:               2700
       Real time:               2701
       Dead time:                  0.05 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:26:14
            Zero offset:           0.095 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.675E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.11keV )
       Stop channel:           16336 (  2041.83keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2998E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2998E+02) =
                                   8.1905E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:32:25
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:15:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	9_2013-12-31_0939.PBC 12/31/2013 09:39:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 20 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1519

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.86	46.	29.49	0.84	1.830E-02	74.81	9.600	7.992E-01	Pb212
77.18	62.	22.66	0.84	1.997E-02	77.11	17.500	5.165E-01	Pb212
84.72	36.	28.90	0.85	2.514E-02				
87.37	57.	22.19	0.85	2.680E-02	87.20	6.300	1.027E+00	Pb212
93.15	15.	94.40	0.85	2.972E-02	92.60	5.600	PBC<MDA	Th234
97.48	4.	260.34	0.86	3.272E-02	98.44	25.100	PBC<MDA	Pa234
163.32	13.	99.08	0.92	4.426E-02	163.35	4.700	PBC<MDA	U235
169.59	11.	76.49	0.23	4.416E-02				
185.63	26.	49.62	0.94	4.351E-02	185.70	54.000	3.390E-02	U235
186.13	17.	78.89	0.94	4.348E-02	186.20	3.600	PBC<MDA	Ra226
218.19	10.	79.53	0.28	4.129E-02				
238.52	221.	10.16	0.64	3.967E-02	238.63	43.100	3.749E-01	Pb212
241.77	25.	52.48	1.00	3.940E-02	241.92	7.470	2.559E-01	Pb214
269.85	26.	40.18	1.02	3.715E-02	270.25	3.460	6.151E-01	Ac228
295.08	92.	17.12	0.71	3.529E-02	295.22	19.200	3.714E-01	Pb214
300.20	16.	65.72	1.05	3.494E-02	300.09	3.270	PBC<MDA	Pb212
338.31	56.	19.21	0.16	3.240E-02	338.40	12.010	4.405E-01	Ac228
351.91	134.	10.21	0.69	3.158E-02	351.79	37.100	3.220E-01	Pb214
463.17	8.	107.81	1.20	2.626E-02	463.00	4.400	PBC<MDA	Ac228
583.11	81.	14.89	0.37	2.240E-02	583.14	86.000	1.282E-01	Tl208
609.18	116.	11.41	0.32	2.172E-02	609.69	46.090	3.529E-01	Bi214
665.11	2.	283.89	1.38	2.052E-02	661.66	84.620	PBC<MDA	Cs137
					665.45	1.560	2.332E-01	Bi214
727.19	5.	167.33	1.43	1.922E-02	727.17	11.800	PBC<MDA	Bi212
768.99	7.	120.70	1.47	1.849E-02	768.36	4.890	PBC<MDA	Bi214
794.86	9.	78.68	1.49	1.805E-02	794.95	4.250	PBC<MDA	Ac228
910.95	73.	11.70	0.22	1.638E-02	911.07	29.000	4.662E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:32:25
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
934.29	7.	96.35	1.61	1.609E-02	934.05	3.170	PBC<MDA	Bi214
964.47	7.	137.14	1.63	1.572E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.671E-01	Ac228
					964.05	14.580	9.135E-02	Eu152
1120.30	1.	137.07	1.76	1.407E-02	1120.28	15.040	PBC<MDA	Bi214
1147.09	7.	37.80	0.16	1.382E-02				
1332.66	5.	139.25	1.92	1.229E-02	1332.50	99.980	PBC<MDA	Co60
1408.17	9.	63.87	1.98	1.176E-02	1407.98	2.480	9.021E-01	Bi214
					1408.08	21.210	1.055E-01	Eu152
					1408.08	21.210	1.055E-01	Eu152
1408.27	8.	66.24	1.98	1.176E-02	1407.98	2.480	8.839E-01	Bi214
					1408.08	21.210	1.034E-01	Eu152
1460.87	675.	3.85	1.44	1.140E-02	1460.80	10.700	1.641E+01	K40
1764.93	16.	31.24	2.23	9.660E-03	1764.51	15.920	3.117E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
678.10	84.91	32.	40.	1.611E+03	58.04	0.399	TH-228	sM
1355.19	169.59	26.	11.	2.491E+02	152.99	0.235	-	sc
1743.82	218.19	25.	10.	2.495E+02	159.07	0.276	-	sc
9174.14	1147.09	0.	7.	5.065E+02	75.59	0.156	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	488.84	61.24	58.	-4.	-0.002	534.48	0.821s
Pb-212	598.64	74.97	51.	61.	0.023	46.22	0.368s
Pb-212	617.20	77.29	66.	72.	0.027	44.88	0.654s
Pb-212	699.25	87.55	55.	63.	0.023	50.74	0.446s
Th-234	744.01	93.15	89.	15.	0.005	188.79	0.853s
Pa-234	778.60	97.48	66.	4.	0.002	520.68	0.858s
Eu-152	972.72	121.75	69.	-4.	-0.001	595.30	0.881s
Eu-154	985.06	123.30	70.	-5.	-0.002	473.80	0.882s
U-235	1305.07	163.32	71.	13.	0.005	198.16	0.921

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:32:25
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1484.03	185.70	72.	26.	0.010	99.24	0.942D
Ra-226	1488.03	186.20	80.	17.	0.006	157.79	0.943D
Pb-212	1906.97	238.59	85.	169.	0.063	20.25	0.992s
Pb-214	1932.38	241.77	84.	25.	0.009	104.97	0.996s
Ac-228	2156.96	269.85	42.	26.	0.010	80.37	1.022s
Pb-214	2358.40	295.04	55.	73.	0.027	32.16	1.046s
Pb-212	2399.66	300.20	48.	16.	0.006	131.44	1.050s
Ac-228	2704.25	338.29	36.	41.	0.015	52.03	1.086s
Eu-152	2749.66	343.97	39.	-4.	-0.001	462.68	1.091s
Pb-214	2813.18	351.91	24.	124.	0.046	20.42	0.686s
Ac-228	3702.99	463.17	34.	8.	0.003	215.63	1.200s
Tl-208	4662.27	583.11	13.	81.	0.030	29.78	0.372s
Bi-214	4870.74	609.18	24.	116.	0.043	22.82	0.322s
Cs-137	5318.14	665.11	23.	2.	0.001	567.78	1.377s
Bi-212	5814.73	727.19	31.	5.	0.002	334.65	1.433s
Bi-214	6149.15	768.99	30.	7.	0.002	241.39	1.469s
Bi-212	6282.89	785.71	31.	-5.	-0.002	305.43	1.483s
Ac-228	6356.06	794.86	22.	9.	0.003	157.37	1.491s
Ac-228	7284.81	910.95	0.	73.	0.027	23.41	0.219s
Bi-214	7471.50	934.29	21.	7.	0.003	192.71	1.608s
Pa-234	7540.67	942.93	26.	-1.	0.000	1560.79	1.618s
Eu-152	7712.94	964.47	41.	7.	0.003	274.29	1.633s
Ac-228	7742.98	968.22	59.	-2.	-0.001	1272.79	1.637s
Bi-214	8959.81	1120.30	38.	1.	0.000	274.14	1.759s
Co-60	9369.70	1171.53	28.	-3.	-0.001	568.17	1.800s
Eu-154	10232.74	1279.38	9.	-1.	0.000	1406.34	1.879s
Co-60	10659.11	1332.66	18.	5.	0.002	278.50	1.923s
Bi-214	11264.28	1408.27	12.	8.	0.003	132.49	1.980
Eu-152	11263.48	1408.17	11.	9.	0.003	127.73	1.980s
K-40	11685.27	1460.87	15.	660.	0.244	7.70	1.443s
Bi-214	14119.04	1764.93	12.	16.	0.006	62.49	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	4.6617E-01					3.65E+11
			911.07	4.662E-01	(	1.488E-02 1.17E+01 2.90E+01	G
			968.90	-1.908E-02	-	1.986E-01 6.36E+02 1.75E+01	GA
			338.40	3.183E-01	-	1.090E-01 2.60E+01 1.20E+01	GA
			964.77	-2.149E-02	%	6.444E-01 1.82E+03 4.99E+00	GA
			463.00	2.129E-01	-	3.575E-01 1.08E+02 4.40E+00	GA
			794.95	3.681E-01	-	4.338E-01 7.87E+01 4.25E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:32:25
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_012.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			270.25	6.151E-01	?	3.556E-01	4.02E+01	3.46E+00 GA
Am-241	I	-4.7825E-02					3.65E+11	
			59.54	-4.783E-02	?(	2.070E-01	2.67E+02	3.63E+01 G
Bi-212	N	6.5578E-02					3.65E+11	
			727.17	6.558E-02	?(	1.741E-01	1.67E+02	1.18E+01 G
			1620.56	0.000E+00	-	2.464E-01	1.00E+03	2.75E+00 GA
			785.42	-4.480E-01	+	1.081E+00	1.53E+02	2.00E+00 GA
Bi-214	N	3.5290E-01					3.65E+11	
			609.69	3.529E-01	@(P	3.424E-02	1.14E+01	4.61E+01 G
			1764.51	3.117E-01	? P	1.601E-01	3.12E+01	1.59E+01 GA
			1120.28	1.586E-02	& P	2.072E-01	1.37E+02	1.50E+01 GA
			768.36	2.255E-01	-	4.249E-01	1.21E+02	4.89E+00 GA
			1377.65	-6.700E-03	% P	2.009E+00	1.00E+03	4.02E+00 GA
			934.05	4.182E-01	& P	6.301E-01	9.64E+01	3.17E+00 GA
			1407.98	8.839E-01	+	8.252E-01	6.62E+01	2.48E+00 GA
			1509.19	0.000E+00	-	2.909E-01	1.00E+03	2.19E+00 GA
			665.45	0.000E+00	-	1.881E+00	1.00E+03	1.56E+00 GA
Co-60	T	2.6023E-03					3.65E+11	
			1173.24	-5.984E-03	?(	2.735E-02	2.84E+02	9.99E+01 G
			1332.50	1.118E-02	?(	2.414E-02	1.39E+02	1.00E+02 G
Cs-137	I	4.2825E-03					3.65E+11	
			661.66	4.282E-03	?(	1.952E-02	2.84E+02	8.46E+01 G
Eu-152	I	-1.3743E-02					3.65E+11	
			344.30	-1.374E-02	?(	5.112E-02	2.31E+02	2.70E+01 G
			121.87	-1.041E-02	+	5.034E-02	2.98E+02	2.86E+01 GA
			1408.08	1.055E-01	?	9.401E-02	6.39E+01	2.12E+01 GA
			964.05	9.135E-02	?	1.983E-01	1.37E+02	1.46E+01 GA
			778.90	-9.560E-04	%	1.483E-01	9.43E+03	1.30E+01 GA
			411.09	1.439E-02	%	6.959E-01	2.94E+03	2.26E+00 GA
Eu-154	I	-4.0396E-03					3.65E+11	
			1274.80	-4.040E-03	?(	4.601E-02	7.03E+02	3.55E+01 G
			123.10	-9.294E-03	&	3.564E-02	2.37E+02	4.05E+01 GA
			723.30	1.481E-04	&	6.775E-02	2.78E+04	1.97E+01 GA
K-40	N	1.6409E+01					3.65E+11	
			1460.80	1.641E+01	(P	2.248E-01	3.85E+00	1.07E+01 G
Pa-234	N	1.7762E-04					3.65E+11	
			883.24	1.776E-04	%(	1.524E-01	5.21E+04	1.50E+01 G
			98.44	1.653E-02	?	6.974E-02	2.60E+02	2.51E+01 GA
			946.00	-1.475E-02	+	1.880E-01	7.80E+02	1.20E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:32:25
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   2.9963E-01                                     3.65E+11
                           238.63 2.996E-01 ?(P 3.812E-02 1.01E+01 4.31E+01 G
                            77.11 6.323E-01 + P 1.649E-01 2.24E+01 1.75E+01 GA
                            74.81 1.060E+00 +   2.891E-01 2.31E+01 9.60E+00 GA
                            87.20 1.139E+00 + P 3.135E-01 2.54E+01 6.30E+00 GA
                           300.09 4.268E-01 +   4.276E-01 6.57E+01 3.27E+00 GA

Pb-214   N   3.2204E-01                                     3.65E+11
                           351.79 3.220E-01  (P 2.928E-02 1.02E+01 3.71E+01 G
                           295.22 3.258E-01 ? P 7.715E-02 1.61E+01 1.92E+01 GA
                           241.92 2.559E-01 - P 2.200E-01 5.25E+01 7.47E+00 GA

Ra-226   N   3.2691E-01                                     3.65E+11
                           186.20 3.269E-01  (  4.042E-01 7.89E+01 3.60E+00 G

Th-234   N   2.6755E-01                                     3.65E+11
                            92.60 2.676E-01 &(  3.999E-01 9.44E+01 5.60E+00 G

Tl-208   N   1.2816E-01                                     3.65E+11
                           583.14 1.282E-01  (  1.302E-02 1.49E+01 8.60E+01 G
                           860.47-7.100E-04 %   1.987E-01 1.70E+04 1.20E+01 GA

U-235    N   3.3899E-02                                     3.65E+11
                           185.70 3.390E-02  (  2.548E-02 4.96E+01 5.40E+01 G
                           143.76-5.722E-05 %   1.321E-01 1.40E+05 1.05E+01 GA
                           163.35 1.828E-01     2.860E-01 9.91E+01 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:32:25
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_012.An1

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	61.24	58.	-4.	-0.002	534.48	-4.783E-02
Th-234	93.15	89.	15.	0.005	188.79	2.676E-01
Pa-234	97.48	66.	4.	0.002	520.68	1.653E-02
Eu-152	121.75	69.	-4.	-0.001	595.30	-1.041E-02
Eu-154	123.30	70.	-5.	-0.002	473.80	-9.294E-03
Eu-152	343.97	39.	-4.	-0.001	462.68	-1.374E-02
Cs-137	665.11	23.	2.	0.001	567.78	4.282E-03
Bi-212	727.19	31.	5.	0.002	334.65	6.558E-02
Bi-212	785.71	31.	-5.	-0.002	305.43	-4.480E-01
Pa-234	942.93	26.	-1.	0.000	1560.79	-1.475E-02
Eu-152	964.47	41.	7.	0.003	274.29	9.135E-02
Co-60	1171.53	28.	-3.	-0.001	568.17	-5.984E-03
Eu-154	1279.38	9.	-1.	0.000	1406.34	-4.040E-03
Co-60	1332.66	18.	5.	0.002	278.50	1.118E-02
Eu-152	1408.17	11.	9.	0.003	127.73	1.055E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.6617E-01	4.6617E-01	1.0912E-01	1.1386E-01	1.488E-02
Am-241 #A	-4.7825E-02	-4.7825E-02	2.5562E-01	2.5565E-01	2.070E-01
Bi-212 #A	6.5578E-02	6.5578E-02	2.1946E-01	2.1951E-01	1.741E-01
Bi-214	3.5290E-01	3.5290E-01	8.7030E-02	9.0505E-02	3.424E-02
Co-60 #A	2.6023E-03	2.6023E-03	7.2476E-03	7.2497E-03	2.735E-02
Cs-137 #A	4.2825E-03	4.2825E-03	2.4315E-02	2.4317E-02	1.952E-02
Eu-152 #A	-1.3743E-02	-1.3743E-02	6.3587E-02	6.3595E-02	5.112E-02
Eu-154 #A	-4.0396E-03	-4.0396E-03	5.6811E-02	5.6811E-02	4.601E-02
K-40	1.6409E+01	1.6409E+01	1.2920E+00	1.7290E+00	2.248E-01
Pa-234 #A	1.7762E-04	1.7762E-04	1.8501E-01	1.8501E-01	1.524E-01
Pb-212	2.9963E-01	2.9963E-01	6.4342E-02	6.8237E-02	3.812E-02
Pb-214	3.2204E-01	3.2204E-01	7.0825E-02	7.4377E-02	2.928E-02
Ra-226 A	3.2691E-01	3.2691E-01	5.1582E-01	5.1641E-01	4.042E-01
Th-234 #A	2.6755E-01	2.6755E-01	5.0512E-01	5.0569E-01	3.999E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:32:25
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_012.An1

 Tl-208       1.2816E-01    1.2816E-01   3.8169E-02    3.9213E-02  1.302E-02
 U-235        3.3899E-02    3.3899E-02   3.3642E-02    3.3740E-02  2.548E-02

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  218.1 to  2041.8 keV)     1.801E+01  pCi/g
 Total Decayed Activity (  218.1 to  2041.8 keV) 1.8012026E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE10
Seqnum : 1594011971013
File : 10_20140108_013
Cal : 08-JAN-2014 07:52:53,30-DEC-2013 19:08:15
IDF : 1.0
PDF : 1.0

Lab ID : 251449-016
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 30-DEC-2013
Sample Amount : 306.6 g

Client ID : 04-PD-D0034-16
Acct : ITSI (JG)
Time : 08-JAN-2014 18:48
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.09 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0380	0.273		.33564	.33565	-0.040	u
Bismuth-212	0.126	0.180		.23619	.23636	-0.0025	u
Bismuth-214	0.407	0.0499		.12384	.1271	-0.052	u
Cesium-137	0.00979	0.0219	0.07	.028019	.028028	-0.0069	u
Cobalt-60	-0.00263	0.0310		.038029	.03803	0	u
Europium-152	-0.000695	0.0647		.078662	.078662	-0.00031	u
Europium-154	0	0.206		.01588	.01588	-0.013	u
Lead-212	0.348	0.0383		.084825	.088829	-0.016	u
Lead-214	0.305	0.0370		.08193	.0847	-0.0040	u
Potassium-40	15.2	0.321		1.3958	1.7539	-0.36	u
Protactinium-234	0.00607	0.152		.18564	.18564	0.015	u
Radium-226	0.614	0.349	1.3	.48509	.48732	-0.082	u
Thallium-208	0.0468	0.0251		.034829	.034983	0.0020	u
Thorium-232 (By Actinium-228)	0.210	0.0938		.13901	.13978	0.019	u
Thorium-234	0.0357	0.485		.59195	.59196	-0.034	u
Uranium-235	0.00356	0.0314		.038339	.03834	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-16
Sample Description: 251449-016, 206637

Detector: HPGE10 51-TP42231A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:18
Acquisition Time: 1/8/2014 18:48:11
Analysis Time: 1/8/2014 19:33
Analysis Quantity: 3.066E+02 g

Spectrum ID: 10_20140108_013
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.09 %

Efficiency: HPGE10 S23325 10_20131230002_EffCal
Efficiency Cal Date: 12/30/2013 19:08
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.104E-01	1.390E-01	1.398E-01	9.384E-02
Am-241	#AB	-3.799E-02	3.356E-01	3.357E-01	2.726E-01
Bi-212	#AB	1.264E-01	2.362E-01	2.364E-01	1.801E-01
Bi-214		4.065E-01	1.238E-01	1.271E-01	4.991E-02
Co-60	#AB	-2.627E-03	3.803E-02	3.803E-02	3.103E-02
Cs-137	#AB	9.792E-03	2.802E-02	2.803E-02	2.186E-02
Eu-152	#AB	-6.948E-04	7.866E-02	7.866E-02	6.474E-02
Eu-154	#AB	0.000E+00	1.588E-02	1.588E-02	2.055E-01
K-40		1.517E+01	1.396E+00	1.754E+00	3.206E-01
Pa-234	#AB	6.073E-03	1.856E-01	1.856E-01	1.522E-01
Pb-212		3.477E-01	8.483E-02	8.883E-02	3.827E-02
Pb-214		3.046E-01	8.193E-02	8.470E-02	3.698E-02
Ra-226		6.137E-01	4.851E-01	4.873E-01	3.493E-01
Th-234	AB	3.570E-02	5.920E-01	5.920E-01	4.853E-01
Tl-208	#	4.677E-02	3.483E-02	3.498E-02	2.508E-02
U-235	AB	3.559E-03	3.834E-02	3.834E-02	3.135E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.728E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:33:20
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_013.An1

Sample description
     251449-016, 206637


Spectrum Filename: C:\User\SPC\Det10\10_20140108_013.An1

Acquisition information
       Start time:                 1/8/2014 18:48:11
       Live time:               2700
       Real time:               2702
       Dead time:                  0.09 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:52:53
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.220E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.73keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.0660E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.0660E+02) =
                                   8.8151E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:33:20
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:18:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_2014-01-01_0202.PBC 1/1/2014 02:02:27
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1694

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.54	28.	28.41	0.32	0.000E+00				
74.87	11.	134.23	0.86	1.370E-02	74.81	9.600	PBC<MDA	Pb212
77.20	62.	19.87	0.45	1.531E-02	77.11	17.500	7.537E-01	Pb212
87.36	16.	81.62	0.87	2.179E-02	87.20	6.300	PBC<MDA	Pb212
92.73	2.	829.13	0.88	2.495E-02	92.60	5.600	PBC<MDA	Th234
93.19	52.	34.44	0.38	2.528E-02				
98.37	12.	104.09	0.88	2.802E-02	98.44	25.100	PBC<MDA	Pa234
122.98	8.	155.21	0.91	3.676E-02	123.10	40.460	PBC<MDA	Eu154
161.98	5.	192.72	0.94	4.064E-02	163.35	4.700	PBC<MDA	U235
185.66	2.	538.69	0.96	4.010E-02	185.70	54.000	PBC<MDA	U235
186.16	27.	39.52	0.96	4.008E-02	186.20	3.600	6.137E-01	Ra226
238.48	168.	12.20	0.91	3.661E-02	238.63	43.100	3.477E-01	Pb212
241.62	65.	22.24	0.37	3.636E-02	241.92	7.470	7.814E-01	Pb214
270.16	7.	151.75	1.03	3.426E-02	270.25	3.460	PBC<MDA	Ac228
					270.25	3.460	1.960E-01	Ac228
295.11	89.	15.23	0.28	3.251E-02	295.22	19.200	4.665E-01	Pb214
300.82	12.	81.04	1.06	3.218E-02	300.09	3.270	PBC<MDA	Pb212
337.95	62.	21.31	0.59	2.983E-02	338.40	12.010	5.609E-01	Ac228
					338.40	12.010	5.609E-01	Ac228
351.89	108.	12.48	0.62	2.905E-02	351.79	37.100	3.046E-01	Pb214
462.30	8.	109.35	1.19	2.407E-02	463.00	4.400	PBC<MDA	Ac228
					463.00	4.400	2.423E-01	Ac228
583.06	25.	31.68	1.29	2.049E-02	583.14	86.000	4.677E-02	Tl208
609.21	114.	14.17	0.25	1.986E-02	609.69	46.090	4.065E-01	Bi214
660.99	5.	143.07	1.35	1.875E-02	661.66	84.620	PBC<MDA	Cs137
727.43	8.	93.41	1.40	1.754E-02	727.17	11.800	PBC<MDA	Bi212
768.82	6.	86.11	1.44	1.687E-02	768.36	4.890	PBC<MDA	Bi214

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:33:20
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
785.93	3.	224.65	1.45	1.660E-02	785.42	2.000	PBC<MDA	Bi212
860.42	11.	59.02	1.50	1.555E-02	860.47	12.000	1.966E-01	Tl208
911.17	28.	33.04	1.54	1.493E-02	911.07	29.000	2.104E-01	Ac228
					911.07	29.000	2.104E-01	Ac228
934.04	3.	230.76	1.56	1.466E-02	934.05	3.170	PBC<MDA	Bi214
946.21	4.	162.66	1.57	1.452E-02	946.00	12.000	PBC<MDA	Pa234
964.04	10.	86.79	1.58	1.432E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	4.489E-01	Ac228
					964.77	4.990	4.489E-01	Ac228
964.06	9.	92.86	1.58	1.432E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	4.274E-01	Ac228
968.70	14.	60.12	1.58	1.427E-02	968.90	17.460	1.850E-01	Ac228
					968.90	17.460	1.850E-01	Ac228
1120.87	10.	54.16	1.69	1.281E-02	1120.28	15.040	PBC<MDA	Bi214
1460.93	532.	4.46	1.41	1.036E-02	1460.80	10.700	1.517E+01	K40
1765.16	7.	40.11	2.10	8.775E-03	1764.51	15.920	1.532E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
244.00	30.54	14.	28.	0.000E+00	56.83	0.317	-	sM
745.96	93.19	54.	37.	1.474E+03	64.59	0.880	TH-234	D
2702.28	337.95	52.	34.	1.142E+03	68.98	0.588	AC-228	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	460.42	57.60	32.	-2.	-0.001	883.42	0.850s
Pb-212	598.49	74.87	97.	11.	0.004	268.46	0.863
Pb-212	617.10	77.20	30.	62.	0.023	39.73	0.445s
Pb-212	698.33	87.36	78.	16.	0.006	163.24	0.874s
Th-234	740.25	92.60	79.	2.	0.001	1658.26	0.879D
Pa-234	786.36	98.37	67.	12.	0.004	208.19	0.884s
Eu-152	976.77	122.18	77.	-2.	-0.001	1427.29	0.905s
Eu-154	983.21	122.98	76.	8.	0.003	310.42	0.906s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:33:20
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1153.08	144.23	84.	-11.	-0.004	244.31	0.924
U-235	1295.03	161.98	47.	5.	0.002	385.43	0.941
U-235	1484.72	185.70	80.	2.	0.001	1077.38	0.961D
Ra-226	1488.71	186.20	44.	27.	0.010	79.04	0.961D
Pb-212	1906.78	238.48	63.	168.	0.062	24.40	0.913
Pb-214	1931.87	241.62	36.	65.	0.024	44.48	0.372s
Ac-228	2160.13	270.16	55.	7.	0.003	303.50	1.034s
Pb-214	2359.64	295.11	34.	89.	0.033	30.47	0.283s
Pb-212	2405.29	300.82	42.	12.	0.004	162.08	1.059
Ac-228	2703.72	338.13	40.	27.	0.010	75.46	1.092s
Pb-214	2813.74	351.89	27.	101.	0.037	24.95	0.620s
Eu-152	3288.53	411.25	37.	-7.	-0.003	242.62	1.152s
Ac-228	3696.78	462.30	33.	8.	0.003	218.70	1.195s
Tl-208	4662.72	583.06	34.	25.	0.009	63.36	1.292s
Bi-214	4871.85	609.21	36.	114.	0.042	28.34	0.247s
Cs-137	5286.08	660.99	21.	5.	0.002	286.14	1.354s
Bi-212	5817.56	727.43	24.	8.	0.003	186.81	1.404s
Bi-214	6148.61	768.82	25.	6.	0.002	172.23	1.436s
Bi-212	6285.56	785.93	24.	3.	0.001	449.30	1.449s
Tl-208	6881.46	860.42	18.	11.	0.004	118.04	1.505s
Ac-228	7287.50	911.17	29.	28.	0.010	66.08	1.542s
Bi-214	7470.42	934.04	19.	3.	0.001	461.52	1.559s
Pa-234	7567.81	946.21	19.	4.	0.001	325.31	1.568s
Eu-152	7710.49	964.04	31.	10.	0.004	173.57	1.581s
Ac-228	7710.65	964.06	33.	9.	0.003	185.73	1.581s
Ac-228	7747.75	968.70	29.	14.	0.005	120.25	1.584s
Bi-214	8965.30	1120.87	30.	10.	0.004	108.33	1.691s
Co-60	9389.67	1173.90	25.	-1.	0.000	1447.91	1.727s
K-40	11686.69	1460.93	22.	515.	0.191	8.91	1.409s
Bi-214	14121.81	1765.16	7.	7.	0.002	80.22	2.097s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	2.1035E-01					3.65E+11
			911.07	2.104E-01	?(	9.384E-02 3.30E+01 2.90E+01	G
			968.90	1.850E-01	&	1.643E-01 6.01E+01 1.75E+01	GA
			338.40	2.503E-01		1.342E-01 3.77E+01 1.20E+01	GA
			964.77	4.274E-01	?	6.120E-01 9.29E+01 4.99E+00	GA
			463.00	2.423E-01	?	4.127E-01 1.09E+02 4.40E+00	GA
			794.95	-2.634E-02	%	5.654E-01 1.31E+03 4.25E+00	GA
			270.25	1.960E-01	?	4.749E-01 1.52E+02 3.46E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:33:20
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_013.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	-3.7993E-02					3.65E+11	
			59.54	-3.799E-02	&(	2.726E-01	4.42E+02	3.63E+01 G
Bi-212	N	1.2643E-01					3.65E+11	
			727.17	1.264E-01	?(	1.801E-01	9.34E+01	1.18E+01 G
			1620.56	0.000E+00	-	2.919E-01	1.00E+03	2.75E+00 GA
			785.42	3.149E-01	?	1.129E+00	2.25E+02	2.00E+00 GA
Bi-214	N	4.0653E-01					3.65E+11	
			609.69	4.065E-01	(P	4.991E-02	1.42E+01	4.61E+01 G
			1764.51	1.532E-01	- P	1.399E-01	4.01E+01	1.59E+01 GA
			1120.28	1.724E-01	- P	2.163E-01	5.42E+01	1.50E+01 GA
			768.36	2.464E-01	& P	4.618E-01	8.61E+01	4.89E+00 GA
			1377.65	-3.087E-02	% P	6.907E-01	3.42E+03	4.02E+00 GA
			934.05	1.934E-01	-	7.097E-01	2.31E+02	3.17E+00 GA
			1407.98	0.000E+00	-	1.967E+00	1.00E+03	2.48E+00 GA
			1509.19	0.000E+00	-	3.445E-01	1.00E+03	2.19E+00 GA
			665.45	-1.881E-01	% P	1.241E+00	1.21E+03	1.56E+00 GA
Co-60	T	-2.6265E-03					3.65E+11	
			1173.24	-2.626E-03	?(	3.103E-02	7.24E+02	9.99E+01 G
			1332.50	0.000E+00	+	6.806E-03	1.00E+03	1.00E+02 G
Cs-137	I	9.7920E-03					3.65E+11	
			661.66	9.792E-03	?(	2.186E-02	1.43E+02	8.46E+01 G
Eu-152	I	-6.9480E-04					3.65E+11	
			344.30	-6.948E-04	%(	6.474E-02	5.66E+03	2.70E+01 G
			121.87	-5.490E-03	+	6.419E-02	7.14E+02	2.86E+01 GA
			1408.08	0.000E+00	+	3.356E-02	1.00E+03	2.12E+01 GA
			964.05	1.535E-01	?	2.042E-01	8.68E+01	1.46E+01 GA
			778.90	0.000E+00	+	1.416E-01	1.00E+03	1.30E+01 GA
			411.09	-4.129E-01	+	7.868E-01	1.21E+02	2.26E+00 GA
K-40	N	1.5166E+01					3.65E+11	
			1460.80	1.517E+01	(P	3.206E-01	4.46E+00	1.07E+01 G
Pa-234	N	6.0732E-03					3.65E+11	
			883.24	6.073E-03	&(	1.522E-01	1.53E+03	1.50E+01 G
			98.44	5.367E-02	&	8.830E-02	1.04E+02	2.51E+01 GA
			946.00	7.494E-02	?	1.911E-01	1.63E+02	1.20E+01 GA
Pb-212	N	3.4768E-01					3.65E+11	
			238.63	3.477E-01	(	3.827E-02	1.22E+01	4.31E+01 G
			77.11	7.537E-01	+	1.572E-01	1.99E+01	1.75E+01 GA
			74.81	2.639E-01	-	5.683E-01	1.34E+02	9.60E+00 GA
			87.20	3.826E-01	?	4.898E-01	8.16E+01	6.30E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:33:20
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          300.09 3.742E-01     4.670E-01 8.10E+01 3.27E+00 GA

Pb-214   N   3.0459E-01                                     3.65E+11
                          351.79 3.046E-01  (P 3.698E-02 1.25E+01 3.71E+01 G
                          295.22 4.665E-01 + P 7.086E-02 1.52E+01 1.92E+01 GA
                          241.92 7.814E-01 +   1.681E-01 2.22E+01 7.47E+00 GA

Ra-226   N   6.1373E-01                                     3.65E+11
                          186.20 6.137E-01  (  3.493E-01 3.95E+01 3.60E+00 G

Th-234   N   3.5697E-02                                     3.65E+11
                           92.60 3.570E-02  (  4.853E-01 8.29E+02 5.60E+00 G

Tl-208   N   4.6769E-02                                     3.65E+11
                          583.14 4.677E-02 ?(P 2.508E-02 3.17E+01 8.60E+01 G
                          860.47 1.966E-01 + P 1.733E-01 5.90E+01 1.20E+01 GA

U-235    N   3.5585E-03                                     3.65E+11
                          185.70 3.559E-03  (  3.135E-02 5.39E+02 5.40E+01 G
                          143.76-8.520E-02 +   1.661E-01 1.22E+02 1.05E+01 GA
                          163.35 8.851E-02     2.736E-01 1.93E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:33:20
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_013.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	57.60	32.	-2.	-0.001	883.42	-3.799E-02
Pa-234	98.37	67.	12.	0.004	208.19	5.367E-02
Eu-152	122.18	77.	-2.	-0.001	1427.29	-5.490E-03
Eu-154	122.98	76.	8.	0.003	310.42	1.795E-02
Ac-228	270.16	55.	7.	0.003	303.50	1.960E-01
Ac-228	338.13	40.	27.	0.010	75.46	2.503E-01
Eu-152	411.25	37.	-7.	-0.003	242.62	-4.129E-01
Ac-228	462.30	33.	8.	0.003	218.70	2.423E-01
Cs-137	660.99	21.	5.	0.002	286.14	9.792E-03
Ac-228	911.17	29.	28.	0.010	66.08	2.104E-01
Pa-234	946.21	19.	4.	0.001	325.31	7.494E-02
Eu-152	964.04	31.	10.	0.004	173.57	1.535E-01
Ac-228	964.06	33.	9.	0.003	185.73	4.274E-01
Ac-228	968.70	29.	14.	0.005	120.25	1.850E-01
Co-60	1173.90	25.	-1.	0.000	1447.91	-2.626E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.1035E-01	2.1035E-01	1.3901E-01	1.3978E-01	9.384E-02
Am-241 #A	-3.7993E-02	-3.7993E-02	3.3564E-01	3.3565E-01	2.726E-01
Bi-212 #A	1.2643E-01	1.2643E-01	2.3619E-01	2.3636E-01	1.801E-01
Bi-214	4.0653E-01	4.0653E-01	1.2384E-01	1.2710E-01	4.991E-02
Co-60 #A	-2.6265E-03	-2.6265E-03	3.8029E-02	3.8030E-02	3.103E-02
Cs-137 #A	9.7920E-03	9.7920E-03	2.8019E-02	2.8028E-02	2.186E-02
Eu-152 #A	-6.9480E-04	-6.9480E-04	7.8662E-02	7.8662E-02	6.474E-02
Eu-154 #A	0.0000E+00	0.0000E+00	1.5880E-02	1.5880E-02	2.055E-01
K-40	1.5166E+01	1.5166E+01	1.3958E+00	1.7539E+00	3.206E-01
Pa-234 #A	6.0732E-03	6.0732E-03	1.8564E-01	1.8564E-01	1.522E-01
Pb-212	3.4768E-01	3.4768E-01	8.4825E-02	8.8829E-02	3.827E-02
Pb-214	3.0459E-01	3.0459E-01	8.1930E-02	8.4700E-02	3.698E-02
Ra-226	6.1373E-01	6.1373E-01	4.8509E-01	4.8732E-01	3.493E-01
Th-234 A	3.5697E-02	3.5697E-02	5.9195E-01	5.9196E-01	4.853E-01
Tl-208 #	4.6769E-02	4.6769E-02	3.4829E-02	3.4983E-02	2.508E-02
U-235 A	3.5585E-03	3.5585E-03	3.8339E-02	3.8340E-02	3.135E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:33:20
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_013.An1

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (238.5 to 2041.7 keV) 1.689E+01 pCi/g
Total Decayed Activity (238.5 to 2041.7 keV) 1.6885239E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604011948013
File : 11_20140108_013
Cal : 08-JAN-2014 07:30:05,03-JAN-2014 14:18:33
IDF : 1.0
PDF : 1.0

Lab ID : 251449-017
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 03-JAN-2014
Sample Amount : 352.28 g

Client ID : 04-PD-D0034-17
Acct : ITSI (JG)
Time : 08-JAN-2014 18:49
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0716	0.180		.22429	.22438	-0.040	u
Bismuth-212	0.0709	0.171		.21768	.21774	-0.0025	u
Bismuth-214	0.395	0.0348		.092696	.096769	-0.052	u
Cesium-137	-0.00928	0.0248	0.07	.031205	.031212	-0.0069	u
Cobalt-60	0.0119	0.0294		.03733	.037339	0	u
Europium-152	-0.0277	0.0596		.075232	.075257	-0.00031	u
Europium-154	-0.0314	0.0905		.11395	.11397	-0.013	u
Lead-212	0.285	0.0298		.063764	.067318	-0.016	u
Lead-214	0.348	0.0370		.089269	.092589	-0.0040	u
Potassium-40	18.6	0.302		1.4652	1.9586	-0.36	u
Protactinium-234	0.00307	0.178		.21586	.21586	0.015	u
Radium-226	0.748	0.409	1.3	.55796	.56083	-0.082	u
Thallium-208	0.162	0.0134		.038104	.039757	0.0020	u
Thorium-232 (By Actinium-228)	0.147	0.0910		.12422	.12464	0.019	u
Thorium-234	0.372	0.367		.47607	.47724	-0.034	u
Uranium-235	0.00419	0.0334		.040792	.040793	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-17
Sample Description: 251449-017, 206637

Detector: HPGE11 50-TP50818A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:20
Acquisition Time: 1/8/2014 18:49:37
Analysis Time: 1/8/2014 19:34
Analysis Quantity: 3.523E+02 g

Spectrum ID: 11_20140108_013
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE11 S23325 11_20140102002_EffCal
Efficiency Cal Date: 1/3/2014 14:18
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		1.474E-01	1.242E-01	1.246E-01	9.100E-02
Am-241	#AB	-7.157E-02	2.243E-01	2.244E-01	1.803E-01
Bi-212	#AB	7.095E-02	2.177E-01	2.177E-01	1.712E-01
Bi-214		3.947E-01	9.270E-02	9.677E-02	3.482E-02
Co-60	#AB	1.191E-02	3.733E-02	3.734E-02	2.944E-02
Cs-137	#AB	-9.282E-03	3.121E-02	3.121E-02	2.475E-02
Eu-152	#AB	-2.773E-02	7.523E-02	7.526E-02	5.955E-02
Eu-154	#AB	-3.137E-02	1.139E-01	1.140E-01	9.050E-02
K-40		1.856E+01	1.465E+00	1.959E+00	3.024E-01
Pa-234	#AB	3.066E-03	2.159E-01	2.159E-01	1.775E-01
Pb-212		2.846E-01	6.376E-02	6.732E-02	2.979E-02
Pb-214		3.484E-01	8.927E-02	9.259E-02	3.700E-02
Ra-226		7.478E-01	5.580E-01	5.608E-01	4.087E-01
Th-234	#	3.718E-01	4.761E-01	4.772E-01	3.670E-01
Tl-208	#	1.618E-01	3.810E-02	3.976E-02	1.344E-02
U-235	AB	4.187E-03	4.079E-02	4.079E-02	3.336E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.111E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:34:45
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_013.An1

Sample description
     251449-017, 206637


Spectrum Filename: C:\User\SPC\Det11\11_20140108_013.An1

Acquisition information
       Start time:                 1/8/2014 18:49:37
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:30:05
            Zero offset:           0.125 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.054E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.31keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.5228E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.5228E+02) =
                                   7.6720E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:34:45
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:20:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	11_2014-01-04_0721.PBC 1/4/2014 07:21:07
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1525

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.11	42.	29.24	0.93	1.145E-02				
75.01	11.	115.44	0.81	1.832E-02	74.81	9.600	PBC<MDA	Pb212
77.23	71.	27.98	0.30	1.963E-02	77.11	17.500	5.858E-01	Pb212
87.14	25.	51.68	0.83	2.451E-02	87.20	6.300	4.637E-01	Pb212
93.44	20.	64.03	0.83	2.677E-02	92.60	5.600	3.718E-01	Th234
99.11	4.	319.10	0.84	2.890E-02	98.44	25.100	PBC<MDA	Pa234
110.99	21.	47.61	0.18	3.245E-02				
143.33	1.	860.23	0.88	3.661E-02	143.76	10.500	PBC<MDA	U235
162.67	1.	980.08	0.90	3.689E-02	163.35	4.700	PBC<MDA	U235
185.70	3.	487.14	0.92	3.622E-02	185.70	54.000	PBC<MDA	U235
186.20	34.	37.31	0.92	3.620E-02	186.20	3.600	7.478E-01	Ra226
238.61	148.	10.81	0.87	3.309E-02	238.63	43.100	2.846E-01	Pb212
241.58	31.	37.41	0.98	3.287E-02	241.92	7.470	3.564E-01	Pb214
267.35	21.	39.43	1.00	3.105E-02	270.25	3.460	5.504E-01	Ac228
295.34	82.	17.12	0.51	2.953E-02	295.22	19.200	3.816E-01	Pb214
299.94	16.	62.73	1.03	2.926E-02	300.09	3.270	4.888E-01	Pb212
337.97	56.	19.45	0.17	2.720E-02	338.40	12.010	4.867E-01	Ac228
351.62	130.	11.90	1.17	2.655E-02	351.79	37.100	3.484E-01	Pb214
380.07	19.	37.29	0.15	2.526E-02				
463.08	8.	81.70	1.19	2.218E-02	463.00	4.400	PBC<MDA	Ac228
583.43	93.	10.95	1.13	1.900E-02	583.14	86.000	1.618E-01	Tl208
609.25	128.	10.86	0.52	1.844E-02	609.69	46.090	3.947E-01	Bi214
669.37	9.	33.33	0.31	1.731E-02				
727.50	5.	153.40	1.43	1.636E-02	727.17	11.800	PBC<MDA	Bi212
768.78	2.	283.68	1.47	1.576E-02	768.36	4.890	PBC<MDA	Bi214
785.96	5.	148.89	1.48	1.552E-02	785.42	2.000	PBC<MDA	Bi212
795.15	12.	64.99	1.49	1.539E-02	794.95	4.250	5.040E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:34:45
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
861.37	10.	75.03	1.55	1.457E-02	860.47	12.000	PBC<MDA	Tl208
894.75	11.	30.15	0.15	1.418E-02				
911.27	21.	34.63	1.60	1.401E-02	911.07	29.000	1.474E-01	Ac228
945.54	3.	244.40	1.63	1.364E-02	946.00	12.000	PBC<MDA	Pa234
964.18	6.	158.26	1.64	1.345E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.361E-01	Ac228
964.38	6.	138.02	1.64	1.346E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	2.692E-01	Ac228
969.17	18.	50.06	1.65	1.341E-02	968.90	17.460	2.222E-01	Ac228
1120.48	4.	108.70	1.78	1.208E-02	1120.28	15.040	PBC<MDA	Bi214
1172.95	5.	156.73	1.82	1.168E-02	1173.24	99.860	PBC<MDA	Co60
1460.85	716.	3.74	1.84	9.854E-03	1460.80	10.700	1.881E+01	K40
1764.56	14.	34.50	2.31	8.394E-03	1764.51	15.920	2.925E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
503.37	63.11	36.	42.	3.694E+03	58.48	0.928	TH-234	
886.15	110.99	32.	21.	6.409E+02	95.23	0.178	-	s
3037.39	380.07	9.	19.	7.444E+02	74.59	0.147	-	s
5351.11	669.37	0.	9.	5.200E+02	66.67	0.313	-	sM
7154.33	894.75	0.	11.	7.755E+02	60.30	0.146	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	473.52	59.37	84.	-8.	-0.003	313.40	0.798s
Pb-212	598.49	75.01	124.	11.	0.004	230.88	0.813s
Pb-212	617.39	77.37	111.	52.	0.019	63.91	0.815s
Pb-212	695.50	87.14	94.	25.	0.009	103.37	0.825
Th-234	745.83	93.44	69.	20.	0.007	128.06	0.830s
Pa-234	791.16	99.11	75.	4.	0.001	638.19	0.836s
Eu-152	975.85	122.22	99.	-9.	-0.003	330.12	0.859s
U-235	1144.67	143.33	81.	1.	0.001	1720.45	0.881s
U-235	1299.24	162.67	66.	1.	0.000	1960.16	0.900s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:34:45
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1483.34	185.70	97.	3.	0.001	974.27	0.921D
Ra-226	1487.34	186.20	65.	34.	0.013	74.61	0.922D
Pb-212	1906.30	238.61	41.	143.	0.053	21.62	0.866
Pb-214	1930.09	241.58	78.	31.	0.011	74.81	0.976s
Ac-228	2136.13	267.35	23.	21.	0.008	78.87	1.003s
Pb-214	2359.85	295.34	32.	76.	0.028	34.24	0.514s
Pb-212	2396.70	299.94	45.	16.	0.006	125.45	1.032
Ac-228	2700.74	337.97	19.	56.	0.021	38.89	0.168s
Eu-152	2747.82	343.86	43.	-7.	-0.003	271.34	1.074s
Pb-214	2809.86	351.62	30.	121.	0.045	23.79	1.172
Eu-152	3287.92	411.40	40.	-3.	-0.001	582.32	1.138s
Ac-228	3701.20	463.08	26.	8.	0.003	163.40	1.187s
Tl-208	4663.69	583.43	11.	93.	0.034	21.91	1.130s
Bi-214	4870.23	609.25	20.	118.	0.044	21.72	0.522s
Cs-137	5292.93	662.09	30.	-5.	-0.002	336.19	1.371s
Eu-154	5782.46	723.29	27.	-2.	-0.001	824.50	1.427s
Bi-212	5816.15	727.50	25.	5.	0.002	306.81	1.430s
Bi-214	6146.41	768.78	30.	2.	0.001	567.36	1.468s
Bi-212	6283.89	785.96	29.	5.	0.002	297.78	1.483s
Ac-228	6357.41	795.15	23.	12.	0.004	129.97	1.491s
Tl-208	6887.27	861.37	25.	10.	0.004	150.05	1.550s
Ac-228	7286.53	911.27	31.	21.	0.008	69.26	1.595s
Pa-234	7560.80	945.54	29.	3.	0.001	488.79	1.626s
Eu-152	7711.56	964.38	35.	6.	0.002	276.04	1.642s
Ac-228	7709.90	964.18	36.	6.	0.002	316.51	1.642s
Ac-228	7749.85	969.17	33.	18.	0.007	100.11	1.646s
Bi-214	8960.85	1120.48	26.	4.	0.002	217.40	1.777s
Co-60	9380.88	1172.95	27.	5.	0.002	313.46	1.823s
Eu-154	10176.62	1272.35	28.	-4.	-0.002	363.24	1.909s
Co-60	10672.67	1334.31	18.	-4.	-0.001	334.69	1.957s
K-40	11686.08	1460.87	23.	689.	0.255	7.69	1.834
Bi-214	14118.52	1764.56	5.	14.	0.005	68.99	2.306s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.4735E-01					3.65E+11
			911.07	1.474E-01	?(P	9.100E-02 3.46E+01 2.90E+01	G
			968.90	2.222E-01	? P	1.627E-01 5.01E+01 1.75E+01	GA
			338.40	4.867E-01	P	8.847E-02 1.94E+01 1.20E+01	GA
			964.77	2.361E-01	?	5.930E-01 1.58E+02 4.99E+00	GA
			463.00	2.349E-01	? P	3.492E-01 8.17E+01 4.40E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:34:45
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_013.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		794.95	5.040E-01	? P	4.904E-01	6.50E+01	4.25E+00 GA
		270.25	5.504E-01	?	2.973E-01	3.94E+01	3.46E+00 GA
Am-241 I	-7.1566E-02					3.65E+11	
		59.54	-7.157E-02	?(	1.803E-01	1.57E+02	3.63E+01 G
Bi-212 N	7.0949E-02					3.65E+11	
		727.17	7.095E-02	?(	1.712E-01	1.53E+02	1.18E+01 G
		1620.56	0.000E+00	-	2.663E-01	1.00E+03	2.75E+00 GA
		785.42	4.857E-01	&	1.140E+00	1.49E+02	2.00E+00 GA
Bi-214 N	3.9470E-01					3.65E+11	
		609.69	3.947E-01	(P	3.482E-02	1.09E+01	4.61E+01 G
		1764.51	2.925E-01	- P	1.072E-01	3.45E+01	1.59E+01 GA
		1120.28	6.603E-02	& P	1.873E-01	1.09E+02	1.50E+01 GA
		768.36	6.569E-02	- P	4.718E-01	2.84E+02	4.89E+00 GA
		1377.65	0.000E+00	-	1.092E+00	1.00E+03	4.02E+00 GA
		934.05	2.673E-02	%	7.941E-01	1.81E+03	3.17E+00 GA
		1407.98	-2.116E-03	% P	1.817E+00	1.00E+03	2.48E+00 GA
		1509.19	0.000E+00	-	3.150E-01	1.00E+03	2.19E+00 GA
		665.45	4.027E-02	%	9.875E-01	1.50E+03	1.56E+00 GA
Co-60 T	1.1909E-02					3.65E+11	
		1173.24	1.191E-02	&(	2.944E-02	1.57E+02	9.99E+01 G
		1332.50	-1.012E-02	+	2.654E-02	1.67E+02	1.00E+02 G
Cs-137 I	-9.2821E-03					3.65E+11	
		661.66	-9.282E-03	?(	2.475E-02	1.68E+02	8.46E+01 G
Eu-152 I	-2.7726E-02					3.65E+11	
		344.30	-2.773E-02	?(	5.955E-02	1.36E+02	2.70E+01 G
		121.87	-2.513E-02	+	6.689E-02	1.65E+02	2.86E+01 GA
		1408.08	0.000E+00	+	2.130E-01	1.00E+03	2.12E+01 GA
		964.05	9.210E-02	?	2.006E-01	1.38E+02	1.46E+01 GA
		778.90	1.312E-03	%	1.598E-01	7.40E+03	1.30E+01 GA
		411.09	-1.631E-01	+	7.675E-01	2.91E+02	2.26E+00 GA
Eu-154 I	-3.1369E-02					3.65E+11	
		1274.80	-3.137E-02	?(	9.050E-02	1.82E+02	3.55E+01 G
		123.10	2.255E-03	%	3.856E-02	1.04E+03	4.05E+01 GA
		723.30	-1.586E-02	&	1.059E-01	4.12E+02	1.97E+01 GA
K-40 N	1.8562E+01					3.65E+11	
		1460.80	1.856E+01	(P	3.024E-01	3.85E+00	1.07E+01 G
Pa-234 N	3.0655E-03					3.65E+11	
		883.24	3.066E-03	&(	1.775E-01	3.52E+03	1.50E+01 G
		98.44	1.523E-02	?	7.905E-02	3.19E+02	2.51E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:34:45
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          946.00 5.523E-02 &   2.165E-01 2.44E+02 1.20E+01 GA

Pb-212   N   2.8460E-01                                     3.65E+11
                          238.63 2.846E-01  (P 2.979E-02 1.08E+01 4.31E+01 G
                           77.11 4.298E-01 +   2.038E-01 3.20E+01 1.75E+01 GA
                           74.81 1.790E-01 - P 4.188E-01 1.15E+02 9.60E+00 GA
                           87.20 4.637E-01 + P 4.153E-01 5.17E+01 6.30E+00 GA
                          300.09 4.888E-01 +   4.645E-01 6.27E+01 3.27E+00 GA

Pb-214   N   3.4841E-01                                     3.65E+11
                          351.79 3.484E-01  (P 3.700E-02 1.19E+01 3.71E+01 G
                          295.22 3.816E-01   P 6.586E-02 1.71E+01 1.92E+01 GA
                          241.92 3.564E-01 ? P 2.383E-01 3.74E+01 7.47E+00 GA

Ra-226   N   7.4780E-01                                     3.65E+11
                          186.20 7.478E-01  (  4.087E-01 3.73E+01 3.60E+00 G

Th-234   N   3.7175E-01                                     3.65E+11
                           92.60 3.718E-01 ?(  3.670E-01 6.40E+01 5.60E+00 G

Tl-208   N   1.6176E-01                                     3.65E+11
                          583.14 1.618E-01 *(P 1.344E-02 1.10E+01 8.60E+01 G
                          860.47 1.690E-01 &   1.903E-01 7.50E+01 1.20E+01 GA

U-235    N   4.1869E-03                                     3.65E+11
                          185.70 4.187E-03  (  3.336E-02 4.87E+02 5.40E+01 G
                          143.76 1.099E-02 ?   1.551E-01 8.60E+02 1.05E+01 GA
                          163.35 1.929E-02 &   3.101E-01 9.80E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:34:45
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_013.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.37	84.	-8.	-0.003	313.40	-7.157E-02
Th-234	93.44	69.	20.	0.007	128.06	3.718E-01
Pa-234	99.11	75.	4.	0.001	638.19	1.523E-02
Eu-152	122.22	99.	-9.	-0.003	330.12	-2.513E-02
Eu-152	343.86	43.	-7.	-0.003	271.34	-2.773E-02
Eu-152	411.40	40.	-3.	-0.001	582.32	-1.631E-01
Cs-137	662.09	30.	-5.	-0.002	336.19	-9.282E-03
Eu-154	723.29	27.	-2.	-0.001	824.50	-1.586E-02
Bi-212	727.50	25.	5.	0.002	306.81	7.095E-02
Bi-212	785.96	29.	5.	0.002	297.78	4.857E-01
Pa-234	945.54	29.	3.	0.001	488.79	5.523E-02
Eu-152	964.38	35.	6.	0.002	276.04	9.210E-02
Co-60	1172.95	27.	5.	0.002	313.46	1.191E-02
Eu-154	1272.35	28.	-4.	-0.002	363.24	-3.137E-02
Co-60	1334.31	18.	-4.	-0.001	334.69	-1.012E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.4735E-01	1.4735E-01	1.2422E-01	1.2464E-01	9.100E-02
Am-241 #A	-7.1566E-02	-7.1566E-02	2.2429E-01	2.2438E-01	1.803E-01
Bi-212 #A	7.0949E-02	7.0949E-02	2.1768E-01	2.1774E-01	1.712E-01
Bi-214	3.9470E-01	3.9470E-01	9.2696E-02	9.6769E-02	3.482E-02
Co-60 #A	1.1909E-02	1.1909E-02	3.7330E-02	3.7339E-02	2.944E-02
Cs-137 #A	-9.2821E-03	-9.2821E-03	3.1205E-02	3.1212E-02	2.475E-02
Eu-152 #A	-2.7726E-02	-2.7726E-02	7.5232E-02	7.5257E-02	5.955E-02
Eu-154 #A	-3.1369E-02	-3.1369E-02	1.1395E-01	1.1397E-01	9.050E-02
K-40	1.8562E+01	1.8562E+01	1.4652E+00	1.9586E+00	3.024E-01
Pa-234 #A	3.0655E-03	3.0655E-03	2.1586E-01	2.1586E-01	1.775E-01
Pb-212	2.8460E-01	2.8460E-01	6.3764E-02	6.7318E-02	2.979E-02
Pb-214	3.4841E-01	3.4841E-01	8.9269E-02	9.2589E-02	3.700E-02
Ra-226	7.4780E-01	7.4780E-01	5.5796E-01	5.6083E-01	4.087E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:34:45
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_013.An1

Th-234	#	3.7175E-01	3.7175E-01	4.7607E-01	4.7724E-01	3.670E-01
Tl-208	#	1.6176E-01	1.6176E-01	3.8104E-02	3.9757E-02	1.344E-02
U-235	A	4.1869E-03	4.1869E-03	4.0792E-02	4.0793E-02	3.336E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (238.6 to 2041.3 keV) 2.065E+01 pCi/g
Total Decayed Activity (238.6 to 2041.3 keV) 2.0646423E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE12	Lab ID	: 251449-018	Client ID	: 04-PD-D0034-18
Seqnum	: 1614011949012	Matrix	: Soil	Acct	: ITSI (JG)
File	: 12_20140108_012	Batch	: 206637	Time	: 08-JAN-2014 18:50
Cal	: 08-JAN-2014 07:54:39,03-JAN-2014 19:51:11	Caldate	: 08-JAN-2014, 03-JAN-2014		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 343.7 g	Live Time	: 2700 sec
				Dead Time	: 0.2 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0564	0.278		.34235	.34239	-0.040	u
Bismuth-212	0.206	0.167		.23182	.23228	-0.0025	u
Bismuth-214	0.228	0.0505		.079459	.081064	-0.052	u
Cesium-137	-0.00668	0.0235	0.07	.029391	.029394	-0.0069	u
Cobalt-60	-0.00340	0.0323		.039675	.039676	0	u
Europium-152	-0.0323	0.0629		.079582	.079615	-0.00031	u
Europium-154	0	0.0638		.077431	.077432	-0.013	u
Lead-212	0.383	0.0288		.073083	.07863	-0.016	u
Lead-214	0.333	0.0408		.088084	.091153	-0.0040	u
Potassium-40	17.8	0.248		1.4317	1.8998	-0.36	u
Protactinium-234	0	0.153		.054639	.05464	0.015	u
Radium-226	0.448	0.382	1.3	.50387	.50502	-0.082	u
Thallium-208	0.0424	0.0258		.034487	.034615	0.0020	u
Thorium-232 (By Actinium-228)	0.547	0.0424		.13088	.13632	0.019	u
Thorium-234	0.0402	0.539		.65639	.6564	-0.034	u
Uranium-235	0.0510	0.0220		.031704	.031939	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-18
Sample Description: 251449-018, 206637

Detector: HPGE12 50-TP32731A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:23
Acquisition Time: 1/8/2014 18:50:46
Analysis Time: 1/8/2014 19:35
Analysis Quantity: 3.437E+02 g

Spectrum ID: 12_20140108_012
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2705 sec
Dead Time: 0.20 %

Efficiency: HPGE12 S23325 12_20140103002_EffCal
Efficiency Cal Date: 1/3/2014 19:51
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		5.467E-01	1.309E-01	1.363E-01	4.243E-02
Am-241	#AB	5.635E-02	3.423E-01	3.424E-01	2.780E-01
Bi-212	#	2.063E-01	2.318E-01	2.323E-01	1.674E-01
Bi-214	#	2.281E-01	7.946E-02	8.106E-02	5.052E-02
Co-60	#AB	-3.400E-03	3.967E-02	3.968E-02	3.232E-02
Cs-137	#AB	-6.679E-03	2.939E-02	2.939E-02	2.346E-02
Eu-152	#AB	-3.227E-02	7.958E-02	7.962E-02	6.289E-02
Eu-154	#AB	0.000E+00	7.743E-02	7.743E-02	6.379E-02
K-40		1.783E+01	1.432E+00	1.900E+00	2.475E-01
Pa-234	AB	0.000E+00	5.464E-02	5.464E-02	1.533E-01
Pb-212		3.825E-01	7.308E-02	7.863E-02	2.879E-02
Pb-214		3.326E-01	8.808E-02	9.115E-02	4.077E-02
Ra-226		4.485E-01	5.039E-01	5.050E-01	3.820E-01
Th-234	#AB	4.019E-02	6.564E-01	6.564E-01	5.385E-01
Tl-208	#	4.239E-02	3.449E-02	3.461E-02	2.580E-02
U-235		5.102E-02	3.170E-02	3.194E-02	2.196E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.017E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:35:57
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_012.An1

Sample description
     251449-018, 206637


Spectrum Filename: C:\User\SPC\Det12\12_20140108_012.An1

Acquisition information
       Start time:                 1/8/2014 18:50:46
       Live time:               2700
       Real time:               2705
       Dead time:                  0.20 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_Soil 250ml TunaCan_01-03-2014.Clb
     HPGE12 S23325 12_20140103002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:54:39
            Zero offset:           0.094 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.482E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 19:51:11
            Type:                  Polynomial
            Uncertainty:           1.037 %
            Coefficients:         -0.383371  -4.365972   0.460548
                                  -0.057677   0.002462  -0.000050

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2042.47keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4370E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4370E+02) =
                                   7.8636E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:35:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:23:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	12_2014-01-04_2135.PBC 1/4/2014 21:35:44
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 18 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1317

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.37	4.	303.76	0.84	5.500E-03	59.54	36.300	PBC<MDA	Am241
74.61	8.	190.23	0.85	1.432E-02	74.81	9.600	PBC<MDA	Pb212
77.03	36.	51.84	0.18	1.564E-02	77.11	17.500	3.799E-01	Pb212
87.66	15.	101.90	0.86	2.134E-02	87.20	6.300	PBC<MDA	Pb212
92.51	2.	816.57	0.87	2.405E-02	92.60	5.600	PBC<MDA	Th234
98.55	8.	141.41	0.87	2.667E-02	98.44	25.100	PBC<MDA	Pa234
122.73	2.	589.13	0.90	3.425E-02	123.10	40.460	PBC<MDA	Eu154
					123.10	40.460	4.219E-03	Eu154
143.45	13.	98.91	0.92	3.704E-02	143.76	10.500	PBC<MDA	U235
185.84	54.	20.79	0.63	3.737E-02	185.70	54.000	7.793E-02	U235
186.18	21.	56.18	0.95	3.735E-02	186.20	3.600	4.485E-01	Ra226
238.49	194.	9.55	1.35	3.425E-02	238.63	43.100	3.825E-01	Pb212
239.55	0.	221.17	1.01	3.401E-02	241.92	7.470	PBC<MDA	Pb214
270.57	8.	116.26	1.03	3.207E-02	270.25	3.460	PBC<MDA	Ac228
295.04	73.	17.69	0.17	3.045E-02	295.22	19.200	3.629E-01	Pb214
338.35	46.	18.73	0.44	2.791E-02	338.40	12.010	3.957E-01	Ac228
351.86	128.	11.90	0.93	2.720E-02	351.79	37.100	3.325E-01	Pb214
463.39	8.	96.01	1.20	2.250E-02	463.00	4.400	PBC<MDA	Ac228
582.99	24.	31.17	1.30	1.911E-02	583.14	86.000	4.239E-02	Tl208
609.33	116.	13.87	0.44	1.853E-02	609.69	46.090	3.548E-01	Bi214
720.87	4.	128.82	1.40	1.640E-02	723.30	19.700	PBC<MDA	Eu154
					723.30	19.700	3.159E-02	Eu154
727.47	14.	56.18	1.41	1.634E-02	727.17	11.800	2.063E-01	Bi212
769.04	10.	63.95	1.44	1.571E-02	768.36	4.890	3.972E-01	Bi214
784.93	8.	79.14	1.45	1.546E-02	785.42	2.000	PBC<MDA	Bi212
812.14	8.	43.26	0.15	1.510E-02				
860.78	8.	88.16	1.51	1.448E-02	860.47	12.000	PBC<MDA	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:35:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_012.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
911.23	76.	11.04	0.28	1.390E-02	911.07	29.000	5.467E-01	Ac228
933.82	6.	99.04	1.56	1.365E-02	934.05	3.170	PBC<MDA	Bi214
968.86	16.	45.86	1.58	1.329E-02	968.90	17.460	1.986E-01	Ac228
1120.36	14.	41.41	1.68	1.193E-02	1120.28	15.040	2.339E-01	Bi214
1460.97	649.	3.93	1.41	9.686E-03	1460.80	10.700	1.783E+01	K40
1509.12	2.	224.88	1.92	9.429E-03	1509.19	2.190	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
6496.98	812.14	2.	8.	5.498E+02	86.51	0.151	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	474.32	59.37	67.	4.	0.001	607.51	0.837s
Pb-212	596.25	74.61	125.	8.	0.003	380.46	0.851
Pb-212	616.32	77.11	94.	27.	0.010	109.57	0.854s
Pb-212	700.68	87.66	114.	15.	0.006	203.81	0.863
Th-234	739.50	92.51	114.	2.	0.001	1633.13	0.868s
Pa-234	787.83	98.55	63.	8.	0.003	282.82	0.874
Eu-152	973.27	121.72	72.	-6.	-0.002	399.88	0.896s
Eu-154	981.34	122.73	69.	2.	0.001	1178.27	0.897s
U-235	1147.12	143.45	77.	13.	0.005	197.82	0.916s
U-235	1302.81	162.91	76.	-1.	-0.001	1736.24	0.934s
U-235	1485.19	185.70	43.	35.	0.013	62.14	0.955D
Ra-226	1489.19	186.20	57.	21.	0.008	112.36	0.955D
Pb-212	1907.60	238.49	39.	194.	0.072	19.11	1.348s
Ac-228	2164.27	270.57	60.	8.	0.003	232.51	1.031s
Pb-214	2360.05	295.04	37.	73.	0.027	35.38	0.170s
Ac-228	2706.55	338.35	14.	46.	0.017	37.45	0.440s
Eu-152	2749.47	343.71	48.	-8.	-0.003	246.64	1.096s
Pb-214	2814.69	351.86	37.	115.	0.043	23.81	0.930
Eu-152	3294.26	411.80	45.	-4.	-0.001	543.89	1.153s
Ac-228	3706.99	463.39	31.	8.	0.003	192.02	1.197s
Tl-208	4663.81	582.99	39.	24.	0.009	62.33	1.295s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:35:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-214	4874.07	609.27	40.	67.	0.025	29.53	1.317s
Cs-137	5296.83	662.12	26.	-3.	-0.001	440.03	1.357s
Bi-214	5322.77	665.36	19.	-3.	-0.001	426.50	1.360s
Eu-154	5766.88	720.87	8.	4.	0.001	257.63	1.405s
Bi-212	5819.68	727.47	23.	14.	0.005	112.37	1.408s
Bi-214	6152.17	769.04	17.	10.	0.004	127.90	1.439s
Bi-212	6279.29	784.93	18.	8.	0.003	158.28	1.452s
Tl-208	6886.08	860.78	20.	8.	0.003	176.32	1.507s
Ac-228	7289.60	911.23	6.	76.	0.028	22.09	0.281s
Bi-214	7470.27	933.82	24.	6.	0.002	198.08	1.559s
Pa-234	7566.48	945.84	25.	-2.	-0.001	754.67	1.568
Ac-228	7739.11	967.43	40.	-5.	-0.002	548.22	1.581s
Ac-228	7750.59	968.86	23.	16.	0.006	91.73	1.583s
Bi-214	8962.35	1120.36	19.	14.	0.005	82.82	1.685s
Co-60	9387.85	1173.56	30.	-1.	0.000	1166.99	1.719s
Co-60	10658.79	1332.47	23.	-1.	0.000	1943.77	1.817s
K-40	11686.40	1460.97	14.	635.	0.235	7.85	1.406s
Bi-214	12071.42	1509.12	7.	2.	0.001	449.76	1.916s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	5.4668E-01					3.65E+11
			911.07	5.467E-01	(P	4.243E-02 1.10E+01 2.90E+01	G
			968.90	1.986E-01	- P	1.417E-01 4.59E+01 1.75E+01	GA
			338.40	3.957E-01	- P	7.694E-02 1.87E+01 1.20E+01	GA
			964.77	-2.150E-01	- P	6.482E-01 2.74E+02 4.99E+00	GA
			463.00	2.263E-01	- P	3.803E-01 9.60E+01 4.40E+00	GA
			794.95	1.707E-03	%	5.048E-01 1.80E+04 4.25E+00	GA
			270.25	2.039E-01	- P	4.734E-01 1.16E+02 3.46E+00	GA
Am-241	I	5.6353E-02					3.65E+11
			59.54	5.635E-02	&(	2.780E-01 3.04E+02 3.63E+01	G
Bi-212	N	2.0631E-01					3.65E+11
			727.17	2.063E-01	?(	1.674E-01 5.62E+01 1.18E+01	G
			1620.56	0.000E+00	-	2.780E-01 1.00E+03 2.75E+00	GA
			785.42	7.922E-01	?	9.297E-01 7.91E+01 2.00E+00	GA
Bi-214	N	2.2806E-01					3.65E+11
			609.69	2.281E-01	?(P	5.052E-02 1.48E+01 4.61E+01	G
			1764.51	-8.233E-02	% P	9.965E-02 1.00E+03 1.59E+01	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:35:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_012.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		1120.28	2.339E-01	? P	1.630E-01	4.14E+01	1.50E+01 GA
		768.36	3.972E-01	+	3.664E-01	6.39E+01	4.89E+00 GA
		1377.65	0.000E+00	-	1.661E-01	1.00E+03	4.02E+00 GA
		934.05	4.136E-01	+ P	7.638E-01	9.90E+01	3.17E+00 GA
		1407.98	0.000E+00	-	1.878E+00	1.00E+03	2.48E+00 GA
		1509.19	2.436E-01	?	8.493E-01	2.25E+02	2.19E+00 GA
		665.45	-3.229E-01	-	1.092E+00	2.13E+02	1.56E+00 GA
Co-60	T -3.3998E-03					3.65E+11	
		1173.24	-3.400E-03	?(	3.232E-02	5.83E+02	9.99E+01 G
		1332.50	-1.965E-03	+	3.122E-02	9.72E+02	1.00E+02 G
Cs-137	I -6.6792E-03					3.65E+11	
		661.66	-6.679E-03	?(	2.346E-02	2.20E+02	8.46E+01 G
Eu-152	I -3.2267E-02					3.65E+11	
		344.30	-3.227E-02	?(	6.289E-02	1.23E+02	2.70E+01 G
		121.87	-1.838E-02	+	5.932E-02	2.00E+02	2.86E+01 GA
		1408.08	0.000E+00	+	2.203E-01	1.00E+03	2.12E+01 GA
		964.05	1.278E-02	%	2.230E-01	1.07E+03	1.46E+01 GA
		778.90	0.000E+00	+	2.624E-01	1.00E+03	1.30E+01 GA
		411.09	-1.880E-01	+	8.262E-01	2.72E+02	2.26E+00 GA
K-40	N 1.7834E+01					3.65E+11	
		1460.80	1.783E+01	(P	2.475E-01	3.93E+00	1.07E+01 G
Pb-212	N 3.8251E-01					3.65E+11	
		238.63	3.825E-01	(	2.879E-02	9.55E+00	4.31E+01 G
		77.11	2.835E-01	-	2.394E-01	5.48E+01	1.75E+01 GA
		74.81	1.791E-01	-	5.521E-01	1.90E+02	9.60E+00 GA
		87.20	3.322E-01		5.399E-01	1.02E+02	6.30E+00 GA
		300.09	0.000E+00	-	5.553E-01	1.00E+03	3.27E+00 GA
Pb-214	N 3.3255E-01					3.65E+11	
		351.79	3.325E-01	(P	4.077E-02	1.19E+01	3.71E+01 G
		295.22	3.629E-01	P	7.076E-02	1.77E+01	1.92E+01 GA
		241.92	5.360E-03	% P	2.738E-01	2.21E+02	7.47E+00 GA
Ra-226	N 4.4845E-01					3.65E+11	
		186.20	4.485E-01	(	3.820E-01	5.62E+01	3.60E+00 G
Th-234	N 4.0192E-02					3.65E+11	
		92.60	4.019E-02	?(	5.385E-01	8.17E+02	5.60E+00 G
Tl-208	N 4.2393E-02					3.65E+11	
		583.14	4.239E-02	?(P	2.580E-02	3.12E+01	8.60E+01 G
		860.47	1.307E-01	?	1.735E-01	8.82E+01	1.20E+01 GA

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:35:57
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

U-235    N   5.1024E-02                                      3.65E+11
                           185.70 5.102E-02  (  2.196E-02 3.11E+01 5.40E+01 G
                           143.76 9.756E-02 ?   1.526E-01 9.89E+01 1.05E+01 GA
                           163.35-2.337E-02 -   3.327E-01 8.68E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
```

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.37	67.	4.	0.001	607.51	5.635E-02
Th-234	92.51	114.	2.	0.001	1633.13	4.019E-02
Pa-234	98.55	63.	8.	0.003	282.82	3.572E-02
Eu-152	121.72	72.	-6.	-0.002	399.88	-1.838E-02
Eu-154	122.73	69.	2.	0.001	1178.27	4.219E-03
Eu-152	343.71	48.	-8.	-0.003	246.64	-3.227E-02
Eu-152	411.80	45.	-4.	-0.001	543.89	-1.880E-01
Cs-137	662.12	26.	-3.	-0.001	440.03	-6.679E-03
Eu-154	720.87	8.	4.	0.001	257.63	3.159E-02
Bi-212	727.47	23.	14.	0.005	112.37	2.063E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:35:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-212	784.93	18.	8.	0.003	158.28	7.922E-01	
Pa-234	945.84	25.	-2.	-0.001	754.67	-3.445E-02	
Co-60	1173.56	30.	-1.	0.000	1166.99	-3.400E-03	
Co-60	1332.47	23.	-1.	0.000	1943.77	-1.965E-03	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	5.4668E-01	5.4668E-01	1.3088E-01	1.3632E-01	4.243E-02
Am-241 #A	5.6353E-02	5.6353E-02	3.4235E-01	3.4239E-01	2.780E-01
Bi-212 #	2.0631E-01	2.0631E-01	2.3182E-01	2.3228E-01	1.674E-01
Bi-214 #	2.2806E-01	2.2806E-01	7.9459E-02	8.1064E-02	5.052E-02
Co-60 #A	-3.3998E-03	-3.3998E-03	3.9675E-02	3.9676E-02	3.232E-02
Cs-137 #A	-6.6792E-03	-6.6792E-03	2.9391E-02	2.9394E-02	2.346E-02
Eu-152 #A	-3.2267E-02	-3.2267E-02	7.9582E-02	7.9615E-02	6.289E-02
Eu-154 #A	0.0000E+00	0.0000E+00	7.7431E-02	7.7432E-02	6.379E-02
K-40	1.7834E+01	1.7834E+01	1.4317E+00	1.8998E+00	2.475E-01
Pa-234 A	0.0000E+00	0.0000E+00	5.4639E-02	5.4640E-02	1.533E-01
Pb-212	3.8251E-01	3.8251E-01	7.3083E-02	7.8630E-02	2.879E-02
Pb-214	3.3255E-01	3.3255E-01	8.8084E-02	9.1153E-02	4.077E-02
Ra-226	4.4845E-01	4.4845E-01	5.0387E-01	5.0502E-01	3.820E-01
Th-234 #A	4.0192E-02	4.0192E-02	6.5639E-01	6.5640E-01	5.385E-01
Tl-208 #	4.2393E-02	4.2393E-02	3.4487E-02	3.4615E-02	2.580E-02
U-235	5.1024E-02	5.1024E-02	3.1704E-02	3.1939E-02	2.196E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (238.5 to 2042.5 keV) 1.987E+01 pCi/g
Total Decayed Activity (238.5 to 2042.5 keV) 1.9866055E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564011942013
File : 7_20140108_013
Cal : 08-JAN-2014 07:13:44,21-FEB-2013 11:46:56
IDF : 1.0
PDF : 1.0

Lab ID : 251449-019
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 21-FEB-2013

Sample Amount : 335.76 g

Client ID : 04-PD-D0034-19
Acct : ITSI (JG)
Time : 08-JAN-2014 19:37

Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0884	0.168		.21107	.21122	-0.040	u
Bismuth-212	0.117	0.174		.21914	.21929	-0.0025	u
Bismuth-214	0.227	0.0468		.072424	.073992	-0.052	u
Cesium-137	0.000805	0.0191	0.07	.023314	.023314	-0.0069	u
Cobalt-60	0.000493	0.0293		.035593	.035593	0	u
Europium-152	0.00122	0.0378		.046089	.046089	-0.00031	u
Europium-154	0	0.160		.017456	.017456	-0.013	u
Lead-212	0.352	0.0293		.064793	.069989	-0.016	u
Lead-214	0.373	0.0328		.077753	.0818	-0.0040	u
Potassium-40	16.6	0.287		1.3203	1.7589	-0.36	u
Protactinium-234	-0.0415	0.158		.19668	.1967	0.015	u
Radium-226	0.476	0.406	1.3	.52573	.52696	-0.082	u
Thallium-208	0.0661	0.0218		.032121	.032421	0.0020	u
Thorium-232 (By Actinium-228)	0.204	0.0776		.11491	.11574	0.019	u
Thorium-234	0.287	0.377		.47675	.47745	-0.034	u
Uranium-235	0.0407	0.0241		.032316	.032463	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-19
Sample Description: 251449-019, 206637

Detector: HPGE07 51-TP32743A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:25
Acquisition Time: 1/8/2014 19:37:07
Analysis Time: 1/8/2014 20:22
Analysis Quantity: 3.358E+02 g

Spectrum ID: 7_20140108_013
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE07 S21603 7_20130220002_EffCal
Efficiency Cal Date: 2/21/2013 11:46
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.045E-01	1.149E-01	1.157E-01	7.756E-02
Am-241	#AB	8.841E-02	2.111E-01	2.112E-01	1.681E-01
Bi-212	#AB	1.165E-01	2.191E-01	2.193E-01	1.737E-01
Bi-214	#	2.266E-01	7.242E-02	7.399E-02	4.681E-02
Co-60	#AB	4.931E-04	3.559E-02	3.559E-02	2.927E-02
Cs-137	#AB	8.046E-04	2.331E-02	2.331E-02	1.911E-02
Eu-152	#AB	1.224E-03	4.609E-02	4.609E-02	3.783E-02
Eu-154	#AB	0.000E+00	1.746E-02	1.746E-02	1.602E-01
K-40		1.660E+01	1.320E+00	1.759E+00	2.866E-01
Pa-234	#AB	-4.146E-02	1.967E-01	1.967E-01	1.581E-01
Pb-212		3.522E-01	6.479E-02	6.999E-02	2.932E-02
Pb-214		3.726E-01	7.775E-02	8.180E-02	3.276E-02
Ra-226		4.764E-01	5.257E-01	5.270E-01	4.062E-01
Th-234	#AB	2.874E-01	4.768E-01	4.774E-01	3.767E-01
Tl-208	#	6.612E-02	3.212E-02	3.242E-02	2.183E-02
U-235		4.073E-02	3.232E-02	3.246E-02	2.409E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.883E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:22:23
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_013.An1

Sample description
     251449-019, 206637


Spectrum Filename: C:\User\SPC\Det7\7_20140108_013.An1

Acquisition information
       Start time:                 1/8/2014 19:37:07
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3576E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3576E+02) =
                                   8.0495E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:22:23
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:25:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2013-12-28_0940.PBC 12/28/2013 09:40:25
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1543

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.97	11.	119.38	0.82	1.006E-02	59.54	36.300	PBC<MDA	Am241
74.67	52.	24.21	0.84	2.196E-02				
77.05	61.	24.35	0.84	2.372E-02	74.81	9.600	8.566E-01	Pb212
					77.11	17.500	4.133E-01	Pb212
87.02	21.	69.04	0.85	3.062E-02	87.20	6.300	PBC<MDA	Pb212
92.57	18.	82.96	0.86	3.375E-02	92.60	5.600	PBC<MDA	Th234
143.68	15.	91.54	0.91	4.783E-02	143.76	10.500	PBC<MDA	U235
185.69	35.	39.68	0.95	4.747E-02	185.70	54.000	4.072E-02	U235
186.07	91.	22.00	0.40	4.744E-02	186.20	3.600	1.596E+00	Ra226
238.62	228.	8.85	0.71	4.311E-02	238.63	43.100	3.522E-01	Pb212
241.78	30.	42.17	1.01	4.281E-02	241.92	7.470	2.759E-01	Pb214
270.33	18.	59.48	1.04	4.027E-02	270.25	3.460	3.820E-01	Ac228
					270.25	3.460	3.820E-01	Ac228
295.44	85.	15.48	1.01	3.814E-02	295.22	19.200	3.041E-01	Pb214
299.75	17.	57.65	1.07	3.777E-02	300.09	3.270	4.123E-01	Pb212
338.48	29.	33.76	1.11	3.490E-02	338.40	12.010	2.070E-01	Ac228
					338.40	12.010	2.070E-01	Ac228
351.90	175.	9.38	0.61	3.399E-02	351.79	37.100	3.726E-01	Pb214
369.73	44.	21.90	0.14	3.285E-02				
411.57	6.	135.65	1.18	3.050E-02	411.09	2.264	PBC<MDA	Eu152
					411.09	2.264	2.739E-01	Eu152
462.96	10.	72.39	1.23	2.803E-02	463.00	4.400	PBC<MDA	Ac228
					463.00	4.400	PBC<MDA	Ac228
510.84	118.	19.66	0.70	2.613E-02				
569.62	8.	51.01	0.26	2.418E-02				
583.43	99.	15.15	0.59	2.378E-02	583.14	86.000	1.346E-01	Tl208
609.14	133.	11.73	0.40	2.306E-02	609.69	46.090	3.268E-01	Bi214

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:22:23
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
665.14	5.	156.53	1.42	2.166E-02	665.45	1.560	PBC<MDA	Bi214
727.46	9.	67.82	1.48	2.034E-02	727.17	11.800	PBC<MDA	Bi212
					727.17	11.800	PBC<MDA	Bi212
767.68	21.	31.94	0.16	1.958E-02				
860.34	7.	109.98	1.59	1.807E-02	860.47	12.000	PBC<MDA	Tl208
911.28	35.	25.45	1.63	1.735E-02	911.07	29.000	2.045E-01	Ac228
					911.07	29.000	2.045E-01	Ac228
934.84	7.	104.43	1.65	1.705E-02	934.05	3.170	PBC<MDA	Bi214
964.69	9.	107.05	1.68	1.666E-02	964.77	4.990	PBC<MDA	Ac228
					964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	PBC<MDA	Ac228
969.16	58.	20.10	0.21	1.661E-02	968.90	17.460	5.536E-01	Ac228
1099.49	1.	240.83	0.12	1.517E-02				
1120.31	4.	98.55	1.80	1.497E-02	1120.28	15.040	PBC<MDA	Bi214
1377.55	6.	91.49	1.99	1.283E-02	1377.65	4.020	PBC<MDA	Bi214
1460.89	764.	3.62	1.40	1.226E-02	1460.80	10.700	1.699E+01	K40
1621.13	3.	129.11	2.15	1.129E-02	1620.56	2.750	PBC<MDA	Bi212
					1620.56	2.750	2.714E-01	Bi212
1764.24	8.	34.90	2.23	1.053E-02	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
2957.04	369.73	10.	44.	1.324E+03	43.80	0.145	-	s
4085.84	510.84	70.	118.	4.515E+03	39.31	0.695	TL-208	s
4556.13	569.62	4.	8.	3.349E+02	102.01	0.257	PA-234	s
6140.75	767.68	6.	21.	1.072E+03	63.89	0.158	-	l
7752.95	969.16	37.	32.	1.953E+03	63.34	0.209	AC-228	s
8796.00	1099.49	3.	1.	6.592E+01	481.66	0.119	-	sc

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:22:23
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_013.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	479.58	59.97	78.	11.	0.004	238.76	0.821s
Pb-212	616.49	77.09	72.	49.	0.018	57.27	0.838s
Pb-212	615.39	76.95	81.	72.	0.027	49.33	0.386s
Pb-212	695.87	87.02	104.	21.	0.008	138.08	0.851s
Th-234	740.29	92.57	105.	18.	0.007	165.91	0.857s
Pa-234	787.22	98.44	128.	-2.	-0.001	1311.09	0.863s
Eu-154	988.28	123.58	106.	-8.	-0.003	350.45	0.889s
U-235	1149.05	143.68	83.	15.	0.005	183.09	0.911
U-235	1306.00	163.31	73.	-5.	-0.002	471.65	0.931
U-235	1485.10	185.70	79.	35.	0.013	79.35	0.955D
Ra-226	1489.10	186.20	100.	27.	0.010	110.35	0.955D
Pb-212	1908.34	238.62	62.	220.	0.081	17.70	0.714s
Pb-214	1933.66	241.78	105.	30.	0.011	84.34	1.013s
Ac-228	2161.96	270.33	55.	18.	0.007	118.96	1.042s
Pb-214	2362.80	295.44	32.	75.	0.028	30.95	1.014
Pb-212	2397.27	299.75	52.	17.	0.006	115.31	1.072s
Ac-228	2707.09	338.48	43.	29.	0.011	67.51	1.110s
Pb-214	2814.41	351.90	35.	158.	0.058	18.75	0.611s
Eu-152	3291.77	411.57	34.	6.	0.002	271.31	1.182s
Ac-228	3702.86	462.96	32.	10.	0.004	144.78	1.232s
Tl-208	4666.13	583.37	41.	45.	0.017	42.39	1.345s
Bi-214	4872.95	609.22	51.	81.	0.030	26.46	1.369s
Bi-214	5320.34	665.14	24.	5.	0.002	313.07	1.420s
Bi-212	5818.93	727.46	36.	9.	0.003	135.65	1.475s
Eu-152	6223.93	778.08	25.	-1.	0.000	1212.44	1.520s
Bi-212	6280.49	785.15	28.	-2.	-0.001	715.80	1.526s
Tl-208	6882.15	860.34	23.	7.	0.002	219.96	1.590s
Pa-234	7062.13	882.83	37.	-4.	-0.001	474.42	1.609s
Ac-228	7289.77	911.28	32.	35.	0.013	50.90	1.632s
Bi-214	7478.31	934.84	24.	7.	0.003	208.87	1.651s
Pa-234	7569.20	946.20	31.	-2.	-0.001	962.58	1.661s
Eu-152	7704.83	963.14	46.	-1.	0.000	1828.07	1.676s
Ac-228	7717.20	964.69	53.	9.	0.003	214.10	1.676s
Ac-228	7752.54	969.11	46.	21.	0.008	82.81	1.680s
Bi-214	8962.68	1120.31	39.	4.	0.002	197.10	1.799s
Bi-214	11021.68	1377.55	13.	6.	0.002	182.97	1.987s
K-40	11689.18	1460.94	29.	731.	0.271	7.78	1.397s
Bi-212	12971.73	1621.13	5.	3.	0.001	258.23	2.147s
Bi-214	14117.57	1764.24	13.	8.	0.003	69.80	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:22:23
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_013.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Activity pCi/g	Code	MDA Value pCi/g			COMMENTS
Ac-228	N	2.0446E-01					3.65E+11		
			911.07	2.045E-01	?(P	7.756E-02	2.55E+01	2.90E+01	G
			968.90	2.205E-01	? P	1.617E-01	4.14E+01	1.75E+01	GA
			338.40	2.070E-01	P	1.091E-01	3.38E+01	1.20E+01	GA
			964.77	3.192E-01	? P	6.110E-01	1.07E+02	4.99E+00	GA
			463.00	2.365E-01	? P	3.174E-01	7.24E+01	4.40E+00	GA
			794.95	0.000E+00	-	5.390E-01	1.00E+03	4.25E+00	GA
			270.25	3.820E-01	? P	3.691E-01	5.95E+01	3.46E+00	GA
Am-241	I	8.8406E-02					3.65E+11		
			59.54	8.841E-02	?(	1.681E-01	1.19E+02	3.63E+01	G
Bi-212	N	1.1653E-01					3.65E+11		
			727.17	1.165E-01	&(P	1.737E-01	6.78E+01	1.18E+01	G
			1620.56	2.714E-01	?	5.124E-01	1.29E+02	2.75E+00	GA
			785.42	-1.655E-01	+	9.582E-01	3.58E+02	2.00E+00	GA
Bi-214	N	2.2664E-01					3.65E+11		
			609.69	2.266E-01	?(P	4.681E-02	1.32E+01	4.61E+01	G
			1764.51	1.511E-01	- P	1.512E-01	3.49E+01	1.59E+01	GA
			1120.28	5.835E-02	& P	1.925E-01	9.86E+01	1.50E+01	GA
			768.36	-4.927E-03	%	4.429E-01	5.46E+03	4.89E+00	GA
			1377.65	3.565E-01	&	4.826E-01	9.15E+01	4.02E+00	GA
			934.05	3.917E-01	+	6.289E-01	1.04E+02	3.17E+00	GA
			1407.98	0.000E+00	-	1.549E+00	1.00E+03	2.48E+00	GA
			1509.19	0.000E+00	-	1.944E+00	1.00E+03	2.19E+00	GA
			665.45	4.091E-01	& P	1.017E+00	1.57E+02	1.56E+00	GA
Co-60	T	4.9309E-04					3.65E+11		
			1173.24	4.931E-04	%(	2.927E-02	3.61E+03	9.99E+01	G
			1332.50	0.000E+00	-	5.279E-03	1.00E+03	1.00E+02	G
Cs-137	I	8.0464E-04					3.65E+11		
			661.66	8.046E-04	%(	1.911E-02	1.45E+03	8.46E+01	G
Eu-152	I	1.2236E-03					3.65E+11		
			344.30	1.224E-03	%(	3.783E-02	1.88E+03	2.70E+01	G
			121.87	0.000E+00	&	4.542E-02	1.00E+03	2.86E+01	GA
			1408.08	0.000E+00	-	1.812E-01	1.00E+03	2.12E+01	GA
			964.05	-1.294E-02	+	1.937E-01	9.14E+02	1.46E+01	GA
			778.90	-1.402E-02	+	1.384E-01	6.06E+02	1.30E+01	GA
			411.09	2.739E-01	?	5.854E-01	1.36E+02	2.26E+00	GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:22:23
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

K-40     N   1.6599E+01                                      3.65E+11
                          1460.80 1.660E+01  (P 2.866E-01 3.89E+00 1.07E+01 G

Pa-234   N  -4.1457E-02                                      3.65E+11
                           883.24-4.146E-02 ?(  1.581E-01 2.37E+02 1.50E+01 G
                            98.44-7.918E-03 &   8.511E-02 6.56E+02 2.51E+01 GA
                           946.00-2.443E-02 +   1.912E-01 4.81E+02 1.20E+01 GA

Pb-212   N   3.5217E-01                                      3.65E+11
                           238.63 3.522E-01  (P 2.932E-02 8.85E+00 4.31E+01 G
                            77.11 5.166E-01 + P 1.497E-01 2.47E+01 1.75E+01 GA
                            74.81 6.812E-01 +   2.781E-01 2.86E+01 9.60E+00 GA
                            87.20 3.239E-01 ? P 3.666E-01 6.90E+01 6.30E+00 GA
                           300.09 4.123E-01 ? P 4.074E-01 5.77E+01 3.27E+00 GA

Pb-214   N   3.7261E-01                                      3.65E+11
                           351.79 3.726E-01  (P 3.276E-02 9.38E+00 3.71E+01 G
                           295.22 3.041E-01   P 5.385E-02 1.55E+01 1.92E+01 GA
                           241.92 2.759E-01 - P 2.225E-01 4.22E+01 7.47E+00 GA

Ra-226   N   4.7643E-01                                      3.65E+11
                           186.20 4.764E-01  (  4.062E-01 5.52E+01 3.60E+00 G

Th-234   N   2.8735E-01                                      3.65E+11
                            92.60 2.874E-01 ?(  3.767E-01 8.30E+01 5.60E+00 G

Tl-208   N   6.6122E-02                                      3.65E+11
                           583.14 6.612E-02 ?(P 2.183E-02 2.12E+01 8.60E+01 G
                           860.47 9.112E-02 ?   1.545E-01 1.10E+02 1.20E+01 GA

U-235    N   4.0725E-02                                      3.65E+11
                           185.70 4.072E-02  (  2.409E-02 3.97E+01 5.40E+01 G
                           143.76 8.727E-02     1.262E-01 9.15E+01 1.05E+01 GA
                           163.35-6.862E-02 -   2.620E-01 2.36E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:22:23
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_013.An1

= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	59.97	78.	11.	0.004	238.76	8.841E-02	
Th-234	92.57	105.	18.	0.007	165.91	2.874E-01	
Pa-234	98.44	128.	-2.	-0.001	1311.09	-7.918E-03	
Eu-154	123.58	106.	-8.	-0.003	350.45	-1.390E-02	
Ac-228	270.33	55.	18.	0.007	118.96	3.820E-01	P
Ac-228	338.48	43.	29.	0.011	67.51	2.070E-01	P
Eu-152	411.57	34.	6.	0.002	271.31	2.739E-01	
Ac-228	462.96	32.	10.	0.004	144.78	2.365E-01	P
Bi-212	727.46	36.	9.	0.003	135.65	1.165E-01	P
Eu-152	778.08	25.	-1.	0.000	1212.44	-1.402E-02	
Bi-212	785.15	28.	-2.	-0.001	715.80	-1.655E-01	
Pa-234	882.83	37.	-4.	-0.001	474.42	-4.146E-02	
Ac-228	911.28	32.	35.	0.013	50.90	2.045E-01	P
Pa-234	946.20	31.	-2.	-0.001	962.58	-2.443E-02	
Eu-152	963.14	46.	-1.	0.000	1828.07	-1.294E-02	
Ac-228	964.69	53.	9.	0.003	214.10	3.192E-01	P
Ac-228	969.11	46.	21.	0.008	82.81	2.205E-01	P
Bi-212	1621.13	5.	3.	0.001	258.23	2.714E-01	

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:22:23
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_013.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.0446E-01	2.0446E-01	1.1491E-01	1.1574E-01	7.756E-02
Am-241 #A	8.8406E-02	8.8406E-02	2.1107E-01	2.1122E-01	1.681E-01
Bi-212 #A	1.1653E-01	1.1653E-01	2.1914E-01	2.1929E-01	1.737E-01
Bi-214 #	2.2664E-01	2.2664E-01	7.2424E-02	7.3992E-02	4.681E-02
Co-60 #A	4.9309E-04	4.9309E-04	3.5593E-02	3.5593E-02	2.927E-02
Cs-137 #A	8.0464E-04	8.0464E-04	2.3314E-02	2.3314E-02	1.911E-02
Eu-152 #A	1.2236E-03	1.2236E-03	4.6089E-02	4.6089E-02	3.783E-02
Eu-154 #A	0.0000E+00	0.0000E+00	1.7456E-02	1.7456E-02	1.602E-01
K-40	1.6599E+01	1.6599E+01	1.3203E+00	1.7589E+00	2.866E-01
Pa-234 #A	-4.1457E-02	-4.1457E-02	1.9668E-01	1.9670E-01	1.581E-01
Pb-212	3.5217E-01	3.5217E-01	6.4793E-02	6.9989E-02	2.932E-02
Pb-214	3.7261E-01	3.7261E-01	7.7753E-02	8.1800E-02	3.276E-02
Ra-226	4.7643E-01	4.7643E-01	5.2573E-01	5.2696E-01	4.062E-01
Th-234 #A	2.8735E-01	2.8735E-01	4.7675E-01	4.7745E-01	3.767E-01
Tl-208 #	6.6122E-02	6.6122E-02	3.2121E-02	3.2421E-02	2.183E-02
U-235	4.0725E-02	4.0725E-02	3.2316E-02	3.2463E-02	2.409E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (238.6 to 2041.3 keV) 1.813E+01 pCi/g
Total Decayed Activity (238.6 to 2041.3 keV) 1.8133533E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574011955015
File : 8_20140108_015
Cal : 08-JAN-2014 07:40:12,08-APR-2013 11:06:59
IDF : 1.0
PDF : 1.0

Lab ID : 251449-020
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 08-APR-2013
Sample Amount : 335.16 g

Client ID : 04-PD-D0034-20
Acct : ITSI (JG)
Time : 08-JAN-2014 19:38
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.13 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.00855	0.215		.2618	.2618	-0.040	u
Bismuth-212	0.188	0.131		.18728	.18771	-0.0025	u
Bismuth-214	0.317	0.0502		.083135	.085795	-0.052	u
Cesium-137	-0.00427	0.0230	0.07	.028427	.028429	-0.0069	u
Cobalt-60	-0.0193	0.0328		.041895	.041915	0	u
Europium-152	-0.00770	0.0494		.060848	.06085	-0.00031	u
Europium-154	-0.0277	0.0700		.089145	.089164	-0.013	u
Lead-212	0.433	0.0344		.074155	.080986	-0.016	u
Lead-214	0.376	0.0444		.095822	.099198	-0.0040	u
Potassium-40	15.6	0.214		1.2419	1.6551	-0.36	u
Protactinium-234	-0.0197	0.151		.1852	.1852	0.015	u
Radium-226	0.737	0.387	1.3	.52588	.52882	-0.082	u
Thallium-208	0.129	0.0130		.034307	.035362	0.0020	u
Thorium-232 (By Actinium-228)	0.245	0.0593		.10659	.10786	0.019	u
Thorium-234	0.00232	0.436		.52921	.52921	-0.034	u
Uranium-235	0.0270	0.0284		.036424	.036481	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-20
Sample Description: 251449-020, 206637

Detector: HPGE08 50-TP42229A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:27
Acquisition Time: 1/8/2014 19:38:16
Analysis Time: 1/8/2014 20:23
Analysis Quantity: 3.352E+02 g

Spectrum ID: 8_20140108_015
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2704 sec
Dead Time: 0.13 %

Efficiency: HPGE08 S22147 8_20130407002_EffCal
Efficiency Cal Date: 4/8/2013 11:06
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.446E-01	1.066E-01	1.079E-01	5.934E-02
Am-241	#AB	8.549E-03	2.618E-01	2.618E-01	2.151E-01
Bi-212		1.876E-01	1.873E-01	1.877E-01	1.306E-01
Bi-214	#	3.171E-01	8.314E-02	8.580E-02	5.016E-02
Co-60	#AB	-1.932E-02	4.189E-02	4.191E-02	3.280E-02
Cs-137	#AB	-4.267E-03	2.843E-02	2.843E-02	2.298E-02
Eu-152	#AB	-7.697E-03	6.085E-02	6.085E-02	4.940E-02
Eu-154	#AB	-2.768E-02	8.914E-02	8.916E-02	7.000E-02
K-40		1.563E+01	1.242E+00	1.655E+00	2.141E-01
Pa-234	#AB	-1.972E-02	1.852E-01	1.852E-01	1.505E-01
Pb-212		4.332E-01	7.416E-02	8.099E-02	3.438E-02
Pb-214		3.763E-01	9.582E-02	9.920E-02	4.443E-02
Ra-226		7.374E-01	5.259E-01	5.288E-01	3.868E-01
Th-234	#AB	2.321E-03	5.292E-01	5.292E-01	4.358E-01
Tl-208		1.288E-01	3.431E-02	3.536E-02	1.298E-02
U-235	AB	2.701E-02	3.642E-02	3.648E-02	2.842E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.809E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:23:26
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_015.An1

Sample description
     251449-020, 206637


Spectrum Filename: C:\User\SPC\Det8\8_20140108_015.An1

Acquisition information
       Start time:                 1/8/2014 19:38:16
       Live time:               2700
       Real time:               2704
       Dead time:                  0.13 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_04-07-2013.Clb
     HPGE08 S22147 8_20130407002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:40:12
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.420E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/8/2013 11:06:59
            Type:                  Polynomial
            Uncertainty:           1.344 %
            Coefficients:         -0.359632  -4.215465   0.446712
                                  -0.054338   0.002307  -0.000047

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3516E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3516E+02) =
                                   8.0639E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:23:26
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_015.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:27:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2013-12-28_0941.PBC 12/28/2013 09:41:06
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 21 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1637

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.72	65.	21.56	0.81	1.905E-02	74.81	9.600	1.065E+00	Pb212
77.34	54.	26.84	0.82	2.093E-02	77.11	17.500	4.063E-01	Pb212
87.25	73.	29.67	0.29	2.741E-02	87.20	6.300	1.262E+00	Pb212
123.14	14.	92.99	0.87	4.147E-02	123.10	40.460	PBC<MDA	Eu154
132.47	23.	47.42	0.28	4.301E-02				
185.71	21.	67.43	0.93	4.366E-02	185.70	54.000	PBC<MDA	U235
186.21	39.	35.66	0.93	4.363E-02	186.20	3.600	7.374E-01	Ra226
209.21	54.	28.73	0.43	4.203E-02				
238.70	260.	8.17	0.81	3.963E-02	238.63	43.100	4.332E-01	Pb212
270.07	46.	33.33	0.17	3.706E-02	270.25	3.460	1.072E+00	Ac228
295.30	113.	14.31	0.52	3.513E-02	295.22	19.200	4.518E-01	Pb214
323.23	19.	49.67	0.23	3.318E-02				
338.05	47.	24.35	1.08	3.221E-02	338.40	12.010	3.608E-01	Ac228
352.10	169.	11.23	0.99	3.137E-02	351.79	37.100	3.993E-01	Pb214
410.92	3.	312.25	1.15	2.825E-02	411.09	2.264	PBC<MDA	Eu152
462.99	6.	136.83	1.20	2.603E-02	463.00	4.400	PBC<MDA	Ac228
510.85	160.	10.20	0.44	2.432E-02				
583.23	86.	12.71	0.60	2.220E-02	583.14	86.000	1.288E-01	Tl208
609.25	105.	11.29	1.32	2.153E-02	609.69	46.090	3.171E-01	Bi214
609.35	157.	9.74	0.20	2.154E-02				
666.65	2.	362.70	1.37	2.027E-02	665.45	1.560	PBC<MDA	Bi214
727.33	14.	49.93	1.42	1.907E-02	727.17	11.800	1.875E-01	Bi212
767.75	1.	148.44	1.45	1.836E-02	768.36	4.890	PBC<MDA	Bi214
779.57	1.	717.43	1.46	1.819E-02	778.90	12.990	PBC<MDA	Eu152
785.25	8.	97.00	1.46	1.809E-02	785.42	2.000	PBC<MDA	Bi212
860.46	16.	52.69	1.52	1.698E-02	860.47	12.000	2.377E-01	Tl208
911.11	39.	21.79	1.55	1.632E-02	911.07	29.000	2.446E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:23:26
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_015.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
934.42	6.	137.59	1.57	1.604E-02	934.05	3.170	PBC<MDA	Bi214
968.89	31.	27.31	1.59	1.563E-02	968.90	17.460	3.386E-01	Ac228
1120.63	12.	55.66	1.68	1.410E-02	1120.28	15.040	PBC<MDA	Bi214
1332.60	3.	207.35	1.79	1.241E-02	1332.50	99.980	PBC<MDA	Co60
1409.00	3.	168.00	1.83	1.190E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	3.659E-02	Eu152
1409.32	1.	996.60	1.83	1.190E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	7.057E-03	Eu152
1460.95	662.	3.89	1.79	1.156E-02	1460.80	10.700	1.563E+01	K40

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1059.55	132.47	39.	23.	5.301E+02	94.83	0.279	-	s
1673.37	209.21	46.	54.	1.297E+03	57.46	0.432	AC-228	s
2585.36	323.23	22.	19.	5.846E+02	99.33	0.234	-	s
4086.04	510.85	16.	160.	6.599E+03	20.39	0.440	TL-208	s
4873.99	609.35	14.	157.	7.299E+03	19.48	0.196	BI-214	l

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	597.94	74.76	127.	36.	0.013	94.84	0.814s
Pb-212	616.48	77.08	117.	39.	0.014	74.48	0.817s
Pb-212	697.89	87.25	103.	73.	0.027	59.34	0.287s
Pa-234	783.39	97.94	91.	-11.	-0.004	260.51	0.840s
Eu-152	995.39	124.45	64.	-18.	-0.007	136.11	0.865s
Eu-154	984.91	123.14	77.	14.	0.005	185.98	0.866s
U-235	1151.26	143.94	82.	-5.	-0.002	553.72	0.888s
U-235	1294.76	161.88	73.	-2.	-0.001	1033.22	0.908
U-235	1485.29	185.70	93.	21.	0.008	134.85	0.931D
Ra-226	1489.29	186.20	76.	39.	0.014	71.31	0.932D
Pb-212	1909.21	238.70	71.	248.	0.092	16.34	0.806
Pb-214	1931.10	241.44	149.	-15.	-0.006	622.25	0.988s
Ac-228	2160.63	270.13	58.	15.	0.006	150.28	1.017s
Pb-214	2361.92	295.30	46.	102.	0.038	28.62	0.520s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:23:26
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_015.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	2703.88	338.05	41.	47.	0.017	48.71	1.083s
Eu-152	2749.47	343.75	37.	-2.	-0.001	790.55	1.089s
Pb-214	2816.00	352.07	55.	147.	0.054	23.35	0.987
Eu-152	3286.76	410.92	42.	3.	0.001	624.50	1.151s
Ac-228	3703.23	462.99	35.	6.	0.002	273.66	1.198s
Tl-208	4665.06	583.23	13.	82.	0.030	25.41	0.599s
Bi-214	4873.19	609.25	51.	105.	0.039	22.59	1.324s
Cs-137	5290.90	661.47	32.	-2.	-0.001	666.19	1.366s
Bi-214	5332.28	666.65	34.	2.	0.001	725.40	1.369s
Bi-212	5817.70	727.33	18.	14.	0.005	99.86	1.418s
Bi-214	6141.07	767.75	31.	1.	0.000	296.88	1.449s
Eu-152	6235.58	779.57	24.	1.	0.000	1434.87	1.457s
Bi-212	6281.06	785.25	25.	8.	0.003	194.00	1.462
Tl-208	6882.67	860.46	28.	16.	0.006	105.37	1.516s
Pa-234	7062.84	882.98	29.	-2.	-0.001	939.26	1.532s
Ac-228	7287.82	911.11	16.	39.	0.014	43.58	1.551s
Bi-214	7474.32	934.42	28.	6.	0.002	275.18	1.566s
Pa-234	7571.09	946.52	27.	-4.	-0.001	389.17	1.574s
Ac-228	7733.27	966.79	63.	-17.	-0.006	141.03	1.586s
Ac-228	7750.07	968.89	20.	31.	0.011	54.62	1.589s
Bi-214	8963.94	1120.63	34.	12.	0.005	111.32	1.682s
Co-60	9387.54	1173.58	41.	-9.	-0.003	216.83	1.712s
Eu-154	10164.43	1270.69	21.	-4.	-0.002	322.05	1.766s
Co-60	10659.71	1332.60	20.	3.	0.001	414.70	1.794s
Bi-214	11270.93	1409.00	12.	3.	0.001	336.01	1.829s
Eu-152	11273.45	1409.32	17.	1.	0.000	1993.21	1.829s
K-40	11686.55	1460.95	15.	648.	0.240	7.77	1.786

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.4457E-01				3.65E+11	
			911.07	2.446E-01	?(	5.934E-02 2.18E+01 2.90E+01	G
			968.90	3.386E-01	?	1.147E-01 2.73E+01 1.75E+01	GA
			338.40	3.608E-01	?	1.157E-01 2.44E+01 1.20E+01	GA
			964.77	-6.477E-01	-	7.065E-01 7.05E+01 4.99E+00	GA
			463.00	1.668E-01	-	3.599E-01 1.37E+02 4.40E+00	GA
			794.95	0.000E+00	-	7.162E-01 1.00E+03 4.25E+00	GA
			270.25	3.553E-01	?	4.136E-01 7.51E+01 3.46E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:23:26
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_015.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	8.5488E-03					3.65E+11	
			59.54	8.549E-03	%(	2.151E-01	1.53E+03	3.63E+01 G
Bi-212	N	1.8755E-01					3.65E+11	
			727.17	1.875E-01	?(	1.306E-01	4.99E+01	1.18E+01 G
			1620.56	0.000E+00	-	2.377E-01	1.00E+03	2.75E+00 GA
			785.42	6.496E-01		9.655E-01	9.70E+01	2.00E+00 GA
Bi-214	N	3.1708E-01					3.65E+11	
			609.69	3.171E-01	?(P	5.016E-02	1.13E+01	4.61E+01 G
			1764.51	-6.198E-02	% P	7.980E-02	1.00E+03	1.59E+01 GA
			1120.28	1.719E-01	& P	1.902E-01	5.57E+01	1.50E+01 GA
			768.36	3.253E-02	- P	4.305E-01	1.48E+02	4.89E+00 GA
			1377.65	-1.182E-01	& P	9.825E-01	1.00E+03	4.02E+00 GA
			934.05	3.347E-01	?	7.227E-01	1.38E+02	3.17E+00 GA
			1407.98	3.129E-01	?	8.150E-01	1.68E+02	2.48E+00 GA
			1509.19	0.000E+00	-	2.819E-01	1.00E+03	2.19E+00 GA
			665.45	2.183E-01	-	1.283E+00	3.63E+02	1.56E+00 GA
Co-60	T	-1.9322E-02					3.65E+11	
			1173.24	-1.932E-02	?(	3.280E-02	1.08E+02	9.99E+01 G
			1332.50	7.626E-03	+	2.508E-02	2.07E+02	1.00E+02 G
Cs-137	I	-4.2671E-03					3.65E+11	
			661.66	-4.267E-03	?(	2.298E-02	3.33E+02	8.46E+01 G
Eu-152	I	-7.6969E-03					3.65E+11	
			344.30	-7.697E-03	?(	4.940E-02	3.95E+02	2.70E+01 G
			121.87	-4.507E-02	+	4.737E-02	6.81E+01	2.86E+01 GA
			1408.08	7.057E-03	?	1.149E-01	9.97E+02	2.12E+01 GA
			964.05	-4.141E-03	&	1.517E-01	2.23E+03	1.46E+01 GA
			778.90	1.239E-02	&	1.450E-01	7.17E+02	1.30E+01 GA
			411.09	1.389E-01	&	7.022E-01	3.12E+02	2.26E+00 GA
Eu-154	I	-2.7680E-02					3.65E+11	
			1274.80	-2.768E-02	?(	7.000E-02	1.61E+02	3.55E+01 G
			123.10	2.481E-02	&	3.640E-02	9.30E+01	4.05E+01 GA
			723.30	0.000E+00	+	2.508E-01	1.00E+03	1.97E+01 GA
K-40	N	1.5627E+01					3.65E+11	
			1460.80	1.563E+01	(P	2.141E-01	3.89E+00	1.07E+01 G
Pa-234	N	-1.9718E-02					3.65E+11	
			883.24	-1.972E-02	?(	1.505E-01	4.70E+02	1.50E+01 G
			98.44	-3.788E-02	+	7.901E-02	1.30E+02	2.51E+01 GA
			946.00	-6.136E-02	+	1.900E-01	1.95E+02	1.20E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:23:26
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_015.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   4.3322E-01                                     3.65E+11
                           238.63 4.332E-01  (P 3.438E-02 8.17E+00 4.31E+01 G
                            77.11 3.193E-01 - P 2.070E-01 3.72E+01 1.75E+01 GA
                            74.81 5.839E-01 +   4.269E-01 4.74E+01 9.60E+00 GA
                            87.20 1.262E+00 + P 4.090E-01 2.97E+01 6.30E+00 GA
                           300.09 0.000E+00 -   5.775E-01 1.00E+03 3.27E+00 GA

Pb-214   N   3.7625E-01                                     3.65E+11
                           351.79 3.762E-01  (P 4.443E-02 1.17E+01 3.71E+01 G
                           295.22 4.518E-01   P 6.991E-02 1.43E+01 1.92E+01 GA
                           241.92-1.558E-01 - P 2.887E-01 3.11E+02 7.47E+00 GA

Ra-226   N   7.3742E-01                                     3.65E+11
                           186.20 7.374E-01  (  3.868E-01 3.57E+01 3.60E+00 G

Th-234   N   2.3209E-03                                     3.65E+11
                            92.60 2.321E-03 %(  4.358E-01 1.14E+04 5.60E+00 G

Tl-208   N   1.2879E-01                                     3.65E+11
                           583.14 1.288E-01  (P 1.298E-02 1.27E+01 8.60E+01 G
                           860.47 2.377E-01 +   1.819E-01 5.27E+01 1.20E+01 GA

U-235    N   2.7011E-02                                     3.65E+11
                           185.70 2.701E-02  (  2.842E-02 6.74E+01 5.40E+01 G
                           143.76-3.033E-02 -   1.364E-01 2.77E+02 1.05E+01 GA
                           163.35-3.368E-02 -   2.844E-01 5.17E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:23:26
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_015.An1

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Pa-234	97.94	91.	-11.	-0.004	260.51	-3.788E-02
Eu-152	124.45	64.	-18.	-0.007	136.11	-4.507E-02
Eu-154	123.14	77.	14.	0.005	185.98	2.481E-02
Eu-152	343.75	37.	-2.	-0.001	790.55	-7.697E-03
Eu-152	410.92	42.	3.	0.001	624.50	1.389E-01
Cs-137	661.47	32.	-2.	-0.001	666.19	-4.267E-03
Eu-152	779.57	24.	1.	0.000	1434.87	1.239E-02
Pa-234	882.98	29.	-2.	-0.001	939.26	-1.972E-02
Pa-234	946.52	27.	-4.	-0.001	389.17	-6.136E-02
Co-60	1173.58	41.	-9.	-0.003	216.83	-1.932E-02
Eu-154	1270.69	21.	-4.	-0.002	322.05	-2.768E-02
Co-60	1332.60	20.	3.	0.001	414.70	7.626E-03
Eu-152	1409.32	17.	1.	0.000	1993.21	7.057E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.4457E-01	2.4457E-01	1.0659E-01	1.0786E-01	5.934E-02
Am-241 #A	8.5488E-03	8.5488E-03	2.6180E-01	2.6180E-01	2.151E-01
Bi-212	1.8755E-01	1.8755E-01	1.8728E-01	1.8771E-01	1.306E-01
Bi-214 #	3.1708E-01	3.1708E-01	8.3135E-02	8.5795E-02	5.016E-02
Co-60 #A	-1.9322E-02	-1.9322E-02	4.1895E-02	4.1915E-02	3.280E-02
Cs-137 #A	-4.2671E-03	-4.2671E-03	2.8427E-02	2.8429E-02	2.298E-02
Eu-152 #A	-7.6969E-03	-7.6969E-03	6.0848E-02	6.0850E-02	4.940E-02
Eu-154 #A	-2.7680E-02	-2.7680E-02	8.9145E-02	8.9164E-02	7.000E-02
K-40	1.5627E+01	1.5627E+01	1.2419E+00	1.6551E+00	2.141E-01
Pa-234 #A	-1.9718E-02	-1.9718E-02	1.8520E-01	1.8520E-01	1.505E-01
Pb-212	4.3322E-01	4.3322E-01	7.4155E-02	8.0986E-02	3.438E-02
Pb-214	3.7625E-01	3.7625E-01	9.5822E-02	9.9198E-02	4.443E-02
Ra-226	7.3742E-01	7.3742E-01	5.2588E-01	5.2882E-01	3.868E-01
Th-234 #A	2.3209E-03	2.3209E-03	5.2921E-01	5.2921E-01	4.358E-01
Tl-208	1.2879E-01	1.2879E-01	3.4307E-02	3.5362E-02	1.298E-02
U-235 A	2.7011E-02	2.7011E-02	3.6424E-02	3.6481E-02	2.842E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:23:26
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_015.An1

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (209.2 to 2042.1 keV) 1.786E+01 pCi/g
Total Decayed Activity (209.2 to 2042.1 keV) 1.7864586E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE06
Seqnum : 1554011902014
File : 6_20140108_014
Cal : 08-JAN-2014 06:45:06,06-JAN-2014 16:42:07
IDF : 1.0
PDF : 1.0

Lab ID : 251449-021
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 06-JAN-2014
Sample Amount : 335.96 g

Client ID : 04-PD-D0034-21
Acct : ITSI (JG)
Time : 08-JAN-2014 19:44
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.08 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0	0.163		.051467	.051467	-0.040	u
Bismuth-212	0.116	0.166		.21638	.21653	-0.0025	u
Bismuth-214	0.294	0.0327		.072267	.075175	-0.052	u
Cesium-137	0.00599	0.0208	0.07	.025999	.026002	-0.0069	u
Cobalt-60	-0.00577	0.0313		.23075	.23075	0	u
Europium-152	0.0528	0.0474		.063536	.063646	-0.00031	u
Europium-154	-0.0355	0.0896		.11294	.11296	-0.013	u
Lead-212	0.353	0.0266		.062227	.067752	-0.016	u
Lead-214	0.309	0.0188		.065261	.068813	-0.0040	u
Potassium-40	21.1	0.330		1.5111	2.1148	-0.36	u
Protactinium-234	0.0449	0.133		.16785	.16788	0.015	u
Radium-226	0.299	0.361	1.3	.4623	.46285	-0.082	u
Thallium-208	0.110	0.0158		.039718	.040458	0.0020	u
Thorium-232 (By Actinium-228)	0.245	0.0750		.11993	.12114	0.019	u
Thorium-234	-0.00708	0.349		.42394	.42394	-0.034	u
Uranium-235	0.0205	0.0239		.030738	.030777	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-21
Sample Description: 251449-021, 206637

Detector: HPGE06 51-TP32744A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:26
Acquisition Time: 1/8/2014 19:44:42
Analysis Time: 1/8/2014 20:29
Analysis Quantity: 3.360E+02 g

Spectrum ID: 6_20140108_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.08 %

Efficiency: HPGE06 S23325 6_20140104002_EffCal
Efficiency Cal Date: 1/6/2014 16:42
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.452E-01	1.199E-01	1.211E-01	7.501E-02
Am-241	#AB	0.000E+00	5.147E-02	5.147E-02	1.630E-01
Bi-212	#AB	1.158E-01	2.164E-01	2.165E-01	1.664E-01
Bi-214		2.942E-01	7.227E-02	7.517E-02	3.267E-02
Co-60	#AB	-5.769E-03	2.307E-01	2.307E-01	3.131E-02
Cs-137	#AB	5.994E-03	2.600E-02	2.600E-02	2.076E-02
Eu-152	#	5.282E-02	6.354E-02	6.365E-02	4.743E-02
Eu-154	#AB	-3.553E-02	1.129E-01	1.130E-01	8.961E-02
K-40		2.113E+01	1.511E+00	2.115E+00	3.296E-01
Pa-234	#AB	4.492E-02	1.678E-01	1.679E-01	1.330E-01
Pb-212		3.533E-01	6.223E-02	6.775E-02	2.663E-02
Pb-214		3.094E-01	6.526E-02	6.881E-02	1.875E-02
Ra-226	#AB	2.989E-01	4.623E-01	4.629E-01	3.606E-01
Th-234	#AB	-7.077E-03	4.239E-01	4.239E-01	3.488E-01
Tl-208		1.099E-01	3.972E-02	4.046E-02	1.581E-02
U-235	#AB	2.045E-02	3.074E-02	3.078E-02	2.394E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.298E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:29:50
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_014.An1

Sample description
     251449-021, 206637


Spectrum Filename: C:\User\SPC\Det6\6_20140108_014.An1

Acquisition information
       Start time:                 1/8/2014 19:44:42
       Live time:               2700
       Real time:               2702
       Dead time:                  0.08 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_Soil 250ml TunaCan_01-04-2014.Clb
     HPGE06 S23325 6_20140104002_EffCal


       Energy Calibration
            Created:               1/8/2014 06:45:06
            Zero offset:           0.078 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.421E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 16:42:07
            Type:                  Polynomial
            Uncertainty:           1.262 %
            Coefficients:         -0.387239  -4.158640   0.426222
                                  -0.050686   0.002155  -0.000042

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2041.45keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3596E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3596E+02) =
                                   8.0447E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:29:50
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:26:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	6_2014-01-07_0843.PBC 1/7/2014 08:43:34
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1329

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.83	56.	23.42	0.81	2.403E-02	74.81	9.600	7.305E-01	Pb212
77.22	67.	20.49	0.82	2.573E-02	77.11	17.500	4.359E-01	Pb212
84.20	32.	49.19	0.27	3.026E-02				
87.39	22.	58.00	0.83	3.202E-02	87.20	6.300	3.288E-01	Pb212
93.01	33.	41.46	0.21	3.509E-02				
98.92	16.	91.99	0.84	3.754E-02	98.44	25.100	PBC<MDA	Pa234
108.50	34.	32.08	0.45	4.111E-02				
163.51	8.	141.46	0.91	4.613E-02	163.35	4.700	PBC<MDA	U235
185.88	16.	77.33	0.93	4.485E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	2.989E-01	Ra226
185.93	17.	75.14	0.93	4.488E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	3.070E-01	Ra226
238.48	213.	8.53	0.80	4.040E-02	238.63	43.100	3.533E-01	Pb212
241.75	26.	57.07	0.99	4.010E-02	241.92	7.470	2.548E-01	Pb214
270.19	10.	105.28	1.02	3.767E-02	270.25	3.460	PBC<MDA	Ac228
295.04	86.	18.44	0.85	3.572E-02	295.22	19.200	3.738E-01	Pb214
300.17	1.	723.03	1.05	3.534E-02	300.09	3.270	PBC<MDA	Pb212
338.39	34.	32.05	1.08	3.270E-02	338.40	12.010	2.561E-01	Ac228
343.91	15.	60.15	1.09	3.233E-02	344.30	27.000	5.282E-02	Eu152
351.98	123.	10.54	0.52	3.186E-02	351.79	37.100	3.094E-01	Pb214
383.05	18.	51.21	0.34	3.010E-02				
463.06	12.	74.44	1.21	2.644E-02	463.00	4.400	PBC<MDA	Ac228
583.11	72.	18.08	0.18	2.255E-02	583.14	86.000	1.099E-01	Tl208
609.37	100.	10.67	0.18	2.187E-02	609.69	46.090	2.942E-01	Bi214
661.64	4.	216.86	1.39	2.067E-02	661.66	84.620	PBC<MDA	Cs137
665.32	3.	149.61	1.39	2.059E-02	665.45	1.560	PBC<MDA	Bi214
727.24	9.	93.44	1.45	1.936E-02	727.17	11.800	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:29:50
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
768.67	10.	90.31	1.49	1.864E-02	768.36	4.890	PBC<MDA	Bi214
785.73	1.	769.07	1.50	1.835E-02	785.42	2.000	PBC<MDA	Bi212
859.11	8.	95.72	1.56	1.722E-02	860.47	12.000	PBC<MDA	Tl208
883.76	4.	186.81	1.58	1.691E-02	883.24	15.000	PBC<MDA	Pa234
910.94	39.	24.46	1.61	1.654E-02	911.07	29.000	2.452E-01	Ac228
961.57	1.	621.33	1.65	1.589E-02	964.05	14.580	PBC<MDA	Eu152
964.80	1.	871.91	1.65	1.588E-02	964.77	4.990	PBC<MDA	Ac228
969.28	24.	39.49	1.65	1.583E-02	968.90	17.460	2.617E-01	Ac228
1120.73	11.	73.32	1.77	1.425E-02	1120.28	15.040	PBC<MDA	Bi214
1377.64	4.	193.88	1.96	1.217E-02	1377.65	4.020	PBC<MDA	Bi214
1460.90	904.	3.49	1.36	1.161E-02	1460.80	10.700	2.113E+01	K40

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
672.65	84.20	67.	32.	1.067E+03	98.37	0.273	TH-231	sM
743.12	93.01	56.	33.	9.462E+02	82.91	0.211	TH-234	l
866.99	108.50	34.	34.	8.368E+02	64.15	0.451	U-235	s
3062.59	383.05	19.	18.	5.914E+02	102.41	0.342	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	598.18	74.89	63.	52.	0.019	58.13	0.869
Pb-212	617.26	77.27	57.	62.	0.023	48.25	0.366s
Pb-212	698.14	87.39	85.	22.	0.008	116.00	0.826s
Pa-234	790.39	98.92	98.	16.	0.006	183.99	0.838s
Eu-152	974.59	121.96	115.	-9.	-0.003	356.54	0.863s
U-235	1306.82	163.51	65.	8.	0.003	282.91	0.906s
U-235	1486.11	185.93	70.	17.	0.006	150.29	0.930s
Ra-226	1485.78	185.88	70.	16.	0.006	154.66	0.930s
Pb-212	1906.41	238.48	45.	206.	0.076	17.05	0.798
Pb-214	1932.52	241.75	94.	26.	0.009	114.14	0.987s
Ac-228	2159.98	270.19	56.	10.	0.004	210.56	1.016s
Pb-214	2358.76	295.04	36.	86.	0.032	36.89	0.853s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:29:50
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	2705.46	338.39	42.	34.	0.013	64.11	1.085s
Eu-152	2749.58	343.91	36.	15.	0.006	120.30	1.091s
Pb-214	2814.16	351.98	10.	123.	0.045	21.09	0.519s
Ac-228	3702.55	463.06	33.	12.	0.004	148.88	1.206s
Tl-208	4662.90	583.11	20.	72.	0.026	36.15	0.184s
Bi-214	4873.00	609.37	22.	100.	0.037	21.33	0.177s
Cs-137	5291.15	661.64	27.	4.	0.001	433.73	1.391s
Bi-214	5320.58	665.32	28.	3.	0.001	299.23	1.395
Bi-212	5815.91	727.24	30.	9.	0.003	186.88	1.450s
Bi-214	6147.38	768.67	38.	10.	0.004	180.63	1.486s
Eu-152	6230.52	779.06	35.	-2.	-0.001	739.93	1.495s
Bi-212	6283.87	785.73	27.	1.	0.000	1538.14	1.501s
Tl-208	6871.01	859.11	27.	8.	0.003	191.44	1.565
Pa-234	7068.28	883.76	24.	4.	0.001	373.62	1.584s
Ac-228	7285.72	910.94	27.	39.	0.015	48.91	1.607s
Bi-214	7467.25	933.62	35.	-2.	-0.001	761.38	1.626s
Eu-152	7690.86	961.57	34.	1.	0.000	1242.65	1.651s
Ac-228	7716.76	964.80	53.	1.	0.000	1743.83	1.651s
Ac-228	7752.54	969.28	34.	24.	0.009	78.99	1.655s
Bi-214	8964.56	1120.73	32.	11.	0.004	146.63	1.775s
Eu-154	10197.87	1274.82	35.	-5.	-0.002	317.84	1.890s
Co-60	10653.79	1331.78	27.	-7.	-0.002	303.84	1.932s
Bi-214	11020.87	1377.64	22.	4.	0.001	387.76	1.964s
K-40	11687.41	1460.90	35.	881.	0.326	6.97	1.362s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	2.4520E-01				3.65E+11	
			911.07	2.452E-01	?(	7.501E-02 2.45E+01 2.90E+01	G
			968.90	2.617E-01	?	1.461E-01 3.95E+01 1.75E+01	GA
			338.40	2.561E-01	?	1.141E-01 3.21E+01 1.20E+01	GA
			964.77	4.466E-02	-	6.380E-01 8.72E+02 4.99E+00	GA
			463.00	3.018E-01	?	3.406E-01 7.44E+01 4.40E+00	GA
			794.95	-2.088E-02	%	4.450E-01 1.30E+03 4.25E+00	GA
			270.25	2.398E-01	?	3.976E-01 1.05E+02 3.46E+00	GA
Bi-212	N	1.1578E-01				3.65E+11	
			727.17	1.158E-01	?(	1.664E-01 9.34E+01 1.18E+01	G
			1620.56	0.000E+00	-	1.837E+00 1.00E+03 2.75E+00	GA
			785.42	7.766E-02	?	9.753E-01 7.69E+02 2.00E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:29:50
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_014.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	2.9420E-01					3.65E+11	
			609.69	2.942E-01	(P	3.267E-02	1.07E+01	4.61E+01 G
			1764.51	-1.384E-01	% P	3.879E-01	1.00E+03	1.59E+01 GA
			1120.28	1.567E-01	& P	1.838E-01	7.33E+01	1.50E+01 GA
			768.36	3.367E-01	?	4.703E-01	9.03E+01	4.89E+00 GA
			1377.65	2.189E-01	-	6.729E-01	1.94E+02	4.02E+00 GA
			934.05	-1.289E-01	-	7.961E-01	3.81E+02	3.17E+00 GA
			1407.98	0.000E+00	-	1.608E+00	1.00E+03	2.48E+00 GA
			1509.19	-2.432E-02	% P	2.068E+00	1.00E+03	2.19E+00 GA
			665.45	2.453E-01	P	1.148E+00	1.50E+02	1.56E+00 GA
Co-60	T	-5.7687E-03					3.65E+11	
			1173.24	-5.769E-03	%(P	3.131E-02	1.00E+03	9.99E+01 G
			1332.50	-1.591E-02	+ P	2.880E-02	1.52E+02	1.00E+02 G
Cs-137	I	5.9942E-03					3.65E+11	
			661.66	5.994E-03	?(	2.076E-02	2.17E+02	8.46E+01 G
Eu-152	I	5.2815E-02					3.65E+11	
			344.30	5.282E-02	(	4.743E-02	6.01E+01	2.70E+01 G
			121.87	-2.043E-02	-	5.891E-02	1.78E+02	2.86E+01 GA
			1408.08	0.000E+00	-	2.736E-02	1.00E+03	2.12E+01 GA
			964.05	1.728E-02	-	1.752E-01	6.21E+02	1.46E+01 GA
			778.90	-2.872E-02	-	1.722E-01	3.70E+02	1.30E+01 GA
			411.09	0.000E+00	-	7.171E-01	1.00E+03	2.26E+00 GA
Eu-154	I	-3.5533E-02					3.65E+11	
			1274.80	-3.553E-02	?(	8.961E-02	1.59E+02	3.55E+01 G
			123.10	1.315E-03	%	3.564E-02	1.65E+03	4.05E+01 GA
			723.30	0.000E+00	+	1.765E-01	1.00E+03	1.97E+01 GA
K-40	N	2.1129E+01					3.65E+11	
			1460.80	2.113E+01	(P	3.296E-01	3.49E+00	1.07E+01 G
Pa-234	N	4.4924E-02					3.65E+11	
			883.24	4.492E-02	&(	1.330E-01	1.87E+02	1.50E+01 G
			98.44	4.996E-02	*	7.283E-02	9.20E+01	2.51E+01 GA
			946.00	0.000E+00	-	3.592E-02	1.00E+03	1.20E+01 GA
Pb-212	N	3.5333E-01					3.65E+11	
			238.63	3.533E-01	(P	2.663E-02	8.53E+00	4.31E+01 G
			77.11	4.108E-01	P	1.171E-01	2.41E+01	1.75E+01 GA
			74.81	6.731E-01	+	2.394E-01	2.91E+01	9.60E+00 GA
			87.20	3.288E-01	? P	3.178E-01	5.80E+01	6.30E+00 GA
			300.09	2.113E-02	% P	4.357E-01	7.23E+02	3.27E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:29:50
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   3.0944E-01                                     3.65E+11
                           351.79 3.094E-01  (  1.875E-02 1.05E+01 3.71E+01 G
                           295.22 3.738E-01     6.076E-02 1.84E+01 1.92E+01 GA
                           241.92 2.548E-01 &   2.248E-01 5.71E+01 7.47E+00 GA

Ra-226   N   2.9892E-01                                     3.65E+11
                           186.20 2.989E-01 ?(  3.606E-01 7.73E+01 3.60E+00 G

Th-234   N  -7.0766E-03                                     3.65E+11
                            92.60-7.077E-03 %(  3.488E-01 3.00E+03 5.60E+00 G

Tl-208   N   1.0986E-01                                     3.65E+11
                           583.14 1.099E-01  (  1.581E-02 1.81E+01 8.60E+01 G
                           860.47 1.195E-01     1.756E-01 9.57E+01 1.20E+01 GA

U-235    N   2.0453E-02                                     3.65E+11
                           185.70 2.045E-02 ?(  2.394E-02 7.51E+01 5.40E+01 G
                           143.76 1.570E-04 %   8.965E-02 3.47E+04 1.05E+01 GA
                           163.35 1.142E-01 ?   2.580E-01 1.41E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:29:50
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_014.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Pa-234	98.92	98.	16.	0.006	183.99	4.996E-02	
Eu-152	121.96	115.	-9.	-0.003	356.54	-2.043E-02	
U-235	163.51	65.	8.	0.003	282.91	1.142E-01	
U-235	185.93	70.	17.	0.006	150.29	2.045E-02	
Ra-226	185.88	70.	16.	0.006	154.66	2.989E-01	
Eu-152	343.91	36.	15.	0.006	120.30	5.282E-02	
Cs-137	661.64	27.	4.	0.001	433.73	5.994E-03	
Bi-212	727.24	30.	9.	0.003	186.88	1.158E-01	
Eu-152	779.06	35.	-2.	-0.001	739.93	-2.872E-02	
Bi-212	785.73	27.	1.	0.000	1538.14	7.766E-02	
Pa-234	883.76	24.	4.	0.001	373.62	4.492E-02	
Eu-152	961.57	34.	1.	0.000	1242.65	1.728E-02	
Eu-154	1274.82	35.	-5.	-0.002	317.84	-3.553E-02	
Co-60	1331.78	27.	-7.	-0.002	303.84	-1.591E-02	P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.4520E-01	2.4520E-01	1.1993E-01	1.2114E-01	7.501E-02
Am-241 #A	0.0000E+00	0.0000E+00	5.1467E-02	5.1467E-02	1.630E-01
Bi-212 #A	1.1578E-01	1.1578E-01	2.1638E-01	2.1653E-01	1.664E-01
Bi-214	2.9420E-01	2.9420E-01	7.2267E-02	7.5175E-02	3.267E-02
Co-60 #A	-5.7687E-03	-5.7687E-03	2.3075E-01	2.3075E-01	3.131E-02
Cs-137 #A	5.9942E-03	5.9942E-03	2.5999E-02	2.6002E-02	2.076E-02
Eu-152 #	5.2815E-02	5.2815E-02	6.3536E-02	6.3646E-02	4.743E-02
Eu-154 #A	-3.5533E-02	-3.5533E-02	1.1294E-01	1.1296E-01	8.961E-02
K-40	2.1129E+01	2.1129E+01	1.5111E+00	2.1148E+00	3.296E-01
Pa-234 #A	4.4924E-02	4.4924E-02	1.6785E-01	1.6788E-01	1.330E-01
Pb-212	3.5333E-01	3.5333E-01	6.2227E-02	6.7752E-02	2.663E-02
Pb-214	3.0944E-01	3.0944E-01	6.5261E-02	6.8813E-02	1.875E-02
Ra-226 #A	2.9892E-01	2.9892E-01	4.6230E-01	4.6285E-01	3.606E-01
Th-234 #A	-7.0766E-03	-7.0766E-03	4.2394E-01	4.2394E-01	3.488E-01
Tl-208	1.0986E-01	1.0986E-01	3.9718E-02	4.0458E-02	1.581E-02
U-235 #A	2.0453E-02	2.0453E-02	3.0738E-02	3.0777E-02	2.394E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:29:50
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_014.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2041.5 keV)     2.244E+01  pCi/g
 Total Decayed Activity (   25.1 to  2041.5 keV) 2.2441431E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE09	Lab ID	: 251449-022	Client ID	: 04-PD-D0034-22
Seqnum	: 1584011944013	Matrix	: Soil	Acct	: ITSI (JG)
File	: 9_20140108_013	Batch	: 206637	Time	: 08-JAN-2014 19:39
Cal	: 08-JAN-2014 07:26:14,30-DEC-2013 12:17:54	Caldate	: 08-JAN-2014, 30-DEC-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 339.12 g	Live Time	: 2700 sec
				Dead Time	: 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.115	0.215		.2708	.27099	-0.040	u
Bismuth-212	0.107	0.186		.238	.23812	-0.0025	u
Bismuth-214	0.233	0.0350		.074456	.076242	-0.052	u
Cesium-137	0.0000459	0.0211	0.07	.025633	.025633	-0.0069	u
Cobalt-60	0.0157	0.0309		.039309	.039323	0	u
Europium-152	0	0.0624		.065462	.065462	-0.00031	u
Europium-154	-0.0360	0.0849		.10747	.1075	-0.013	u
Lead-212	0.320	0.0347		.072467	.076428	-0.016	u
Lead-214	0.225	0.0434		.069241	.071034	-0.0040	u
Potassium-40	21.2	0.262		1.4838	2.0991	-0.36	u
Protactinium-234	-0.0244	0.158		.19503	.19504	0.015	u
Radium-226	0.436	0.328	1.3	.43799	.43923	-0.082	u
Thallium-208	0.121	0.0109		.033119	.034182	0.0020	u
Thorium-232 (By Actinium-228)	0.201	0.0913		.13142	.13216	0.019	u
Thorium-234	0.433	0.386		.4999	.5014	-0.034	u
Uranium-235	0.0238	0.0227		.029627	.029682	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-22
Sample Description: 251449-022, 206637

Detector: HPGE09 50-TP42232A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:29
Acquisition Time: 1/8/2014 19:39:44
Analysis Time: 1/8/2014 20:24
Analysis Quantity: 3.391E+02 g

Spectrum ID: 9_20140108_013
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE09 S23325 9_20131229002_EffCal
Efficiency Cal Date: 12/30/2013 12:17
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		2.012E-01	1.314E-01	1.322E-01	9.125E-02
Am-241	#AB	1.155E-01	2.708E-01	2.710E-01	2.150E-01
Bi-212	#AB	1.066E-01	2.380E-01	2.381E-01	1.862E-01
Bi-214		2.331E-01	7.446E-02	7.624E-02	3.498E-02
Co-60	#AB	1.572E-02	3.931E-02	3.932E-02	3.092E-02
Cs-137	#AB	4.586E-05	2.563E-02	2.563E-02	2.111E-02
Eu-152	#AB	0.000E+00	6.546E-02	6.546E-02	6.244E-02
Eu-154	#AB	-3.600E-02	1.075E-01	1.075E-01	8.485E-02
K-40		2.121E+01	1.484E+00	2.099E+00	2.617E-01
Pa-234	#AB	-2.443E-02	1.950E-01	1.950E-01	1.582E-01
Pb-212		3.202E-01	7.247E-02	7.643E-02	3.474E-02
Pb-214	#	2.249E-01	6.924E-02	7.103E-02	4.337E-02
Ra-226		4.359E-01	4.380E-01	4.392E-01	3.284E-01
Th-234	#	4.326E-01	4.999E-01	5.014E-01	3.857E-01
Tl-208		1.206E-01	3.312E-02	3.418E-02	1.089E-02
U-235		2.382E-02	2.963E-02	2.968E-02	2.268E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.344E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:24:53
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_013.An1

Sample description
     251449-022, 206637


Spectrum Filename: C:\User\SPC\Det9\9_20140108_013.An1

Acquisition information
       Start time:                 1/8/2014 19:39:44
       Live time:               2700
       Real time:               2702
       Dead time:                  0.06 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:26:14
            Zero offset:           0.095 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.675E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.11keV )
       Stop channel:           16336 (  2041.83keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3912E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3912E+02) =
                                   7.9698E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:24:53
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:29:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	9_2013-12-31_0939.PBC 12/31/2013 09:39:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 14 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1562

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
51.82	28.	33.57	0.24	2.818E-03				
59.09	10.	117.28	0.82	7.177E-03	59.54	36.300	PBC<MDA	Am241
75.17	33.	37.32	0.84	1.849E-02	74.81	9.600	5.570E-01	Pb212
77.07	55.	24.49	0.84	1.986E-02	77.11	17.500	4.397E-01	Pb212
87.58	10.	138.38	0.85	2.658E-02	87.20	6.300	PBC<MDA	Pb212
92.81	24.	57.78	0.85	2.972E-02	92.60	5.600	4.326E-01	Th234
119.48	3.	285.50	0.88	4.070E-02	121.87	28.590	PBC<MDA	Eu152
122.36	11.	98.89	0.88	4.097E-02	123.10	40.460	PBC<MDA	Eu154
177.59	30.	40.59	0.17	4.389E-02				
185.73	19.	62.18	0.94	4.351E-02	185.70	54.000	2.382E-02	U235
186.23	23.	50.24	0.94	4.348E-02	186.20	3.600	4.359E-01	Ra226
238.47	196.	10.73	0.89	3.968E-02	238.63	43.100	3.202E-01	Pb212
241.87	27.	49.12	1.00	3.940E-02	241.92	7.470	2.755E-01	Pb214
270.23	57.	24.14	0.29	3.715E-02	270.25	3.460	1.318E+00	Ac228
295.15	76.	19.83	0.57	3.529E-02	295.22	19.200	2.899E-01	Pb214
300.01	16.	60.33	1.05	3.494E-02	300.09	3.270	4.152E-01	Pb212
338.19	75.	16.81	1.06	3.241E-02	338.40	12.010	5.690E-01	Ac228
351.81	128.	13.19	0.78	3.159E-02	351.79	37.100	2.975E-01	Pb214
411.85	1.	660.02	1.15	2.848E-02	411.09	2.264	PBC<MDA	Eu152
579.78	16.	31.22	1.30	2.249E-02				
583.41	78.	12.79	1.31	2.240E-02	583.14	86.000	1.188E-01	Tl208
609.36	79.	14.27	0.34	2.172E-02	609.69	46.090	2.331E-01	Bi214
665.57	5.	156.67	1.38	2.044E-02	665.45	1.560	PBC<MDA	Bi214
705.76	10.	37.50	0.14	1.962E-02				
726.94	8.	111.62	1.43	1.922E-02	727.17	11.800	PBC<MDA	Bi212
768.38	7.	126.70	1.47	1.849E-02	768.36	4.890	PBC<MDA	Bi214
786.27	7.	110.49	1.48	1.820E-02	785.42	2.000	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:24:53
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
794.55	5.	132.24	1.49	1.805E-02	794.95	4.250	PBC<MDA	Ac228
911.48	32.	32.66	1.59	1.638E-02	911.07	29.000	2.012E-01	Ac228
934.30	4.	176.88	1.61	1.609E-02	934.05	3.170	PBC<MDA	Bi214
946.10	5.	139.96	1.62	1.594E-02	946.00	12.000	PBC<MDA	Pa234
963.92	5.	181.00	1.63	1.572E-02	964.05	14.580	PBC<MDA	Eu152
969.13	22.	38.33	1.63	1.572E-02	964.77	4.990	8.465E-01	Ac228
					968.90	17.460	2.427E-01	Ac228
969.22	29.	34.45	1.64	1.567E-02	964.77	4.990	1.090E+00	Ac228
					968.90	17.460	3.124E-01	Ac228
1120.44	14.	48.91	1.76	1.407E-02	1120.28	15.040	PBC<MDA	Bi214
1173.46	7.	125.03	1.80	1.358E-02	1173.24	99.860	PBC<MDA	Co60
1378.61	2.	217.87	1.96	1.197E-02	1377.65	4.020	PBC<MDA	Bi214
1408.18	2.	321.23	1.98	1.176E-02				
1460.92	892.	3.44	1.55	1.140E-02	1460.80	10.700	2.120E+01	K40
1764.28	6.	53.83	2.23	9.660E-03	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
413.52	51.82	22.	28.	9.794E+03	67.14	0.241	- s
601.05	75.22	53.	31.	1.686E+03	75.05	0.836	- D
1419.22	177.59	34.	30.	6.721E+02	81.17	0.171	- s
4635.68	579.79	4.	9.	4.179E+02	88.55	0.155	- sM
5643.33	705.76	1.	10.	4.893E+02	75.00	0.141	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	471.69	59.09	66.	10.	0.004	234.55	0.821s
Pb-212	597.37	74.81	81.	3.	0.001	911.38	0.835D
Pb-212	615.47	77.07	108.	28.	0.010	99.21	0.838s
Pb-212	699.51	87.58	86.	10.	0.004	276.76	0.847
Th-234	741.27	92.81	87.	24.	0.009	115.57	0.853s
Eu-152	954.50	119.48	48.	3.	0.001	570.99	0.881s
Eu-154	977.56	122.36	58.	11.	0.004	197.77	0.882s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:24:53
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1142.87	143.03	95.	-11.	-0.004	263.11	0.902s
U-235	1484.03	185.70	60.	19.	0.007	124.36	0.942D
Ra-226	1488.03	186.20	56.	23.	0.009	100.48	0.943D
Pb-212	1905.97	238.47	75.	185.	0.069	21.46	0.893
Pb-214	1933.21	241.87	88.	27.	0.010	98.24	0.996s
Ac-228	2159.96	270.23	31.	57.	0.021	48.29	0.285s
Pb-214	2358.83	295.10	53.	37.	0.014	50.55	1.046s
Pb-212	2398.14	300.01	39.	16.	0.006	120.66	1.050s
Ac-228	2703.43	338.19	21.	75.	0.028	33.63	1.063
Pb-214	2812.31	351.80	55.	89.	0.033	27.81	1.098s
Eu-152	3292.52	411.85	41.	1.	0.001	1320.04	1.153s
Tl-208	4664.69	583.41	9.	79.	0.029	27.47	1.034s
Bi-214	4872.24	609.36	26.	79.	0.029	28.54	0.339s
Bi-214	5321.85	665.57	30.	5.	0.002	313.34	1.380s
Eu-154	5786.60	723.67	42.	-4.	-0.002	423.89	1.430s
Bi-212	5812.69	726.94	38.	8.	0.003	223.24	1.433s
Bi-214	6144.25	768.38	35.	7.	0.003	253.40	1.469s
Bi-212	6287.37	786.27	24.	7.	0.002	220.98	1.483s
Ac-228	6353.58	794.55	22.	5.	0.002	264.48	1.491s
Tl-208	6873.89	859.59	35.	-3.	-0.001	500.53	1.547s
Pa-234	7063.36	883.27	33.	-2.	-0.001	798.44	1.566s
Ac-228	7289.06	911.48	40.	32.	0.012	65.31	1.589s
Bi-214	7471.62	934.30	25.	4.	0.001	353.76	1.608s
Pa-234	7566.04	946.10	24.	5.	0.002	279.93	1.618s
Eu-152	7708.54	963.92	37.	5.	0.002	361.99	1.633s
Ac-228	7750.28	969.13	26.	22.	0.008	76.66	1.633s
Ac-228	7751.01	969.22	35.	29.	0.011	68.89	1.637s
Bi-214	8960.95	1120.44	38.	14.	0.005	97.82	1.759s
Co-60	9385.17	1173.46	37.	7.	0.003	250.06	1.800s
Eu-154	10198.12	1275.05	31.	-6.	-0.002	298.51	1.879s
Bi-214	11026.85	1378.61	12.	2.	0.001	435.75	1.957s
Eu-152	11263.52	1408.18	14.	2.	0.001	642.46	1.980s
K-40	11685.64	1460.92	22.	876.	0.325	6.88	1.545s
Bi-214	14113.89	1764.28	12.	6.	0.002	107.65	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.0122E-01				3.65E+11	
			911.07	2.012E-01	?(	9.125E-02 3.27E+01 2.90E+01	G
			968.90	3.124E-01	?	1.493E-01 3.44E+01 1.75E+01	GA
			338.40	5.690E-01		8.100E-02 1.68E+01 1.20E+01	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:24:53
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_013.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			964.77	8.465E-01	+	4.463E-01	3.83E+01	4.99E+00 GA
			463.00	0.000E+00	-	4.548E-01	1.00E+03	4.40E+00 GA
			794.95	2.043E-01	&	4.206E-01	1.32E+02	4.25E+00 GA
			270.25	1.318E+00	+	2.960E-01	2.41E+01	3.46E+00 GA
Am-241	I	1.1545E-01					3.65E+11	
			59.54	1.155E-01	&(	2.150E-01	1.17E+02	3.63E+01 G
Bi-212	N	1.0661E-01					3.65E+11	
			727.17	1.066E-01	?(	1.862E-01	1.12E+02	1.18E+01 G
			1620.56	0.000E+00	-	2.398E-01	1.00E+03	2.75E+00 GA
			785.42	5.413E-01	?	9.229E-01	1.10E+02	2.00E+00 GA
Bi-214	N	2.3313E-01					3.65E+11	
			609.69	2.331E-01	(P	3.498E-02	1.43E+01	4.61E+01 G
			1764.51	1.190E-01	- P	1.575E-01	5.38E+01	1.59E+01 GA
			1120.28	1.914E-01	? P	2.008E-01	4.89E+01	1.50E+01 GA
			768.36	2.264E-01	?	4.509E-01	1.27E+02	4.89E+00 GA
			1377.65	1.346E-01	- P	4.851E-01	2.18E+02	4.02E+00 GA
			934.05	2.284E-01	? P	6.699E-01	1.77E+02	3.17E+00 GA
			1407.98	1.913E-03	%	8.354E-01	2.65E+04	2.48E+00 GA
			1509.19	0.000E+00	-	2.831E-01	1.00E+03	2.19E+00 GA
			665.45	4.799E-01	+	1.189E+00	1.57E+02	1.56E+00 GA
Co-60	T	1.5720E-02					3.65E+11	
			1173.24	1.572E-02	&(	3.092E-02	1.25E+02	9.99E+01 G
			1332.50	-5.597E-04	%	2.513E-02	2.73E+03	1.00E+02 G
Cs-137	I	4.5857E-05					3.65E+11	
			661.66	4.586E-05	&(	2.111E-02	2.79E+04	8.46E+01 G
Eu-154	I	-3.6002E-02					3.65E+11	
			1274.80	-3.600E-02	?(	8.485E-02	1.49E+02	3.55E+01 G
			123.10	2.039E-02	&	3.171E-02	9.89E+01	4.05E+01 GA
			723.30	-3.456E-02	+	1.176E-01	2.12E+02	1.97E+01 GA
K-40	N	2.1205E+01					3.65E+11	
			1460.80	2.120E+01	(P	2.617E-01	3.44E+00	1.07E+01 G
Pa-234	N	-2.4426E-02					3.65E+11	
			883.24	-2.443E-02	?(	1.582E-01	3.99E+02	1.50E+01 G
			98.44	0.000E+00	+	9.290E-02	1.00E+03	2.51E+01 GA
			946.00	8.068E-02	?	1.767E-01	1.40E+02	1.20E+01 GA
Pb-212	N	3.2020E-01					3.65E+11	
			238.63	3.202E-01	(P	3.474E-02	1.07E+01	4.31E+01 G
			77.11	2.386E-01	- P	2.058E-01	4.96E+01	1.75E+01 GA
			74.81	4.768E-02	-	3.549E-01	4.56E+02	9.60E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:24:53
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                           87.20 1.693E-01 - P 3.818E-01 1.38E+02 6.30E+00 GA
                          300.09 4.152E-01 ?   3.758E-01 6.03E+01 3.27E+00 GA

Pb-214   N   2.2489E-01                                     3.65E+11
                          351.79 2.249E-01 ?(P 4.337E-02 1.39E+01 3.71E+01 G
                          295.22 1.599E-01 - P 7.396E-02 2.53E+01 1.92E+01 GA
                          241.92 2.755E-01 & P 2.198E-01 4.91E+01 7.47E+00 GA

Ra-226   N   4.3589E-01                                     3.65E+11
                          186.20 4.359E-01  (  3.284E-01 5.02E+01 3.60E+00 G

Th-234   N   4.3256E-01                                     3.65E+11
                           92.60 4.326E-01  (  3.857E-01 5.78E+01 5.60E+00 G

Tl-208   N   1.2057E-01                                     3.65E+11
                          583.14 1.206E-01  (  1.089E-02 1.37E+01 8.60E+01 G
                          860.47-4.910E-02 -   1.976E-01 2.50E+02 1.20E+01 GA

U-235    N   2.3824E-02                                     3.65E+11
                          185.70 2.382E-02  (  2.268E-02 6.22E+01 5.40E+01 G
                          143.76-6.915E-02 -   1.458E-01 1.32E+02 1.05E+01 GA
                          163.35-1.709E-03 %   2.758E-01 9.80E+03 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:24:53
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108_013.An1

M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.09	66.	10.	0.004	234.55	1.155E-01
Th-234	92.81	87.	24.	0.009	115.57	4.326E-01
Eu-152	119.48	48.	3.	0.001	570.99	8.842E-03
Eu-154	122.36	58.	11.	0.004	197.77	2.039E-02
Eu-152	411.85	41.	1.	0.001	1320.04	6.364E-02
Eu-154	723.67	42.	-4.	-0.002	423.89	-3.456E-02
Bi-212	726.94	38.	8.	0.003	223.24	1.066E-01
Bi-212	786.27	24.	7.	0.002	220.98	5.413E-01
Pa-234	883.27	33.	-2.	-0.001	798.44	-2.443E-02
Pa-234	946.10	24.	5.	0.002	279.93	8.068E-02
Eu-152	963.92	37.	5.	0.002	361.99	6.310E-02
Co-60	1173.46	37.	7.	0.003	250.06	1.572E-02
Eu-154	1275.05	31.	-6.	-0.002	298.51	-3.600E-02
Eu-152	1408.18	14.	2.	0.001	642.46	2.001E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	2.0122E-01	2.0122E-01	1.3142E-01	1.3216E-01	9.125E-02
Am-241 #A	1.1545E-01	1.1545E-01	2.7080E-01	2.7099E-01	2.150E-01
Bi-212 #A	1.0661E-01	1.0661E-01	2.3800E-01	2.3812E-01	1.862E-01
Bi-214	2.3313E-01	2.3313E-01	7.4456E-02	7.6242E-02	3.498E-02
Co-60 #A	1.5720E-02	1.5720E-02	3.9309E-02	3.9323E-02	3.092E-02
Cs-137 #A	4.5857E-05	4.5857E-05	2.5633E-02	2.5633E-02	2.111E-02
Eu-152 #A	0.0000E+00	0.0000E+00	6.5462E-02	6.5462E-02	6.244E-02
Eu-154 #A	-3.6002E-02	-3.6002E-02	1.0747E-01	1.0750E-01	8.485E-02
K-40	2.1205E+01	2.1205E+01	1.4838E+00	2.0991E+00	2.617E-01
Pa-234 #A	-2.4426E-02	-2.4426E-02	1.9503E-01	1.9504E-01	1.582E-01
Pb-212	3.2020E-01	3.2020E-01	7.2467E-02	7.6428E-02	3.474E-02
Pb-214 #	2.2489E-01	2.2489E-01	6.9241E-02	7.1034E-02	4.337E-02
Ra-226	4.3589E-01	4.3589E-01	4.3799E-01	4.3923E-01	3.284E-01
Th-234 #	4.3256E-01	4.3256E-01	4.9990E-01	5.0140E-01	3.857E-01
Tl-208	1.2057E-01	1.2057E-01	3.3119E-02	3.4182E-02	1.089E-02
U-235	2.3824E-02	2.3824E-02	2.9627E-02	2.9682E-02	2.268E-02

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:24:53
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108_013.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.6 to  2041.8 keV)     2.276E+01  pCi/g
 Total Decayed Activity (  238.6 to  2041.8 keV) 2.2764721E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE10	Lab ID	: 251449-023	Client ID	: 04-PD-D0034-23
Seqnum	: 1594011971014	Matrix	: Soil	Acct	: ITSI (JG)
File	: 10_20140108_014	Batch	: 206637	Time	: 08-JAN-2014 19:40
Cal	: 08-JAN-2014 07:52:53,30-DEC-2013 19:08:15	Caldate	: 08-JAN-2014, 30-DEC-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 301.52 g	Live Time	: 2700 sec
				Dead Time	: 0.09 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0379	0.334		.40934	.40936	-0.040	u
Bismuth-212	0.169	0.154		.21407	.2144	-0.0025	u
Bismuth-214	0.253	0.0477		.081117	.083049	-0.052	u
Cesium-137	0.00542	0.0264	0.07	.03275	.032753	-0.0069	u
Cobalt-60	-0.000297	0.0294		.035707	.035707	0	u
Europium-152	0	0.0949		.068593	.068593	-0.00031	u
Europium-154	0	0.0266		.032294	.032295	-0.013	u
Lead-212	0.296	0.0426		.071869	.075294	-0.016	u
Lead-214	0.402	0.0446		.098422	.10241	-0.0040	u
Potassium-40	14.2	0.332		1.3779	1.6979	-0.36	u
Protactinium-234	0.0172	0.148		.18285	.18286	0.015	u
Radium-226	0.540	0.444	1.3	.5833	.58473	-0.082	u
Thallium-208	0.0553	0.0236		.034307	.034525	0.0020	u
Thorium-232 (By Actinium-228)	0.195	0.0891		.13296	.13366	0.019	u
Thorium-234	0.0343	0.541		.65907	.65908	-0.034	u
Uranium-235	0.0385	0.0285		.037899	.03801	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-23
Sample Description: 251449-023, 206637

Detector: HPGE10 51-TP42231A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:32
Acquisition Time: 1/8/2014 19:40:25
Analysis Time: 1/8/2014 20:25
Analysis Quantity: 3.015E+02 g

Spectrum ID: 10_20140108_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.09 %

Efficiency: HPGE10 S23325 10_20131230002_EffCal
Efficiency Cal Date: 12/30/2013 19:08
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		1.954E-01	1.330E-01	1.337E-01	8.905E-02
Am-241	#AB	3.793E-02	4.093E-01	4.094E-01	3.340E-01
Bi-212	#	1.687E-01	2.141E-01	2.144E-01	1.541E-01
Bi-214	#	2.530E-01	8.112E-02	8.305E-02	4.774E-02
Co-60	#AB	-2.972E-04	3.571E-02	3.571E-02	2.938E-02
Cs-137	#AB	5.417E-03	3.275E-02	3.275E-02	2.640E-02
Eu-152	AB	0.000E+00	6.859E-02	6.859E-02	9.493E-02
Eu-154	#AB	0.000E+00	3.229E-02	3.229E-02	2.660E-02
K-40		1.417E+01	1.378E+00	1.698E+00	3.319E-01
Pa-234	#AB	1.720E-02	1.829E-01	1.829E-01	1.484E-01
Pb-212		2.960E-01	7.187E-02	7.529E-02	4.259E-02
Pb-214		4.015E-01	9.842E-02	1.024E-01	4.462E-02
Ra-226	#	5.400E-01	5.833E-01	5.847E-01	4.440E-01
Th-234	#AB	3.433E-02	6.591E-01	6.591E-01	5.409E-01
Tl-208	#	5.526E-02	3.431E-02	3.453E-02	2.364E-02
U-235		3.845E-02	3.790E-02	3.801E-02	2.854E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.621E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:25:35
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_014.An1

Sample description
     251449-023, 206637


Spectrum Filename: C:\User\SPC\Det10\10_20140108_014.An1

Acquisition information
       Start time:                 1/8/2014 19:40:25
       Live time:               2700
       Real time:               2702
       Dead time:                  0.09 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:52:53
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.220E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.73keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.0152E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.0152E+02) =
                                   8.9636E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:25:35
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:32:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_2014-01-01_0202.PBC 1/1/2014 02:02:27
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.2033

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.86	32.	26.88	0.25	0.000E+00				
59.63	2.	539.55	0.85	4.361E-03	59.54	36.300	PBC<MDA	Am241
75.05	15.	96.20	0.86	1.370E-02	74.81	9.600	PBC<MDA	Pb212
77.32	36.	38.49	0.18	1.539E-02	77.11	17.500	4.479E-01	Pb212
87.14	7.	174.87	0.87	2.179E-02	87.20	6.300	PBC<MDA	Pb212
87.74	38.	37.24	0.14	2.212E-02				
92.30	1.	960.05	0.88	2.495E-02	92.60	5.600	PBC<MDA	Th234
143.24	18.	67.44	0.92	3.987E-02	143.76	10.500	PBC<MDA	U235
163.21	8.	134.14	0.94	4.064E-02	163.35	4.700	PBC<MDA	U235
186.22	23.	54.01	0.96	4.008E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	5.400E-01	Ra226
186.22	25.	49.28	0.96	4.010E-02	185.70	54.000	3.845E-02	U235
					186.20	3.600	5.771E-01	Ra226
238.56	157.	12.69	0.50	3.661E-02	238.63	43.100	3.304E-01	Pb212
241.36	17.	81.79	1.01	3.636E-02	241.92	7.470	PBC<MDA	Pb214
294.79	48.	23.42	0.26	3.251E-02	295.22	19.200	2.569E-01	Pb214
300.23	14.	70.48	1.06	3.218E-02	300.09	3.270	PBC<MDA	Pb212
322.12	14.	36.78	0.17	3.078E-02				
338.27	49.	19.78	0.66	2.981E-02	338.40	12.010	4.563E-01	Ac228
351.72	163.	10.78	1.05	2.905E-02	351.79	37.100	4.788E-01	Pb214
358.34	10.	47.60	0.17	2.870E-02				
384.45	32.	26.92	0.13	2.737E-02				
462.85	8.	103.38	1.19	2.407E-02	463.00	4.400	PBC<MDA	Ac228
510.63	109.	13.88	0.22	2.248E-02				
583.35	29.	26.97	1.29	2.049E-02	583.14	86.000	5.526E-02	Tl208
609.16	111.	11.25	0.33	1.987E-02	609.69	46.090	3.731E-01	Bi214
661.61	3.	302.29	1.35	1.875E-02	661.66	84.620	PBC<MDA	Cs137

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:25:35
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
727.03	11.	63.47	1.40	1.754E-02	727.17	11.800	1.686E-01	Bi212
791.24	1.	441.93	1.46	1.646E-02	794.95	4.250	PBC<MDA	Ac228
877.67	12.	28.87	0.16	1.533E-02				
882.73	1.	531.57	1.52	1.526E-02	883.24	15.000	PBC<MDA	Pa234
910.70	25.	34.03	1.54	1.493E-02	911.07	29.000	1.954E-01	Ac228
931.59	4.	115.78	1.56	1.466E-02	934.05	3.170	PBC<MDA	Bi214
946.32	5.	128.31	1.57	1.452E-02	946.00	12.000	PBC<MDA	Pa234
964.81	2.	237.46	1.58	1.432E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	8.777E-02	Ac228
969.29	14.	63.84	1.58	1.427E-02	968.90	17.460	1.896E-01	Ac228
1119.99	11.	50.00	1.69	1.281E-02	1120.28	15.040	PBC<MDA	Bi214
1377.05	6.	91.26	1.86	1.088E-02	1377.65	4.020	PBC<MDA	Bi214
1407.98	2.	16.16	1.88	1.069E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	2.959E-02	Eu152
1460.84	490.	4.69	1.27	1.036E-02	1460.80	10.700	1.417E+01	K40

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.59	30.86	14.	32.	0.000E+00	53.76	0.251	-	sM
700.89	87.74	54.	21.	9.351E+02	109.97	0.875	-	D
2575.67	322.12	5.	14.	4.484E+02	73.56	0.173	-	s
2865.36	358.34	5.	10.	3.415E+02	95.20	0.169	-	s
3074.14	384.45	10.	32.	1.173E+03	53.84	0.130	-	s
4083.34	510.63	20.	109.	4.848E+03	27.77	0.223	TL-208	s
7019.50	877.67	0.	12.	7.825E+02	57.74	0.156	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	476.63	59.63	47.	2.	0.001	1079.10	0.850s
Pb-212	599.93	75.05	93.	15.	0.005	192.39	0.863
Pb-212	618.36	77.36	92.	30.	0.011	97.98	0.865s
Pb-212	697.07	87.20	78.	7.	0.003	349.74	0.874D
Th-234	737.87	92.30	95.	1.	0.001	1920.11	0.879s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:25:35
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pa-234	790.72	98.91	80.	-3.	-0.001	772.70	0.884s
Eu-154	986.39	123.38	84.	-8.	-0.003	325.85	0.906s
U-235	1145.15	143.24	63.	18.	0.007	134.89	0.924
U-235	1304.84	163.21	59.	8.	0.003	268.28	0.941
U-235	1488.85	186.22	64.	25.	0.009	98.56	0.961
Ra-226	1488.84	186.22	69.	23.	0.009	108.02	0.961s
Pb-212	1907.81	238.61	75.	141.	0.052	24.28	1.007s
Pb-214	1929.83	241.36	86.	17.	0.006	163.59	1.010s
Pb-214	2357.10	294.79	39.	48.	0.018	46.84	0.262s
Pb-212	2400.63	300.23	40.	14.	0.005	140.96	1.059s
Ac-228	2704.80	338.27	14.	49.	0.018	39.57	0.657s
Pb-214	2812.94	351.79	39.	130.	0.048	23.12	1.039
Eu-152	3286.83	411.04	38.	-3.	-0.001	515.55	1.152s
Ac-228	3701.19	462.85	27.	8.	0.003	206.75	1.195s
Tl-208	4665.02	583.35	29.	29.	0.011	53.95	1.292s
Bi-214	4872.61	609.30	32.	70.	0.026	28.56	1.313s
Cs-137	5290.99	661.61	29.	3.	0.001	604.58	1.354s
Bi-214	5325.57	665.93	34.	-4.	-0.001	570.35	1.356s
Eu-154	5787.46	723.67	26.	-1.	0.000	1937.79	1.401s
Bi-212	5814.38	727.03	17.	11.	0.004	126.93	1.404s
Ac-228	6328.04	791.24	17.	1.	0.001	883.87	1.456s
Pa-234	7059.97	882.73	19.	1.	0.000	1063.14	1.522s
Ac-228	7283.70	910.70	25.	25.	0.009	68.06	1.542s
Bi-214	7450.85	931.59	10.	4.	0.002	231.57	1.559s
Pa-234	7568.72	946.32	20.	5.	0.002	256.62	1.568s
Ac-228	7716.32	964.77	12.	2.	0.001	474.91	1.581D
Ac-228	7752.48	969.29	34.	14.	0.005	127.68	1.584s
Bi-214	8958.31	1119.99	27.	11.	0.004	100.00	1.691s
Bi-214	11015.38	1377.05	12.	6.	0.002	182.52	1.863s
Bi-214	11262.90	1407.98	0.	2.	0.001	32.32	1.882D
K-40	11685.97	1460.84	23.	473.	0.175	9.39	1.266s
Bi-212	12960.35	1620.06	9.	-3.	-0.001	353.39	2.013s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.9535E-01					3.65E+11
			911.07	1.954E-01	?(	8.905E-02 3.40E+01	2.90E+01 G
			968.90	1.896E-01	&	1.815E-01 6.38E+01	1.75E+01 GA
			338.40	4.563E-01		8.027E-02 1.98E+01	1.20E+01 GA
			964.77	8.777E-02	}	3.728E-01 2.37E+02	4.99E+00 GA
			463.00	2.366E-01	?	3.771E-01 1.03E+02	4.40E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:25:35
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_014.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			794.95	6.426E-02	-	4.590E-01	4.42E+02	4.25E+00 GA
			270.25	0.000E+00	-	5.909E-01	1.00E+03	3.46E+00 GA
Am-241	I	3.7934E-02					3.65E+11	
			59.54	3.793E-02	&(	3.340E-01	5.40E+02	3.63E+01 G
Bi-212	N	1.6865E-01					3.65E+11	
			727.17	1.686E-01	&(	1.541E-01	6.35E+01	1.18E+01 G
			1620.56	-3.232E-01	-	8.795E-01	1.77E+02	2.75E+00 GA
			785.42	4.381E-03	%	1.130E+00	1.57E+04	2.00E+00 GA
Bi-214	N	2.5303E-01					3.65E+11	
			609.69	2.530E-01	?(P	4.774E-02	1.43E+01	4.61E+01 G
			1764.51	-8.318E-02	% P	1.036E-01	1.00E+03	1.59E+01 GA
			1120.28	1.875E-01	- P	2.106E-01	5.00E+01	1.50E+01 GA
			768.36	-9.309E-02	% P	1.039E+00	1.00E+03	4.89E+00 GA
			1377.65	4.246E-01	+ P	6.010E-01	9.13E+01	4.02E+00 GA
			934.05	3.058E-01	&	5.300E-01	1.16E+02	3.17E+00 GA
			1407.98	2.530E-01	}	2.918E-01	1.62E+01	2.48E+00 GA
			1509.19	0.000E+00	-	3.503E-01	1.00E+03	2.19E+00 GA
			665.45	-4.602E-01	- P	1.548E+00	2.85E+02	1.56E+00 GA
Co-60	T	-2.9717E-04					3.65E+11	
			1173.24	-2.972E-04	%(	2.938E-02	6.01E+03	9.99E+01 G
			1332.50	2.750E-04	%	2.728E-02	6.03E+03	1.00E+02 G
Cs-137	I	5.4171E-03					3.65E+11	
			661.66	5.417E-03	?(	2.640E-02	3.02E+02	8.46E+01 G
K-40	N	1.4170E+01					3.65E+11	
			1460.80	1.417E+01	(P	3.319E-01	4.69E+00	1.07E+01 G
Pa-234	N	1.7199E-02					3.65E+11	
			883.24	1.720E-02	&(	1.484E-01	5.32E+02	1.50E+01 G
			98.44	-1.561E-02	+	9.838E-02	3.86E+02	2.51E+01 GA
			946.00	1.003E-01	?	1.993E-01	1.28E+02	1.20E+01 GA
Pb-212	N	2.9603E-01					3.65E+11	
			238.63	2.960E-01	?(	4.259E-02	1.21E+01	4.31E+01 G
			77.11	3.717E-01	?	2.784E-01	4.90E+01	1.75E+01 GA
			74.81	3.714E-01		5.666E-01	9.62E+01	9.60E+00 GA
			87.20	1.764E-01	-	4.968E-01	1.75E+02	6.30E+00 GA
			300.09	4.353E-01	+	4.672E-01	7.05E+01	3.27E+00 GA
Pb-214	N	4.0152E-01					3.65E+11	
			351.79	4.015E-01	(P	4.462E-02	1.16E+01	3.71E+01 G
			295.22	2.569E-01	- P	7.710E-02	2.34E+01	1.92E+01 GA
			241.92	2.058E-01	-	2.647E-01	8.18E+01	7.47E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:25:35
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   5.4001E-01                                      3.65E+11
                           186.20 5.400E-01 ?(  4.440E-01 5.40E+01 3.60E+00 G

Th-234   N   3.4325E-02                                      3.65E+11
                            92.60 3.432E-02 ?(  5.409E-01 9.60E+02 5.60E+00 G

Tl-208   N   5.5255E-02                                      3.65E+11
                           583.14 5.526E-02 ?(P 2.364E-02 2.70E+01 8.60E+01 G
                           860.47-4.089E-03 % P 2.312E-01 5.41E+03 1.20E+01 GA

U-235    N   3.8454E-02                                      3.65E+11
                           185.70 3.845E-02  (  2.854E-02 4.93E+01 5.40E+01 G
                           143.76 1.410E-01     1.466E-01 6.74E+01 1.05E+01 GA
                           163.35 1.451E-01     3.099E-01 1.34E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:25:35
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108_014.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.63	47.	2.	0.001	1079.10	3.793E-02
Th-234	92.30	95.	1.	0.001	1920.11	3.432E-02
Pa-234	98.91	80.	-3.	-0.001	772.70	-1.561E-02
Eu-154	123.38	84.	-8.	-0.003	325.85	-1.819E-02
Eu-152	411.04	38.	-3.	-0.001	515.55	-1.940E-01
Cs-137	661.61	29.	3.	0.001	604.58	5.417E-03
Eu-154	723.67	26.	-1.	0.000	1937.79	-7.225E-03
Bi-212	727.03	17.	11.	0.004	126.93	1.686E-01
Pa-234	882.73	19.	1.	0.000	1063.14	1.720E-02
Pa-234	946.32	20.	5.	0.002	256.62	1.003E-01
Bi-212	1620.06	9.	-3.	-0.001	353.39	-3.232E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	1.9535E-01	1.9535E-01	1.3296E-01	1.3366E-01	8.905E-02
Am-241 #A	3.7934E-02	3.7934E-02	4.0934E-01	4.0936E-01	3.340E-01
Bi-212 #	1.6865E-01	1.6865E-01	2.1407E-01	2.1440E-01	1.541E-01
Bi-214 #	2.5303E-01	2.5303E-01	8.1117E-02	8.3049E-02	4.774E-02
Co-60 #A	-2.9717E-04	-2.9717E-04	3.5707E-02	3.5707E-02	2.938E-02
Cs-137 #A	5.4171E-03	5.4171E-03	3.2750E-02	3.2753E-02	2.640E-02
Eu-152 A	0.0000E+00	0.0000E+00	6.8593E-02	6.8593E-02	9.493E-02
Eu-154 #A	0.0000E+00	0.0000E+00	3.2294E-02	3.2295E-02	2.660E-02
K-40	1.4170E+01	1.4170E+01	1.3779E+00	1.6979E+00	3.319E-01
Pa-234 #A	1.7199E-02	1.7199E-02	1.8285E-01	1.8286E-01	1.484E-01
Pb-212	2.9603E-01	2.9603E-01	7.1869E-02	7.5294E-02	4.259E-02
Pb-214	4.0152E-01	4.0152E-01	9.8422E-02	1.0241E-01	4.462E-02
Ra-226 #	5.4001E-01	5.4001E-01	5.8330E-01	5.8473E-01	4.440E-01
Th-234 #A	3.4325E-02	3.4325E-02	6.5907E-01	6.5908E-01	5.409E-01
Tl-208 #	5.5255E-02	5.5255E-02	3.4307E-02	3.4525E-02	2.364E-02
U-235	3.8454E-02	3.8454E-02	3.7899E-02	3.8010E-02	2.854E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:25:35
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108_014.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity ( 1408.0 to  2041.7 keV)     1.591E+01  pCi/g
 Total Decayed Activity ( 1408.0 to  2041.7 keV) 1.5911354E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604011948014
File : 11_20140108_014
Cal : 08-JAN-2014 07:30:05,03-JAN-2014 14:18:33
IDF : 1.0
PDF : 1.0

Lab ID : 251449-024
Matrix : Soil
Batch : 206637
Caldate : 08-JAN-2014, 03-JAN-2014

Sample Amount : 354.56 g

Client ID : 04-PD-D0034-24
Acct : ITSI (JG)
Time : 08-JAN-2014 19:41

Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.08 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.00182	0.173		.20957	.20957	-0.040	u
Bismuth-212	0.243	0.207		.27848	.27901	-0.0025	u
Bismuth-214	0.529	0.0385		.10333	.10983	-0.052	u
Cesium-137	0.00293	0.0246	0.07	.030208	.030208	-0.0069	u
Cobalt-60	-0.0117	0.0347		.043453	.04346	0	u
Europium-152	-0.00967	0.0603		.074208	.074211	-0.00031	u
Europium-154	-0.00417	0.0752		.091991	.091991	-0.013	u
Lead-212	0.493	0.0375		.089382	.096888	-0.016	u
Lead-214	0.385	0.0500		.088223	.092298	-0.0040	u
Potassium-40	17.1	0.304		1.4114	1.8491	-0.36	u
Protactinium-234	0	0.150		.026301	.026301	0.015	u
Radium-226	0.912	0.407	1.3	.56809	.57228	-0.082	u
Thallium-208	0.127	0.0226		.039274	.040267	0.0020	u
Thorium-232 (By Actinium-228)	0.241	0.104		.14715	.1481	0.019	u
Thorium-234	0.277	0.501		.62515	.62564	-0.034	u
Uranium-235	0.0266	0.0339		.042971	.043019	0	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-24
Sample Description: 251449-024, 206637

Detector: HPGE11 50-TP50818A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:35
Acquisition Time: 1/8/2014 19:41:56
Analysis Time: 1/8/2014 20:27
Analysis Quantity: 3.546E+02 g

Spectrum ID: 11_20140108_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.08 %

Efficiency: HPGE11 S23325 11_20140102002_EffCal
Efficiency Cal Date: 1/3/2014 14:18
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		2.405E-01	1.471E-01	1.481E-01	1.037E-01
Am-241	#AB	1.819E-03	2.096E-01	2.096E-01	1.725E-01
Bi-212	#	2.431E-01	2.785E-01	2.790E-01	2.073E-01
Bi-214		5.291E-01	1.033E-01	1.098E-01	3.853E-02
Co-60	#AB	-1.174E-02	4.345E-02	4.346E-02	3.470E-02
Cs-137	#AB	2.928E-03	3.021E-02	3.021E-02	2.458E-02
Eu-152	#AB	-9.671E-03	7.421E-02	7.421E-02	6.029E-02
Eu-154	#AB	-4.171E-03	9.199E-02	9.199E-02	7.524E-02
K-40		1.706E+01	1.411E+00	1.849E+00	3.043E-01
Pa-234	#AB	0.000E+00	2.630E-02	2.630E-02	1.497E-01
Pb-212		4.930E-01	8.938E-02	9.689E-02	3.747E-02
Pb-214	#	3.846E-01	8.822E-02	9.230E-02	4.995E-02
Ra-226		9.119E-01	5.681E-01	5.723E-01	4.067E-01
Th-234	#AB	2.766E-01	6.251E-01	6.256E-01	5.011E-01
Tl-208	#	1.267E-01	3.927E-02	4.027E-02	2.256E-02
U-235	AB	2.658E-02	4.297E-02	4.302E-02	3.390E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.030E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:27:04
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_014.An1

Sample description
     251449-024, 206637


Spectrum Filename: C:\User\SPC\Det11\11_20140108_014.An1

Acquisition information
       Start time:                 1/8/2014 19:41:56
       Live time:               2700
       Real time:               2702
       Dead time:                  0.08 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:30:05
            Zero offset:           0.125 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.054E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.31keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.5456E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.5456E+02) =
                                   7.6227E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:27:04
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:35:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	11_2014-01-04_0721.PBC 1/4/2014 07:21:07
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 20 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0738

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
31.31	63.	21.61	0.63	0.000E+00				
74.88	71.	20.06	0.81	1.832E-02	74.81	9.600	1.092E+00	Pb212
77.17	83.	17.59	0.82	1.956E-02	77.11	17.500	6.848E-01	Pb212
87.41	37.	38.55	0.42	2.460E-02	87.20	6.300	6.246E-01	Pb212
92.85	15.	112.99	0.83	2.677E-02	92.60	5.600	PBC<MDA	Th234
108.34	32.	32.33	0.38	3.181E-02				
121.39	5.	257.01	0.86	3.453E-02	121.87	28.590	PBC<MDA	Eu152
					121.87	28.590	1.494E-02	Eu152
156.77	20.	38.91	0.59	3.691E-02				
185.81	91.	20.05	0.52	3.622E-02	185.70	54.000	1.312E-01	U235
186.21	42.	31.15	0.92	3.620E-02	186.20	3.600	9.119E-01	Ra226
238.50	254.	8.88	0.89	3.309E-02	238.63	43.100	4.930E-01	Pb212
241.75	33.	38.63	0.98	3.287E-02	241.92	7.470	3.844E-01	Pb214
270.22	45.	27.98	0.38	3.105E-02	270.25	3.460	1.177E+00	Ac228
295.08	132.	14.95	0.29	2.955E-02	295.22	19.200	6.300E-01	Pb214
300.28	9.	111.04	1.03	2.926E-02	300.09	3.270	PBC<MDA	Pb212
338.35	61.	21.89	0.30	2.720E-02	338.40	12.010	5.303E-01	Ac228
351.78	195.	8.79	1.02	2.654E-02	351.79	37.100	5.337E-01	Pb214
480.83	30.	26.62	0.21	2.163E-02				
583.10	73.	14.15	1.30	1.900E-02	583.14	86.000	1.267E-01	Tl208
609.35	180.	9.23	0.72	1.844E-02	609.69	46.090	5.676E-01	Bi214
661.67	2.	515.82	1.37	1.744E-02	661.66	84.620	PBC<MDA	Cs137
665.64	3.	302.47	1.37	1.738E-02	665.45	1.560	PBC<MDA	Bi214
727.52	17.	57.27	1.43	1.636E-02	727.17	11.800	2.431E-01	Bi212
769.26	7.	107.32	1.47	1.576E-02	768.36	4.890	PBC<MDA	Bi214
794.54	8.	68.70	1.49	1.539E-02	794.95	4.250	PBC<MDA	Ac228
860.63	9.	92.89	1.55	1.457E-02	860.47	12.000	PBC<MDA	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:27:04
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
911.06	35.	27.02	1.60	1.401E-02	911.07	29.000	2.405E-01	Ac228
931.81	1.	951.54	1.62	1.376E-02	934.05	3.170	PBC<MDA	Bi214
965.46	4.	262.56	1.64	1.345E-02	964.77	4.990	PBC<MDA	Ac228
					964.05	14.580	5.130E-02	Eu152
968.84	15.	57.06	1.65	1.341E-02	968.90	17.460	1.853E-01	Ac228
1120.16	18.	44.44	1.78	1.208E-02	1120.28	15.040	2.820E-01	Bi214
1377.21	2.	241.26	1.99	1.033E-02	1377.65	4.020	PBC<MDA	Bi214
1407.89	4.	113.63	2.02	1.015E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	PBC<MDA	Eu152
					1408.08	21.210	PBC<MDA	Eu152
1407.90	4.	113.76	2.02	1.015E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	5.547E-02	Eu152
1460.85	655.	4.02	1.75	9.854E-03	1460.80	10.700	1.706E+01	K40
1509.17	3.	139.79	2.10	9.596E-03	1509.19	2.190	PBC<MDA	Bi214
1621.97	3.	146.06	2.19	9.041E-03	1620.56	2.750	PBC<MDA	Bi212
1764.57	16.	32.97	2.31	8.394E-03	1764.51	15.920	3.346E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
249.24	31.31	36.	63.	0.000E+00	43.23	0.634	- s
864.96	108.34	30.	32.	1.006E+03	64.65	0.376	- s
1252.08	156.77	20.	20.	5.472E+02	77.82	0.592	- sM
3843.12	480.83	7.	30.	1.378E+03	53.24	0.208	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	596.90	74.81	60.	88.	0.032	37.43	0.691
Pb-212	615.21	77.10	48.	90.	0.033	32.73	0.380s
Pb-212	697.31	87.37	141.	30.	0.011	108.51	0.825s
Th-234	741.13	92.85	130.	15.	0.005	225.98	0.830s
Eu-152	969.26	121.39	88.	5.	0.002	514.03	0.859s
Eu-154	983.09	123.12	81.	-9.	-0.003	303.61	0.860s
U-235	1149.34	143.92	155.	-10.	-0.004	372.66	0.881s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:27:04
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1316.89	164.88	96.	-20.	-0.007	146.73	0.900
U-235	1483.34	185.70	102.	18.	0.007	161.65	0.921D
Ra-226	1487.34	186.20	65.	42.	0.016	62.30	0.922D
Pb-212	1905.42	238.50	66.	249.	0.092	17.76	0.889
Pb-214	1931.42	241.75	97.	33.	0.012	77.25	0.976s
Ac-228	2159.01	270.22	31.	45.	0.017	55.96	0.375s
Pb-214	2358.39	295.15	48.	88.	0.033	28.61	1.027s
Pb-212	2399.35	300.28	41.	9.	0.003	222.08	1.032s
Ac-228	2703.81	338.35	33.	61.	0.023	43.77	0.302s
Eu-152	2759.53	345.32	44.	-2.	-0.001	767.31	1.074s
Pb-214	2811.22	351.79	56.	134.	0.050	21.46	1.081
Eu-152	3280.80	410.51	49.	-5.	-0.002	376.58	1.138s
Tl-208	4661.05	583.10	31.	73.	0.027	28.30	1.298s
Bi-214	4871.76	609.44	25.	159.	0.059	18.42	0.715s
Cs-137	5289.53	661.67	30.	2.	0.001	1031.63	1.371s
Bi-214	5321.32	665.64	28.	3.	0.001	604.93	1.374s
Eu-154	5789.57	724.17	55.	-5.	-0.002	415.45	1.427s
Bi-212	5816.37	727.52	37.	17.	0.006	114.53	1.430s
Bi-214	6150.28	769.26	32.	7.	0.003	214.64	1.468s
Ac-228	6352.52	794.54	12.	8.	0.003	137.41	1.491s
Tl-208	6881.32	860.63	29.	9.	0.003	185.78	1.550s
Ac-228	7284.83	911.06	41.	35.	0.013	54.04	1.595s
Bi-214	7450.86	931.81	25.	1.	0.000	1903.07	1.615s
Pa-234	7557.60	945.15	29.	-1.	0.000	1484.57	1.626s
Ac-228	7720.15	965.46	42.	4.	0.001	525.12	1.642s
Ac-228	7747.21	968.84	31.	15.	0.006	114.12	1.646s
Bi-214	8958.29	1120.16	35.	18.	0.007	88.87	1.777s
Co-60	9391.52	1174.28	38.	-5.	-0.002	370.13	1.823s
Co-60	10647.80	1331.20	21.	-2.	-0.001	743.91	1.957s
Bi-214	11016.17	1377.21	14.	2.	0.001	482.52	1.994s
Bi-214	11261.85	1407.89	9.	4.	0.002	227.27	2.019s
Eu-152	11261.91	1407.90	9.	4.	0.002	227.53	2.020s
K-40	11685.91	1460.85	24.	637.	0.236	8.05	1.754
Bi-214	12072.87	1509.17	8.	3.	0.001	279.57	2.102s
Bi-212	12976.28	1621.97	10.	3.	0.001	292.12	2.192s
Bi-214	14118.55	1764.57	6.	16.	0.006	65.94	2.306s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:27:04
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_014.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g			COMMENTS
Ac-228	N	2.4050E-01					3.65E+11		
			911.07	2.405E-01	?(P	1.037E-01	2.70E+01	2.90E+01	G
			968.90	1.853E-01	? P	1.566E-01	5.71E+01	1.75E+01	GA
			338.40	5.303E-01	P	1.151E-01	2.19E+01	1.20E+01	GA
			964.77	1.500E-01	?	6.354E-01	2.63E+02	4.99E+00	GA
			463.00	-4.014E-02	% P	4.689E-01	1.00E+03	4.40E+00	GA
			794.95	3.534E-01	? P	3.543E-01	6.87E+01	4.25E+00	GA
			270.25	1.177E+00	+	3.420E-01	2.80E+01	3.46E+00	GA
Am-241	I	1.8191E-03					3.65E+11		
			59.54	1.819E-03	%(	1.725E-01	5.76E+03	3.63E+01	G
Bi-212	N	2.4314E-01					3.65E+11		
			727.17	2.431E-01	?(	2.073E-01	5.73E+01	1.18E+01	G
			1620.56	3.720E-01	?	8.287E-01	1.46E+02	2.75E+00	GA
			785.42	-6.551E-03	%	9.663E-01	8.96E+03	2.00E+00	GA
Bi-214	N	5.2905E-01					3.65E+11		
			609.69	5.291E-01	(P	3.853E-02	9.21E+00	4.61E+01	G
			1764.51	3.346E-01	- P	1.207E-01	3.30E+01	1.59E+01	GA
			1120.28	2.820E-01	- P	2.129E-01	4.44E+01	1.50E+01	GA
			768.36	2.489E-01	- P	4.817E-01	1.07E+02	4.89E+00	GA
			1377.65	1.548E-01	-	5.917E-01	2.41E+02	4.02E+00	GA
			934.05	4.843E-02	-	7.536E-01	9.52E+02	3.17E+00	GA
			1407.98	4.728E-01	? P	8.045E-01	1.14E+02	2.48E+00	GA
			1509.19	4.090E-01	-	8.590E-01	1.40E+02	2.19E+00	GA
			665.45	2.645E-01	-	1.289E+00	3.02E+02	1.56E+00	GA
Co-60	T	-1.1740E-02					3.65E+11		
			1173.24	-1.174E-02	?(	3.470E-02	1.85E+02	9.99E+01	G
			1332.50	-4.718E-03	+	2.832E-02	3.72E+02	1.00E+02	G
Cs-137	I	2.9281E-03					3.65E+11		
			661.66	2.928E-03	?(	2.458E-02	5.16E+02	8.46E+01	G
Eu-152	I	-9.6711E-03					3.65E+11		
			344.30	-9.671E-03	?(	6.029E-02	3.84E+02	2.70E+01	G
			121.87	1.494E-02	&	6.234E-02	2.57E+02	2.86E+01	GA
			1408.08	5.547E-02	?	9.399E-02	1.14E+02	2.12E+01	GA
			964.05	0.000E+00	+	3.929E-01	1.00E+03	1.46E+01	GA
			778.90	9.961E-04	%	1.671E-01	1.02E+04	1.30E+01	GA
			411.09	-2.807E-01	+	8.478E-01	1.88E+02	2.26E+00	GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 20:27:04
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Eu-154   I  -4.1711E-03                                     3.65E+11
                         1274.80-4.171E-03 %(  7.524E-02 1.10E+03 3.55E+01 G
                          123.10-1.734E-02 +   4.226E-02 1.52E+02 4.05E+01 GA
                          723.30-4.492E-02 +   1.502E-01 2.08E+02 1.97E+01 GA

K-40     N   1.7061E+01                                     3.65E+11
                         1460.80 1.706E+01  (P 3.043E-01 4.02E+00 1.07E+01 G

Pb-212   N   4.9302E-01                                     3.65E+11
                          238.63 4.930E-01  (P 3.747E-02 8.88E+00 4.31E+01 G
                           77.11 7.452E-01 +   1.325E-01 1.64E+01 1.75E+01 GA
                           74.81 1.407E+00 + P 2.906E-01 1.87E+01 9.60E+00 GA
                           87.20 5.395E-01 ? P 5.053E-01 5.43E+01 6.30E+00 GA
                          300.09 2.526E-01 -   4.397E-01 1.11E+02 3.27E+00 GA

Pb-214   N   3.8459E-01                                     3.65E+11
                          351.79 3.846E-01 ?(P 4.995E-02 1.07E+01 3.71E+01 G
                          295.22 4.378E-01 ? P 8.036E-02 1.43E+01 1.92E+01 GA
                          241.92 3.844E-01 ? P 2.645E-01 3.86E+01 7.47E+00 GA

Ra-226   N   9.1189E-01                                     3.65E+11
                          186.20 9.119E-01  (  4.067E-01 3.11E+01 3.60E+00 G

Th-234   N   2.7664E-01                                     3.65E+11
                           92.60 2.766E-01  (  5.011E-01 1.13E+02 5.60E+00 G

Tl-208   N   1.2671E-01                                     3.65E+11
                          583.14 1.267E-01 ?(P 2.256E-02 1.41E+01 8.60E+01 G
                          860.47 1.429E-01 ?   2.039E-01 9.29E+01 1.20E+01 GA

U-235    N   2.6582E-02                                     3.65E+11
                          185.70 2.658E-02  (  3.390E-02 8.08E+01 5.40E+01 G
                          143.76-7.045E-02 +   2.130E-01 1.86E+02 1.05E+01 GA
                          163.35-3.222E-01 +   3.708E-01 7.34E+01 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:27:04
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_014.An1

= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	92.85	130.	15.	0.005	225.98	2.766E-01
Eu-152	121.39	88.	5.	0.002	514.03	1.494E-02
Eu-154	123.12	81.	-9.	-0.003	303.61	-1.734E-02
Eu-152	345.32	44.	-2.	-0.001	767.31	-9.671E-03
Eu-152	410.51	49.	-5.	-0.002	376.58	-2.807E-01
Cs-137	661.67	30.	2.	0.001	1031.63	2.928E-03
Eu-154	724.17	55.	-5.	-0.002	415.45	-4.492E-02
Bi-212	727.52	37.	17.	0.006	114.53	2.431E-01
Pa-234	945.15	29.	-1.	0.000	1484.57	-1.798E-02
Co-60	1174.28	38.	-5.	-0.002	370.13	-1.174E-02
Co-60	1331.20	21.	-2.	-0.001	743.91	-4.718E-03
Eu-152	1407.90	9.	4.	0.002	227.53	5.547E-02
Bi-212	1621.97	10.	3.	0.001	292.12	3.720E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	2.4050E-01	2.4050E-01	1.4715E-01	1.4810E-01	1.037E-01
Am-241 #A	1.8191E-03	1.8191E-03	2.0957E-01	2.0957E-01	1.725E-01
Bi-212 #	2.4314E-01	2.4314E-01	2.7848E-01	2.7901E-01	2.073E-01
Bi-214	5.2905E-01	5.2905E-01	1.0333E-01	1.0983E-01	3.853E-02
Co-60 #A	-1.1740E-02	-1.1740E-02	4.3453E-02	4.3460E-02	3.470E-02
Cs-137 #A	2.9281E-03	2.9281E-03	3.0208E-02	3.0208E-02	2.458E-02
Eu-152 #A	-9.6711E-03	-9.6711E-03	7.4208E-02	7.4211E-02	6.029E-02
Eu-154 #A	-4.1711E-03	-4.1711E-03	9.1991E-02	9.1991E-02	7.524E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 20:27:04
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108_014.An1

K-40	1.7061E+01	1.7061E+01	1.4114E+00	1.8491E+00	3.043E-01
Pa-234 #A	0.0000E+00	0.0000E+00	2.6301E-02	2.6301E-02	1.497E-01
Pb-212	4.9302E-01	4.9302E-01	8.9382E-02	9.6888E-02	3.747E-02
Pb-214 #	3.8459E-01	3.8459E-01	8.8223E-02	9.2298E-02	4.995E-02
Ra-226	9.1189E-01	9.1189E-01	5.6809E-01	5.7228E-01	4.067E-01
Th-234 #A	2.7664E-01	2.7664E-01	6.2515E-01	6.2564E-01	5.011E-01
Tl-208 #	1.2671E-01	1.2671E-01	3.9274E-02	4.0267E-02	2.256E-02
U-235 A	2.6582E-02	2.6582E-02	4.2971E-02	4.3019E-02	3.390E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (238.6 to 2041.3 keV) 1.975E+01 pCi/g
Total Decayed Activity (238.6 to 2041.3 keV) 1.9746643E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

QC Raw Data

CURTIS & TOMPKINS BLANK USER REPORT FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst	: HPGE08	Lab ID	: QC722413		
Seqnum	: 1574009095011.4	Matrix	: Soil		
File	: 8_20140106_011	Batch	: 206637	Time	: 06-JAN-2014 16:28
Cal	: 06-JAN-2014 07:47:05,08-APR-2013 11:06:59	Caldate	: 06-JAN-2014, 08-APR-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 323.66 g	Live Time	: 2700 sec
				Dead Time	: 0.09 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Flags
Americium-241	-0.0400	0.149		.18593	.18596	u
Bismuth-212	-0.00251	0.121		.14703	.14703	u
Bismuth-214	-0.0523	0.0415		7.9037	7.9037	u
Cesium-137	-0.00686	0.0171	0.07	.021911	.021915	u
Cobalt-60	0	0.0315		.006422	.0064221	u
Europium-152	-0.000312	0.0357		.043391	.043391	u
Europium-154	-0.0129	0.0490		.062367	.062373	u
Lead-212	-0.0162	0.0273		.20626	.20626	u
Lead-214	-0.00402	0.0360		.048578	.048579	u
Potassium-40	-0.362	0.222		14.496	14.496	u
Protactinium-234	0.0147	0.0931		.11615	.11616	u
Radium-226	-0.0825	0.273	1.3	.34128	.34133	u
Thallium-208	0.00199	0.0160		.018695	.018695	u
Thorium-232 (By Actinium-228)	0.0192	0.0422		.055856	.055871	u
Thorium-234	-0.0339	0.219		.27054	.27056	u
Uranium-235	0	0.0124		.011131	.011131	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: Prep Blank
Sample Description: QC722413, 206637, BLANK

Detector: HPGE08 50-TP42229A
Spectrum ID: 8_20140106_011
Contract: Tetra Tech EC
Sample Type: SAMPLE
Unit Number: BLANK
Matrix: S
Sample Time: 12/30/2013 14:40
Live Time: 2700 sec
Acquisition Time: 1/6/2014 16:28:54
Real Time: 2702 sec
Analysis Time: 1/6/2014 17:14
Dead Time: 0.09 %
Analysis Quantity: 3.237E+02 g

Efficiency: HPGE08 S22147 8_20130407002_EffCal
Efficiency Cal Date: 4/8/2013 11:06
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#AB	1.918E-02	5.586E-02	5.587E-02	4.215E-02
Am-241	#AB	-4.001E-02	1.859E-01	1.860E-01	1.493E-01
Bi-212	#AB	-2.514E-03	1.470E-01	1.470E-01	1.207E-01
Bi-214	#AB	-5.229E-02	7.904E+00	7.904E+00	4.147E-02
Co-60	#AB	0.000E+00	6.422E-03	6.422E-03	3.151E-02
Cs-137	#AB	-6.855E-03	2.191E-02	2.192E-02	1.710E-02
Eu-152	#AB	-3.118E-04	4.339E-02	4.339E-02	3.570E-02
Eu-154	#AB	-1.293E-02	6.237E-02	6.237E-02	4.900E-02
K-40	#AB	-3.624E-01	1.450E+01	1.450E+01	2.217E-01
Pa-234	#AB	1.468E-02	1.162E-01	1.162E-01	9.308E-02
Pb-212	#AB	-1.618E-02	2.063E-01	2.063E-01	2.733E-02
Pb-214	#AB	-4.021E-03	4.858E-02	4.858E-02	3.601E-02
Ra-226	#AB	-8.249E-02	3.413E-01	3.413E-01	2.732E-01
Th-234	#AB	-3.394E-02	2.705E-01	2.706E-01	2.191E-01
Tl-208	#AB	1.991E-03	1.869E-02	1.870E-02	1.602E-02
U-235	#AB	0.000E+00	1.113E-02	1.113E-02	1.244E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 3.585E-02

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/6/2014 17:14:04
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140106_011.An1

Sample description
     QC722413, 206637, BLANK


Spectrum Filename: C:\User\SPC\Det8\8_20140106_011.An1

Acquisition information
       Start time:                 1/6/2014 16:28:54
       Live time:               2700
       Real time:               2702
       Dead time:                  0.09 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_04-07-2013.Clb
     HPGE08 S22147 8_20130407002_EffCal


       Energy Calibration
            Created:               1/6/2014 07:47:05
            Zero offset:          -0.009 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.738E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/8/2013 11:06:59
            Type:                  Polynomial
            Uncertainty:           1.344 %
            Coefficients:         -0.359632  -4.215465   0.446712
                                  -0.054338   0.002307  -0.000047

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2042.04keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2366E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2366E+02) =
                                   8.3504E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:14:04
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:40:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2013-12-28_0941.PBC 12/28/2013 09:41:06
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 2 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.95	1.	635.09	0.82	1.910E-02	74.81	9.600	PBC<MDA	Pb212
123.36	1.	760.68	0.87	4.147E-02	123.10	40.460	PBC<MDA	Eu154
168.03	10.	35.99	0.14	4.442E-02				
238.85	-9.	274.29	0.97	3.963E-02	238.63	43.100	PBC<MDA	Pb212
270.11	4.	204.84	1.00	3.705E-02	270.25	3.460	PBC<MDA	Ac228
294.77	-9.	516.28	1.02	3.514E-02	295.22	19.200	PBC<MDA	Pb214
339.34	4.	142.78	1.06	3.221E-02	338.40	12.010	PBC<MDA	Ac228
352.01	-2.	61.76	1.07	3.139E-02	351.79	37.100	PBC<MDA	Pb214
411.29	3.	277.72	1.12	2.825E-02	411.09	2.264	PBC<MDA	Eu152
463.02	1.	624.36	1.17	2.603E-02	463.00	4.400	PBC<MDA	Ac228
583.25	1.	110.87	1.27	2.220E-02	583.14	86.000	PBC<MDA	Tl208
882.60	1.	395.72	1.51	1.668E-02	883.24	15.000	PBC<MDA	Pa234
910.88	3.	145.59	1.53	1.632E-02	911.07	29.000	PBC<MDA	Ac228
972.24	1.	258.41	1.57	1.563E-02	968.90	17.460	PBC<MDA	Ac228
1120.05	4.	62.28	1.68	1.410E-02	1120.28	15.040	PBC<MDA	Bi214
1620.63	1.	233.41	2.01	1.064E-02	1620.56	2.750	PBC<MDA	Bi212

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1343.97	168.03	1.	10.	2.206E+02	71.98	0.141	-	s

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:14:04
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106_011.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	471.53	58.95	35.	-4.	-0.001	464.66	0.808s
Pb-212	599.55	74.95	32.	1.	0.000	1270.19	0.822s
Pb-212	612.84	76.61	35.	-7.	-0.003	753.06	0.824s
Th-234	732.29	91.55	27.	-2.	-0.001	797.21	0.838s
Eu-152	973.69	121.73	35.	-1.	-0.001	1172.61	0.865s
Eu-154	986.73	123.36	35.	1.	0.000	1521.35	0.867s
Ra-226	1489.54	186.23	35.	-4.	-0.002	413.72	0.924s
Pb-212	1910.42	238.85	42.	-9.	-0.003	548.59	0.971s
Pb-214	1945.51	243.23	43.	-13.	-0.005	479.15	0.974s
Ac-228	2160.49	270.11	28.	4.	0.001	409.69	1.000s
Pb-212	2412.43	301.61	26.	-6.	-0.002	249.56	1.026s
Ac-228	2714.25	339.34	18.	4.	0.002	285.57	1.060s
Pb-214	2815.53	352.01	34.	-2.	-0.001	123.53	1.071s
Eu-152	3289.71	411.29	23.	3.	0.001	555.43	1.123s
Ac-228	3703.53	463.02	14.	1.	0.000	1248.72	1.167s
Tl-208	4665.25	583.25	18.	1.	0.000	221.74	1.268s
Cs-137	5282.08	660.37	17.	-4.	-0.001	319.62	1.331s
Bi-214	5315.47	664.54	20.	-6.	-0.002	242.22	1.335s
Eu-152	6227.16	778.51	16.	-1.	0.000	873.06	1.425s
Bi-212	6277.98	784.87	10.	-2.	-0.001	577.62	1.430s
Tl-208	6883.47	860.56	15.	-3.	-0.001	436.06	1.488s
Pa-234	7059.81	882.60	10.	1.	0.000	791.44	1.505s
Ac-228	7286.01	910.88	8.	3.	0.001	291.19	1.526s
Ac-228	7728.65	966.21	13.	-1.	0.000	1053.33	1.567s
Ac-228	7776.88	972.24	5.	1.	0.000	516.83	1.570s
Bi-214	8959.33	1120.05	10.	4.	0.001	124.57	1.680s
Eu-154	10183.42	1273.06	10.	-2.	-0.001	482.24	1.787s
Bi-212	12964.21	1620.63	2.	1.	0.000	466.82	2.010s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:14:04
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106_011.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	1.9182E-02					3.65E+11	
			911.07	1.918E-02	?(	4.215E-02	1.46E+02	2.90E+01 G
			968.90	1.526E-02	?	6.124E-02	2.58E+02	1.75E+01 GA
			338.40	3.519E-02	&	7.803E-02	1.43E+02	1.20E+01 GA
			964.77	-3.838E-02	+	3.267E-01	5.27E+02	4.99E+00 GA
			463.00	2.306E-02	?	2.336E-01	6.24E+02	4.40E+00 GA
			794.95	0.000E+00	-	9.453E-02	1.00E+03	4.25E+00 GA
			270.25	9.038E-02	?	2.952E-01	2.05E+02	3.46E+00 GA
Am-241	I	-4.0014E-02					3.65E+11	
			59.54	-4.001E-02	&(	1.493E-01	2.32E+02	3.63E+01 G
Bi-212	N	-2.5135E-03					3.65E+11	
			727.17	-2.513E-03	%(	1.207E-01	2.92E+03	1.18E+01 G
			1620.56	9.435E-02	?	3.234E-01	2.33E+02	2.75E+00 GA
			785.42	-1.394E-01	+	6.386E-01	2.89E+02	2.00E+00 GA
Bi-214	N	-5.2289E-02					3.65E+11	
			609.69	-5.229E-02	%(P	4.147E-02	3.76E+03	4.61E+01 G
			1764.51	-6.419E-02	% P	8.264E-02	1.00E+03	1.59E+01 GA
			1120.28	5.619E-02	? P	1.082E-01	6.23E+01	1.50E+01 GA
			768.36	-1.438E-01	% P	3.895E-01	1.00E+03	4.89E+00 GA
			1377.65	-1.459E-01	% P	5.509E-01	1.33E+03	4.02E+00 GA
			934.05	0.000E+00	+	1.417E-01	1.00E+03	3.17E+00 GA
			1407.98	0.000E+00	+	1.673E+00	1.00E+03	2.48E+00 GA
			1509.19	0.000E+00	+	2.129E+00	1.00E+03	2.19E+00 GA
			665.45	-5.426E-01	+	1.014E+00	1.21E+02	1.56E+00 GA
Cs-137	I	-6.8551E-03					3.65E+11	
			661.66	-6.855E-03	?(	1.710E-02	1.60E+02	8.46E+01 G
Eu-152	I	-3.1177E-04					3.65E+11	
			344.30	-3.118E-04	%(	3.570E-02	6.96E+03	2.70E+01 G
			121.87	-3.773E-03	&	3.607E-02	5.86E+02	2.86E+01 GA
			1408.08	0.000E+00	+	1.957E-01	1.00E+03	2.12E+01 GA
			964.05	2.672E-03	%	1.230E-01	2.80E+03	1.46E+01 GA
			778.90	-1.715E-02	+	1.208E-01	4.37E+02	1.30E+01 GA
			411.09	1.214E-01	?	5.409E-01	2.78E+02	2.26E+00 GA
Eu-154	I	-1.2933E-02					3.65E+11	
			1274.80	-1.293E-02	?(	4.900E-02	2.41E+02	3.55E+01 G
			123.10	2.040E-03	+	2.537E-02	7.61E+02	4.05E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/6/2014 17:14:04
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140106_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          723.30 1.140E-03 %   6.887E-02 3.68E+03 1.97E+01 GA

K-40     N  -3.6239E-01                                     3.65E+11
                         1460.80-3.624E-01 %(P 2.217E-01 1.00E+03 1.07E+01 G

Pa-234   N   1.4676E-02                                     3.65E+11
                          883.24 1.468E-02 ?(  9.308E-02 3.96E+02 1.50E+01 G
                           98.44 0.000E+00 -   5.341E-02 1.00E+03 2.51E+01 GA
                          946.00 0.000E+00 &   3.777E-02 1.00E+03 1.20E+01 GA

Pb-212   N  -1.6176E-02                                     3.65E+11
                          238.63-1.618E-02 ?(P 2.733E-02 2.74E+02 4.31E+01 G
                           77.11-6.078E-02 + P 1.169E-01 3.77E+02 1.75E+01 GA
                           74.81 2.152E-02 ?   2.230E-01 6.35E+02 9.60E+00 GA
                           87.20-3.146E-02 % P 2.397E-01 1.07E+03 6.30E+00 GA
                          300.09-1.651E-01 +   3.210E-01 1.25E+02 3.27E+00 GA

Pb-214   N  -4.0208E-03                                     3.65E+11
                          351.79-4.021E-03 ?(P 3.601E-02 6.18E+01 3.71E+01 G
                          295.22-4.256E-02 & P 6.600E-02 5.16E+02 1.92E+01 GA
                          241.92-1.410E-01 + P 1.605E-01 2.40E+02 7.47E+00 GA

Ra-226   N  -8.2489E-02                                     3.65E+11
                          186.20-8.249E-02 ?(  2.732E-01 2.07E+02 3.60E+00 G

Th-234   N  -3.3936E-02                                     3.65E+11
                           92.60-3.394E-02 ?(  2.191E-01 3.99E+02 5.60E+00 G

Tl-208   N   1.9914E-03                                     3.65E+11
                          583.14 1.991E-03 &(P 1.602E-02 1.11E+02 8.60E+01 G
                          860.47-4.000E-02 +   1.379E-01 2.18E+02 1.20E+01 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
```

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:14:04
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106_011.An1

} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	58.95	35.	-4.	-0.001	464.66	-4.001E-02	
Pb-212	74.95	32.	1.	0.000	1270.19	2.152E-02	
Pb-212	76.61	35.	-7.	-0.003	753.06	-6.078E-02	P
Th-234	91.55	27.	-2.	-0.001	797.21	-3.394E-02	
Eu-152	121.73	35.	-1.	-0.001	1172.61	-3.773E-03	
Eu-154	123.36	35.	1.	0.000	1521.35	2.040E-03	
Ra-226	186.23	35.	-4.	-0.002	413.72	-8.249E-02	
Pb-212	238.85	42.	-9.	-0.003	548.59	-1.618E-02	P
Pb-214	243.23	43.	-13.	-0.005	479.15	-1.410E-01	P
Ac-228	270.11	28.	4.	0.001	409.69	9.038E-02	
Pb-212	301.61	26.	-6.	-0.002	249.56	-1.651E-01	
Ac-228	339.34	18.	4.	0.002	285.57	3.519E-02	
Pb-214	352.01	34.	-2.	-0.001	123.53	-4.021E-03	P
Eu-152	411.29	23.	3.	0.001	555.43	1.214E-01	
Ac-228	463.02	14.	1.	0.000	1248.72	2.306E-02	
Tl-208	583.25	18.	1.	0.000	221.74	1.991E-03	P
Cs-137	660.37	17.	-4.	-0.001	319.62	-6.855E-03	
Bi-214	664.54	20.	-6.	-0.002	242.22	-5.426E-01	
Eu-152	778.51	16.	-1.	0.000	873.06	-1.715E-02	
Bi-212	784.87	10.	-2.	-0.001	577.62	-1.394E-01	
Tl-208	860.56	15.	-3.	-0.001	436.06	-4.000E-02	
Pa-234	882.60	10.	1.	0.000	791.44	1.468E-02	
Ac-228	910.88	8.	3.	0.001	291.19	1.918E-02	
Ac-228	966.21	13.	-1.	0.000	1053.33	-3.838E-02	
Ac-228	972.24	5.	1.	0.000	516.83	1.526E-02	
Bi-214	1120.05	10.	4.	0.001	124.57	5.619E-02	P
Eu-154	1273.06	10.	-2.	-0.001	482.24	-1.293E-02	
Bi-212	1620.63	2.	1.	0.000	466.82	9.435E-02	

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:14:04
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106_011.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#A	1.9182E-02	1.9182E-02	5.5856E-02	5.5871E-02	4.215E-02
Am-241	#A	-4.0014E-02	-4.0014E-02	1.8593E-01	1.8596E-01	1.493E-01
Bi-212	#A	-2.5135E-03	-2.5135E-03	1.4703E-01	1.4703E-01	1.207E-01
Bi-214	#A	-5.2289E-02	-5.2289E-02	7.9037E+00	7.9037E+00	4.147E-02
Co-60	#A	0.0000E+00	0.0000E+00	6.4220E-03	6.4221E-03	3.151E-02
Cs-137	#A	-6.8551E-03	-6.8551E-03	2.1911E-02	2.1915E-02	1.710E-02
Eu-152	#A	-3.1177E-04	-3.1177E-04	4.3391E-02	4.3391E-02	3.570E-02
Eu-154	#A	-1.2933E-02	-1.2933E-02	6.2367E-02	6.2373E-02	4.900E-02
K-40	#A	-3.6239E-01	-3.6239E-01	1.4496E+01	1.4496E+01	2.217E-01
Pa-234	#A	1.4676E-02	1.4676E-02	1.1615E-01	1.1616E-01	9.308E-02
Pb-212	#A	-1.6176E-02	-1.6176E-02	2.0626E-01	2.0626E-01	2.733E-02
Pb-214	#A	-4.0208E-03	-4.0208E-03	4.8578E-02	4.8579E-02	3.601E-02
Ra-226	#A	-8.2489E-02	-8.2489E-02	3.4128E-01	3.4133E-01	2.732E-01
Th-234	#A	-3.3936E-02	-3.3936E-02	2.7054E-01	2.7056E-01	2.191E-01
Tl-208	#A	1.9914E-03	1.9914E-03	1.8695E-02	1.8695E-02	1.602E-02
U-235	#A	0.0000E+00	0.0000E+00	1.1131E-02	1.1131E-02	1.244E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2042.0 keV) 0.000E+00 pCi/g
Total Decayed Activity (25.0 to 2042.0 keV) 0.0000000E+00 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SPIKE USER REPORT FOR 251449 RAD Soil
DOE HASL 300 4.5.2.3

Type : LCS
Inst : HPGE07
Seqnum : 1564009082011.4
File : 7_20140106_011
IDF : 1.0
PDF : 1.0
Lab ID : QC722414
Matrix : Soil
Batch : 206637
Time : 06-JAN-2014 16:27
Sample Amount : 330.03 g
Live Time : 2700 sec
Dead Time : 0.18 %
Cal : 06-JAN-2014 07:33:28,21-FEB-2013 11:46:56
Units : pCi/g

Analyte	Spiked	LCS	%Rec	Limits	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Flags
Radium-226	13.00	13.10	101	54-146	1.4871	1.7866	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: LCS
Sample Description: QC722414, 206637, LCS, S19706

Detector: HPGE07 51-TP32743A
Spectrum ID: 7_20140106_011
Contract: Tetra Tech EC
Sample Type: SAMPLE
Unit Number: LCS
Matrix: S
Sample Time: 12/30/2013 14:35
Live Time: 2700 sec
Acquisition Time: 1/6/2014 16:27:27
Real Time: 2705 sec
Analysis Time: 1/6/2014 17:12
Dead Time: 0.18 %
Analysis Quantity: 3.300E+02 g

Efficiency: HPGE07 S21603 7_20130220002_EffCal
Efficiency Cal Date: 2/21/2013 11:46
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		9.970E-01	3.242E-01	3.312E-01	1.314E-01
Am-241	#AB	2.632E-01	6.060E-01	6.065E-01	4.932E-01
Bi-212	#	3.447E-01	3.607E-01	3.615E-01	2.794E-01
Bi-214		1.111E+01	3.829E-01	8.354E-01	7.295E-02
Co-60	#AB	-5.495E-04	5.165E-02	5.165E-02	4.251E-02
Cs-137	#AB	4.654E-02	6.442E-02	6.450E-02	5.107E-02
Eu-152	AB	4.410E-04	1.615E-01	1.615E-01	1.330E-01
Eu-154	#AB	-2.932E-02	1.476E-01	1.476E-01	1.195E-01
K-40		8.807E+00	1.120E+00	1.278E+00	3.487E-01
Pa-234	#AB	-1.066E-01	3.375E-01	3.375E-01	2.720E-01
Pb-212		6.428E-01	1.292E-01	1.379E-01	7.025E-02
Pb-214		1.196E+01	3.877E-01	9.029E-01	9.828E-02
Ra-226		1.310E+01	1.487E+00	1.787E+00	9.324E-01
Th-234	#AB	-1.654E-01	8.982E-01	8.983E-01	7.350E-01
Tl-208		1.984E-01	6.133E-02	6.274E-02	3.133E-02
U-235	AB	4.360E-02	1.172E-01	1.172E-01	9.579E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 4.750E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/6/2014 17:12:46
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106_011.An1

Sample description
     QC722414, 206637, LCS, S19706


Spectrum Filename: C:\User\SPC\Det7\7_20140106_011.An1

Acquisition information
       Start time:                 1/6/2014 16:27:27
       Live time:               2700
       Real time:               2705
       Dead time:                  0.18 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               1/6/2014 07:33:28
            Zero offset:          -0.010 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.439E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2041.12keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3003E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3003E+02) =
                                   8.1893E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:12:46
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:35:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2013-12-28_0940.PBC 12/28/2013 09:40:25
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 35 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1089

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.86	196.	15.50	0.46	0.000E+00				
50.71	66.	41.91	0.88	3.708E-03				
59.44	32.	115.12	0.84	1.006E-02	59.54	36.300	PBC<MDA	Am241
74.68	707.	6.16	0.86	2.202E-02	74.81	9.600	1.009E+01	Pb212
77.04	1119.	4.19	0.86	2.377E-02	77.11	17.500	8.114E+00	Pb212
79.36	125.	24.05	0.86	2.543E-02				
87.05	459.	8.16	0.87	3.055E-02	87.20	6.300	7.201E+00	Pb212
89.71	162.	18.92	0.87	3.215E-02				
98.45	24.	145.95	0.88	3.673E-02	98.44	25.100	PBC<MDA	Pa234
119.86	32.	76.48	0.90	4.432E-02				
119.97	35.	53.68	0.15	4.432E-02				
121.76	27.	103.29	0.90	4.476E-02	121.87	28.590	PBC<MDA	Eu152
123.33	22.	169.49	0.91	4.503E-02	123.10	40.460	PBC<MDA	Eu154
153.91	81.	35.07	0.94	4.829E-02				
155.83	73.	40.85	0.94	4.833E-02				
163.75	35.	60.02	0.14	4.833E-02				
186.19	847.	7.80	0.96	4.744E-02	185.70	54.000	1.003E+00	U235
					186.20	3.600	1.505E+01	Ra226
234.82	70.	36.84	0.30	4.346E-02				
238.61	440.	7.29	1.02	4.311E-02	238.63	43.100	7.046E-01	Pb212
241.98	1301.	3.45	1.02	4.281E-02	241.92	7.470	1.227E+01	Pb214
270.22	28.	100.81	1.05	4.027E-02	270.25	3.460	PBC<MDA	Ac228
274.97	92.	34.84	0.56	3.986E-02				
282.61	44.	38.83	0.27	3.921E-02				
295.22	2907.	2.20	1.16	3.816E-02	295.22	19.200	1.199E+01	Pb214
300.02	79.	38.61	0.16	3.777E-02				
300.22	50.	53.17	1.08	3.777E-02	300.09	3.270	1.240E+00	Pb212

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:12:46
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
338.40	112.	31.07	0.23	3.490E-02	338.40	12.010	7.957E-01	Ac228
351.93	5088.	1.65	1.20	3.398E-02	351.79	37.100	1.219E+01	Pb214
410.79	7.	308.15	1.18	3.050E-02	411.09	2.264	PBC<MDA	Eu152
480.84	97.	26.82	0.41	2.729E-02				
486.72	160.	17.92	0.73	2.705E-02				
492.33	18.	49.62	0.27	2.683E-02				
583.24	134.	14.73	0.41	2.378E-02	583.14	86.000	1.984E-01	Tl208
609.34	3906.	1.72	1.34	2.305E-02	609.69	46.090	1.111E+01	Bi214
661.39	28.	69.21	1.40	2.175E-02	661.66	84.620	PBC<MDA	Cs137
665.43	90.	21.76	1.40	2.166E-02	665.45	1.560	8.055E+00	Bi214
697.28	32.	38.95	0.27	2.096E-02				
726.97	27.	46.19	1.45	2.034E-02	727.17	11.800	3.447E-01	Bi212
					727.17	11.800	3.447E-01	Bi212
768.29	442.	6.81	0.81	1.957E-02	768.36	4.890	1.403E+01	Bi214
774.98	7.	157.16	1.50	1.938E-02	778.90	12.990	PBC<MDA	Eu152
785.83	108.	15.19	1.50	1.927E-02	785.42	2.000	8.506E+00	Bi212
					785.42	2.000	8.506E+00	Bi212
794.93	10.	131.09	1.51	1.911E-02	794.95	4.250	PBC<MDA	Ac228
860.77	3.	415.88	1.56	1.807E-02	860.47	12.000	PBC<MDA	Tl208
911.24	165.	15.91	0.93	1.735E-02	911.07	29.000	9.970E-01	Ac228
934.25	235.	9.56	0.86	1.705E-02	934.05	3.170	1.319E+01	Bi214
964.62	17.	50.26	1.64	1.666E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	PBC<MDA	Ac228
969.36	31.	41.94	1.64	1.661E-02	968.90	17.460	3.214E-01	Ac228
1120.34	928.	3.84	1.45	1.496E-02	1120.28	15.040	1.245E+01	Bi214
1155.74	104.	13.95	1.78	1.463E-02				
1161.50	22.	41.30	1.78	1.458E-02				
1238.13	308.	7.91	0.81	1.391E-02				
1254.10	18.	46.47	0.13	1.377E-02				
1377.89	264.	7.77	0.92	1.283E-02	1377.65	4.020	1.549E+01	Bi214
1408.29	101.	15.24	1.95	1.262E-02	1407.98	2.480	9.755E+00	Bi214
					1408.08	21.210	1.141E+00	Eu152
1460.85	381.	6.10	0.74	1.227E-02	1460.80	10.700	8.807E+00	K40
1509.06	167.	11.67	0.38	1.196E-02	1509.19	2.190	1.932E+01	Bi214
1619.94	4.	254.81	2.08	1.129E-02	1620.56	2.750	PBC<MDA	Bi212
					1620.56	2.750	3.439E-01	Bi212
1764.64	804.	3.67	2.00	1.052E-02	1764.51	15.920	1.442E+01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.84	30.86	221.	196.	0.000E+00	31.00	0.457	-	s
405.60	50.71	267.	66.	1.775E+04	83.82	0.880	TH-227	s
597.13	74.66	1118.	213.	9.661E+03	46.52	0.882	-	M
634.60	79.34	315.	104.	4.089E+03	57.42	0.524	TH-227	sM

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:12:46
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106_011.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
696.58	87.10	869.	98.	3.205E+03	87.53	0.739	-	M
717.90	89.76	329.	188.	5.836E+03	31.02	0.486	-	sM
958.61	119.97	292.	32.	7.330E+02	152.96	0.902	-	sc
1230.96	153.95	363.	81.	1.678E+03	70.15	0.936	AC-228	D
1246.25	155.86	406.	73.	1.507E+03	81.70	0.938	RA-223	D
1309.61	163.75	211.	50.	1.042E+03	86.30	0.136	-	sM
1878.01	234.82	203.	70.	1.604E+03	73.68	0.302	-	sM
2199.18	274.97	257.	92.	2.298E+03	69.67	0.557	PB-214	s
2260.29	282.61	110.	44.	1.135E+03	77.67	0.273	-	s
2399.51	300.02	276.	27.	7.107E+02	179.30	0.158	PA-231	sc
3845.97	480.84	116.	97.	3.555E+03	53.65	0.408	-	s
3892.97	486.72	113.	160.	5.926E+03	35.84	0.734	PB-214	s
3937.87	492.33	29.	18.	6.783E+02	99.24	0.272	-	s
5577.59	697.28	32.	32.	1.508E+03	77.90	0.269	-	s
9246.55	1155.74	30.	141.	9.638E+03	26.57	0.553	BI-214	s
9292.66	1161.50	10.	32.	2.223E+03	49.78	0.389	-	s
9906.08	1238.13	41.	308.	2.213E+04	15.82	0.806	BI-214	s
10033.88	1254.10	15.	18.	1.278E+03	92.93	0.133	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	475.43	59.44	649.	32.	0.012	230.24	0.841s
Pb-212	597.10	74.66	1510.	470.	0.174	25.14	0.857
Pb-212	615.99	77.02	640.	1034.	0.383	10.81	0.804
Pb-212	696.18	87.04	781.	431.	0.160	20.66	0.869
Th-234	760.02	95.03	386.	-10.	-0.004	543.16	0.875s
Pa-234	787.36	98.45	606.	24.	0.009	291.90	0.881s
Eu-152	974.68	121.87	376.	27.	0.010	206.57	0.904D
Eu-154	986.35	123.33	700.	22.	0.008	338.99	0.905s
U-235	1135.63	141.99	566.	-7.	-0.003	959.81	0.926
U-235	1307.53	163.49	779.	-17.	-0.006	468.82	0.945
U-235	1485.18	185.70	1207.	37.	0.014	268.75	0.967D
Ra-226	1489.17	186.20	508.	737.	0.273	11.35	0.967D
Pb-212	1908.41	238.62	341.	394.	0.146	19.67	1.049
Pb-214	1935.40	241.99	506.	1321.	0.489	9.13	0.996
Ac-228	2161.19	270.22	430.	28.	0.011	201.63	1.048s
Pb-214	2361.17	295.22	279.	2897.	1.073	4.40	1.163

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:12:46
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	2401.10	300.22	364.	50.	0.019	106.34	1.077
Ac-228	2706.24	338.36	368.	74.	0.027	74.38	1.113s
Pb-214	2814.91	351.95	308.	4971.	1.841	3.23	1.199
Eu-152	3285.61	410.79	258.	7.	0.003	616.29	1.180s
Tl-208	4665.14	583.24	82.	134.	0.050	29.46	0.409s
Bi-214	4873.95	609.34	120.	3889.	1.440	3.43	1.338
Cs-137	5290.44	661.39	177.	28.	0.010	138.42	1.399s
Bi-214	5322.79	665.43	146.	90.	0.033	43.51	1.403s
Eu-154	5787.61	723.53	127.	-20.	-0.007	167.30	1.451s
Bi-212	5815.18	726.97	90.	27.	0.010	92.37	1.454s
Bi-214	6145.77	768.29	76.	442.	0.164	13.63	0.806s
Eu-152	6199.29	774.98	50.	7.	0.002	314.32	1.496s
Bi-212	6286.11	785.83	81.	108.	0.040	30.39	1.501s
Ac-228	6358.91	794.93	85.	10.	0.004	262.19	1.509s
Tl-208	6885.83	860.77	96.	3.	0.001	831.76	1.561s
Pa-234	7059.62	882.49	105.	-9.	-0.003	316.46	1.579s
Ac-228	7289.70	911.24	88.	165.	0.061	31.83	0.926s
Bi-214	7473.81	934.25	45.	235.	0.087	19.13	0.861s
Pa-234	7567.99	946.01	90.	-9.	-0.003	291.89	1.627s
Ac-228	7718.09	964.77	73.	17.	0.006	100.51	1.641D
Ac-228	7754.80	969.36	91.	31.	0.011	83.89	1.645s
Bi-214	8963.23	1120.34	47.	924.	0.342	7.69	1.451
Eu-154	10221.96	1277.60	67.	-5.	-0.002	503.34	1.863s
Bi-214	11024.87	1377.89	26.	264.	0.098	15.54	0.919s
Bi-214	11265.76	1407.98	62.	101.	0.037	30.48	1.949D
K-40	11689.06	1460.85	42.	381.	0.141	12.19	0.740s
Bi-214	12075.01	1509.06	27.	167.	0.062	23.34	0.377s
Bi-212	12962.83	1619.94	38.	4.	0.001	509.62	2.077s
Bi-214	14121.60	1764.64	14.	797.	0.295	7.33	2.003

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	9.9700E-01				3.65E+11	
			911.07	9.970E-01	(P	1.314E-01 1.59E+01 2.90E+01	G
			968.90	3.214E-01	- P	2.325E-01 4.19E+01 1.75E+01	GA
			338.40	5.352E-01	- P	3.234E-01 3.72E+01 1.20E+01	GA
			964.77	6.202E-01	} P	7.267E-01 5.03E+01 4.99E+00	GA
			463.00	-3.742E-02	% P	6.465E-01 4.31E+03 4.40E+00	GA
			794.95	3.828E-01	-	8.030E-01 1.31E+02 4.25E+00	GA
			270.25	6.204E-01	- P	1.052E+00 1.01E+02 3.46E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:12:46
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	2.6321E-01					3.65E+11	
			59.54	2.632E-01	?(	4.932E-01	1.15E+02	3.63E+01 G
Bi-212	N	3.4468E-01					3.65E+11	
			727.17	3.447E-01	?(P	2.794E-01	4.62E+01	1.18E+01 G
			1620.56	3.439E-01	?	1.412E+00	2.55E+02	2.75E+00 GA
			785.42	8.506E+00		1.648E+00	1.52E+01	2.00E+00 GA
Bi-214	N	1.1105E+01					3.65E+11	
			609.69	1.111E+01	(P	7.295E-02	1.72E+00	4.61E+01 G
			1764.51	1.442E+01	+ P	1.593E-01	3.67E+00	1.59E+01 GA
			1120.28	1.245E+01	P	2.156E-01	3.84E+00	1.50E+01 GA
			768.36	1.403E+01	+	6.459E-01	6.81E+00	4.89E+00 GA
			1377.65	1.549E+01	+	6.918E-01	7.77E+00	4.02E+00 GA
			934.05	1.319E+01	+	8.772E-01	9.56E+00	3.17E+00 GA
			1407.98	9.755E+00	}	1.782E+00	1.52E+01	2.48E+00 GA
			1509.19	1.932E+01	+	1.408E+00	1.17E+01	2.19E+00 GA
			665.45	8.055E+00	- P	2.526E+00	2.18E+01	1.56E+00 GA
Co-60	T	-5.4948E-04					3.65E+11	
			1173.24	-5.495E-04	%(	4.251E-02	4.70E+03	9.99E+01 G
			1332.50	0.000E+00	+	4.651E-02	1.00E+03	1.00E+02 G
Cs-137	I	4.6544E-02					3.65E+11	
			661.66	4.654E-02	(	5.107E-02	6.92E+01	8.46E+01 G
Eu-152	I	4.4096E-04					3.65E+11	
			344.30	4.410E-04	&(	1.330E-01	1.83E+04	2.70E+01 G
			121.87	6.401E-02		1.070E-01	1.03E+02	2.86E+01 GA
			1408.08	4.410E-04	}	1.238E-01	1.83E+04	2.12E+01 GA
			964.05	4.410E-04	}	2.739E-01	1.20E+03	1.46E+01 GA
			778.90	7.945E-02	?	1.993E-01	1.57E+02	1.30E+01 GA
			411.09	3.260E-01	&	1.643E+00	3.08E+02	2.26E+00 GA
Eu-154	I	-2.9317E-02					3.65E+11	
			1274.80	-2.932E-02	?(	1.195E-01	2.52E+02	3.55E+01 G
			123.10	3.705E-02	&	1.027E-01	1.69E+02	4.05E+01 GA
			723.30	-1.490E-01	+	1.978E-01	8.36E+01	1.97E+01 GA
K-40	N	8.8072E+00					3.65E+11	
			1460.80	8.807E+00	(P	3.487E-01	6.10E+00	1.07E+01 G
Pa-234	N	-1.0663E-01					3.65E+11	
			883.24	-1.066E-01	?(	2.720E-01	1.58E+02	1.50E+01 G
			98.44	7.923E-02	?	1.887E-01	1.46E+02	2.51E+01 GA
			946.00	-1.408E-01	+	3.301E-01	1.46E+02	1.20E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/6/2014 17:12:46
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   6.4279E-01                                     3.65E+11
                           238.63 6.428E-01  (P 7.025E-02 9.83E+00 4.31E+01 G
                            77.11 7.517E+00 + P 4.288E-01 5.40E+00 1.75E+01 GA
                            74.81 6.708E+00 +   1.292E+00 1.26E+01 9.60E+00 GA
                            87.20 6.781E+00 + P 1.024E+00 1.03E+01 6.30E+00 GA
                           300.09 1.240E+00 + P 1.092E+00 5.32E+01 3.27E+00 GA

Pb-214   N   1.1957E+01                                     3.65E+11
                           351.79 1.196E+01  (P 9.828E-02 1.62E+00 3.71E+01 G
                           295.22 1.199E+01   P 1.612E-01 2.20E+00 1.92E+01 GA
                           241.92 1.253E+01   P 4.971E-01 4.57E+00 7.47E+00 GA

Ra-226   N   1.3097E+01                                     3.65E+11
                           186.20 1.310E+01  (  9.324E-01 5.68E+00 3.60E+00 G

Th-234   N  -1.6536E-01                                     3.65E+11
                            92.60-1.654E-01 ?(  7.350E-01 2.72E+02 5.60E+00 G

Tl-208   N   1.9837E-01                                     3.65E+11
                           583.14 1.984E-01  (P 3.133E-02 1.47E+01 8.60E+01 G
                           860.47 4.690E-02 -   3.186E-01 4.16E+02 1.20E+01 GA

U-235    N   4.3598E-02                                     3.65E+11
                           185.70 4.360E-02  (  9.579E-02 1.34E+02 5.40E+01 G
                           143.76-4.245E-02 +   3.346E-01 4.80E+02 1.05E+01 GA
                           163.35-2.261E-01 +   8.684E-01 2.34E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
```

ORTEC g v - i (3263) Env32 G53W4.26 1/6/2014 17:12:46
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106_011.An1

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Th-234	95.03	386.	-10.	-0.004	543.16	-1.654E-01	
Eu-154	123.33	700.	22.	0.008	338.99	3.705E-02	
Cs-137	661.39	177.	28.	0.010	138.42	4.654E-02	
Eu-154	723.53	127.	-20.	-0.007	167.30	-1.490E-01	
Bi-212	726.97	90.	27.	0.010	92.37	3.447E-01	P
Bi-212	785.83	81.	108.	0.040	30.39	8.506E+00	
Eu-154	1277.60	67.	-5.	-0.002	503.34	-2.932E-02	
Bi-212	1619.94	38.	4.	0.001	509.62	3.439E-01	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	9.9700E-01	9.9700E-01	3.2424E-01	3.3116E-01	1.314E-01
Am-241 #A	2.6321E-01	2.6321E-01	6.0600E-01	6.0645E-01	4.932E-01
Bi-212 #	3.4468E-01	3.4468E-01	3.6069E-01	3.6145E-01	2.794E-01
Bi-214	1.1105E+01	1.1105E+01	3.8293E-01	8.3540E-01	7.295E-02
Co-60 #A	-5.4948E-04	-5.4948E-04	5.1652E-02	5.1652E-02	4.251E-02
Cs-137 #A	4.6544E-02	4.6544E-02	6.4425E-02	6.4501E-02	5.107E-02
Eu-152 A	4.4096E-04	4.4096E-04	1.6153E-01	1.6153E-01	1.330E-01
Eu-154 #A	-2.9317E-02	-2.9317E-02	1.4756E-01	1.4758E-01	1.195E-01
K-40	8.8072E+00	8.8072E+00	1.1197E+00	1.2783E+00	3.487E-01
Pa-234 #A	-1.0663E-01	-1.0663E-01	3.3745E-01	3.3753E-01	2.720E-01
Pb-212	6.4279E-01	6.4279E-01	1.2920E-01	1.3793E-01	7.025E-02
Pb-214	1.1957E+01	1.1957E+01	3.8769E-01	9.0294E-01	9.828E-02
Ra-226	1.3097E+01	1.3097E+01	1.4871E+00	1.7866E+00	9.324E-01
Th-234 #A	-1.6536E-01	-1.6536E-01	8.9818E-01	8.9830E-01	7.350E-01
Tl-208	1.9837E-01	1.9837E-01	6.1332E-02	6.2738E-02	3.133E-02
U-235 A	4.3598E-02	4.3598E-02	1.1717E-01	1.1722E-01	9.579E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/6/2014 17:12:46
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106_011.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
-----------------------------   S U M M A R Y   -----------------------------
Total Activity ( 1408.0 to  2041.1 keV)     4.680E+01  pCi/g
Total Decayed Activity ( 1408.0 to  2041.1 keV) 4.6804260E+01  pCi/g

Analyzed by: ____________________________________________
                   Technician

Reviewed by: ____________________________________________
                   Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type	: MSS	Type	: SDUP
Inst	: HPGE06	Inst	: HPGE07
Seqnum	: 1554011902007	Seqnum	: 1564011942009.4
File	: 6_20140108_007	File	: 7_20140108_009
IDF	: 1.0	IDF	: 1.0
PDF	: 1.0	PDF	: 1.0
Lab ID	: 251445-016	Lab ID	: QC722416
Matrix	: Soil	Matrix	: Soil
Batch	: 206637	Batch	: 206637
Time	: 08-JAN-2014 11:13	Time	: 08-JAN-2014 15:11
Sample Amount	: 375.04 g	Sample Amount	: 368.76 g
Live Time	: 5400 sec	Live Time	: 5400 sec
Dead Time	: 0.08 %	Dead Time	: 0.06 %
Cal	: 08-JAN-2014 06:45:06,06-JAN-2014 16:42:07	Cal	: 08-JAN-2014 07:13:44,21-FEB-2013 11:46:56
Units	: pCi/g		

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	SDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.04699	0.09447		.11717	.11725	0.05915	0.1139		.14138	.14147		40		1	u
Bismuth-212	0.1237	0.08619		.11763	.11796	0.3977	0.06406		.14358	.14609	**105***	40	**1.038***	1	u
Bismuth-214	0.2590	0.02296		.04749	.05087	0.2712	0.02659		.056346	.059192	5	40	0.110	1	u
Cesium-137	0.008498	0.01331	0.07	.016939	.016949	0.007396	0.01193	0.07	.015212	.01522		20		1	u
Cobalt-60	-0.003197	0.01787		.012728	.01273	0.002716	0.01528		.012599	.0126		40		1	u
Europium-152	-0.01622	0.03502		.043658	.043673	0.01009	0.02997		.037181	.037187		40		1	u
Europium-154	0	0.03905		.027271	.027271	0.0001480	0.03251		.039491	.039491		40		1	u
Lead-212	0.3552	0.01930		.044115	.051687	0.3096	0.01850		.040902	.047053	14	40	0.462	1	u
Lead-214	0.3923	0.02444		.065762	.071345	0.3391	0.02127		.047594	.052914	15	40	0.429	1	u
Potassium-40	13.09	0.1906		.79332	1.2123	12.71	0.1735		.775	1.1801	3	40	0.159	1	u
Protactinium-234	0.0001344	0.08550		.10381	.10381	0.01176	0.08660		.10626	.10627		40		1	u
Radium-226	0.3755	0.2259	1.3	.29599	.29735	0.3482	0.2285	1.3	.29661	.29778	8	20	0.046	1	u
Thallium-208	0.1382	0.007026		.024318	.026179	0.09537	0.01358		.022394	.023276	37	40	0.866	1	u
Thorium-232 (By Actinium-228)	0.4371	0.02328		.083547	.088934	0.4014	0.03395		.09328	.097139	9	40	0.192	1	u
Thorium-234	0.3987	0.2422		.31195	.31399	0.2032	0.2713		.33813	.33862		40		1	u
Uranium-235	0.02245	0.01541		.019981	.020054	0.02013	0.01556		.019981	.020039	11	40	0.058	1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0039-16DUP
Sample Description: QC722416, 206637, SDUP

Detector: HPGE07 51-TP32743A
Spectrum ID: 7_20140108_009
Contract: ITSI
Sample Type: DUP
Unit Number: PD-D0039
Matrix: S
Sample Time: 11/29/2013 15:49
Live Time: 5400 sec
Acquisition Time: 1/8/2014 15:11:51
Real Time: 5403 sec
Analysis Time: 1/8/2014 16:42
Dead Time: 0.06 %
Analysis Quantity: 3.688E+02 g

Efficiency: HPGE07 S21603 7_20130220002_EffCal
Efficiency Cal Date: 2/21/2013 11:46
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.014E-01	9.328E-02	9.714E-02	3.395E-02
Am-241	#AB	5.915E-02	1.414E-01	1.415E-01	1.139E-01
Bi-212		3.977E-01	1.436E-01	1.461E-01	6.406E-02
Bi-214		2.712E-01	5.635E-02	5.919E-02	2.659E-02
Co-60	#AB	2.716E-03	1.260E-02	1.260E-02	1.528E-02
Cs-137	#AB	7.396E-03	1.521E-02	1.522E-02	1.193E-02
Eu-152	#AB	1.009E-02	3.718E-02	3.719E-02	2.997E-02
Eu-154	#AB	1.480E-04	3.949E-02	3.949E-02	3.251E-02
K-40		1.271E+01	7.750E-01	1.180E+00	1.735E-01
Pa-234	#AB	1.176E-02	1.063E-01	1.063E-01	8.660E-02
Pb-212		3.096E-01	4.090E-02	4.705E-02	1.850E-02
Pb-214		3.391E-01	4.759E-02	5.291E-02	2.127E-02
Ra-226		3.482E-01	2.966E-01	2.978E-01	2.285E-01
Th-234	#AB	2.032E-01	3.381E-01	3.386E-01	2.713E-01
Tl-208	#	9.537E-02	2.239E-02	2.328E-02	1.358E-02
U-235		2.013E-02	1.998E-02	2.004E-02	1.556E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.519E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 16:42:08
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_009.An1

Sample description
     QC722416, 206637, SDUP


Spectrum Filename: C:\User\SPC\Det7\7_20140108_009.An1

Acquisition information
       Start time:                 1/8/2014 15:11:51
       Live time:               5400
       Real time:               5403
       Dead time:                  0.06 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.6876E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.6876E+02) =
                                   7.3292E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 15:49:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2013-12-28_0940.PBC 12/28/2013 09:40:25
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 24 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1719

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.83	16.	119.51	0.82	1.006E-02	59.54	36.300	PBC<MDA	Am241
74.62	97.	20.74	0.84	2.195E-02	74.81	9.600	6.212E-01	Pb212
77.06	182.	11.43	0.84	2.376E-02	77.11	17.500	5.708E-01	Pb212
87.30	65.	42.37	0.19	3.068E-02	87.20	6.300	4.450E-01	Pb212
92.86	28.	83.20	0.86	3.375E-02	92.60	5.600	PBC<MDA	Th234
98.01	26.	80.23	0.86	3.673E-02	98.44	25.100	PBC<MDA	Pa234
					98.44	25.100	3.821E-02	Pa234
121.95	19.	111.52	0.89	4.476E-02	121.87	28.590	PBC<MDA	Eu152
					121.87	28.590	1.968E-02	Eu152
122.87	9.	227.92	0.89	4.503E-02	123.10	40.460	PBC<MDA	Eu154
163.49	19.	112.01	0.93	4.834E-02	163.35	4.700	PBC<MDA	U235
185.85	93.	30.06	0.57	4.746E-02	185.70	54.000	4.914E-02	U235
186.18	44.	42.59	0.96	4.744E-02	186.20	3.600	3.482E-01	Ra226
196.07	23.	52.16	0.48	4.677E-02				
209.16	69.	26.79	0.40	4.573E-02				
233.55	50.	35.83	0.18	4.358E-02				
238.58	461.	7.16	0.72	4.312E-02	238.63	43.100	3.240E-01	Pb212
241.52	138.	15.15	0.57	4.281E-02	241.92	7.470	5.849E-01	Pb214
270.09	35.	43.79	1.04	4.027E-02	270.25	3.460	3.417E-01	Ac228
295.35	236.	9.81	0.82	3.815E-02	295.22	19.200	3.981E-01	Pb214
300.27	25.	49.50	1.07	3.777E-02	300.09	3.270	2.710E-01	Pb212
338.17	149.	14.48	0.21	3.492E-02	338.40	12.010	4.654E-01	Ac228
344.34	7.	184.29	1.12	3.449E-02	344.30	27.000	PBC<MDA	Eu152
					344.30	27.000	1.009E-02	Eu152
351.89	351.	6.31	0.71	3.399E-02	351.79	37.100	3.391E-01	Pb214
414.95	25.	42.33	0.27	3.030E-02				
462.82	46.	24.56	0.42	2.804E-02				

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
463.05	23.	42.73	1.23	2.803E-02	463.00	4.400	2.553E-01	Ac228
583.20	180.	10.34	1.17	2.378E-02	583.14	86.000	1.104E-01	Tl208
604.19	24.	37.26	0.16	2.319E-02				
609.22	255.	8.82	0.92	2.306E-02	609.69	46.090	2.827E-01	Bi214
662.22	10.	102.84	1.42	2.175E-02	661.66	84.620	PBC<MDA	Cs137
669.21	7.	97.96	1.42	2.166E-02	665.45	1.560	PBC<MDA	Bi214
720.17	1.	539.70	1.47	2.042E-02	723.30	19.700	PBC<MDA	Eu154
727.19	70.	16.36	0.21	2.034E-02	727.17	11.800	3.977E-01	Bi212
768.67	6.	184.39	1.51	1.957E-02	768.36	4.890	PBC<MDA	Bi214
785.88	12.	90.77	1.53	1.927E-02	785.42	2.000	PBC<MDA	Bi212
794.90	8.	117.78	1.53	1.911E-02	794.95	4.250	PBC<MDA	Ac228
882.92	2.	451.85	1.61	1.774E-02	883.24	15.000	PBC<MDA	Pa234
					883.24	15.000	1.176E-02	Pa234
911.38	149.	11.08	0.54	1.735E-02	911.07	29.000	4.014E-01	Ac228
935.08	2.	509.57	1.65	1.705E-02	934.05	3.170	PBC<MDA	Bi214
945.70	5.	187.14	1.66	1.689E-02	946.00	12.000	PBC<MDA	Pa234
					946.00	12.000	3.332E-02	Pa234
964.21	0.	645.22	1.68	1.666E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	PBC<MDA	Ac228
					964.05	14.580	PBC<MDA	Eu152
968.86	90.	14.96	0.19	1.661E-02	968.90	17.460	3.862E-01	Ac228
1120.62	31.	30.46	1.80	1.497E-02	1120.28	15.040	1.876E-01	Bi214
1171.14	1.	786.86	1.84	1.447E-02	1173.24	99.860	PBC<MDA	Co60
1331.48	4.	231.95	1.96	1.316E-02	1332.50	99.980	PBC<MDA	Co60
1377.18	45.	14.91	0.25	1.283E-02	1377.65	4.020	1.184E+00	Bi214
1407.92	9.	83.68	2.01	1.262E-02	1407.98	2.480	PBC<MDA	Bi214
					1408.08	21.210	4.705E-02	Eu152
					1408.08	21.210	4.705E-02	Eu152
1408.00	9.	85.54	2.01	1.262E-02	1407.98	2.480	3.953E-01	Bi214
					1408.08	21.210	4.622E-02	Eu152
1460.94	1280.	2.86	1.83	1.226E-02	1460.80	10.700	1.291E+01	K40
1509.94	7.	101.66	2.08	1.196E-02	1509.19	2.190	PBC<MDA	Bi214
1620.36	9.	73.41	2.15	1.129E-02	1620.56	2.750	PBC<MDA	Bi212
1764.76	6.	38.33	2.23	1.053E-02	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1568.03	196.07	55.	23.	5.004E+02	104.32	0.483	-	s
1672.72	209.16	86.	69.	1.513E+03	53.59	0.395	AC-228	s
1867.84	233.55	83.	50.	1.152E+03	71.65	0.183	-	s
3318.75	414.95	27.	25.	8.152E+02	72.11	0.266	-	s
4832.71	604.19	17.	24.	1.043E+03	74.53	0.158	-	s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	478.42	59.83	173.	16.	0.003	239.02	0.821s
Pb-212	597.60	74.73	303.	53.	0.010	96.16	0.838s
Pb-212	616.13	77.05	211.	189.	0.035	25.15	0.840
Pb-212	698.00	87.28	292.	53.	0.010	92.39	0.851s
Th-234	742.57	92.86	263.	28.	0.005	166.39	0.857s
Pa-234	783.76	98.01	204.	26.	0.005	160.47	0.863s
Eu-152	975.22	121.95	205.	19.	0.003	223.05	0.888s
Eu-154	982.57	122.87	210.	9.	0.002	455.84	0.889s
U-235	1307.44	163.49	221.	19.	0.004	224.03	0.931
U-235	1485.10	185.70	159.	38.	0.007	99.25	0.955D
Ra-226	1489.10	186.20	152.	44.	0.008	85.19	0.955D
Pb-212	1908.37	238.62	118.	424.	0.078	12.69	0.719s
Pb-214	1931.58	241.52	111.	138.	0.026	30.30	0.574s
Ac-228	2160.04	270.09	116.	35.	0.006	87.58	1.042s
Pb-214	2362.12	295.35	81.	215.	0.040	19.62	0.824s
Pb-212	2401.43	300.27	89.	25.	0.005	99.00	1.072s
Ac-228	2704.90	338.21	83.	93.	0.017	32.60	1.110s
Eu-152	2753.93	344.34	78.	7.	0.001	368.58	1.116s
Pb-214	2814.38	351.89	72.	315.	0.058	12.61	0.709s
Ac-228	3703.59	463.05	57.	23.	0.004	85.46	1.232s
Tl-208	4665.53	583.30	77.	144.	0.027	21.50	1.345
Bi-214	4873.10	609.24	80.	212.	0.039	17.94	0.915s
Cs-137	5296.97	662.22	48.	10.	0.002	205.68	1.417s
Bi-214	5352.86	669.21	21.	7.	0.001	195.91	1.420s
Eu-154	5760.59	720.17	30.	1.	0.000	1079.40	1.472s
Bi-212	5816.77	727.19	24.	70.	0.013	32.73	0.206s
Bi-214	6148.65	768.67	64.	6.	0.001	368.78	1.511s
Bi-212	6286.34	785.88	56.	12.	0.002	181.54	1.526s
Ac-228	6358.56	794.90	45.	8.	0.002	235.57	1.534s
Pa-234	7062.89	882.92	53.	2.	0.000	903.71	1.609s
Ac-228	7290.59	911.38	29.	149.	0.028	22.17	0.536s
Bi-214	7480.26	935.08	48.	2.	0.000	1019.13	1.651s
Pa-234	7565.22	945.70	41.	5.	0.001	374.28	1.661s
Ac-228	7751.25	968.94	66.	45.	0.008	49.41	1.680s
Bi-214	8965.15	1120.62	64.	31.	0.006	60.91	1.799s
Co-60	9369.45	1171.14	49.	1.	0.000	1573.71	1.839s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Co-60	10652.90	1331.48	43.	4.	0.001	463.90	1.956s
Bi-214	11018.71	1377.18	0.	45.	0.008	29.81	0.250s
Bi-214	11264.75	1407.92	26.	9.	0.002	167.37	2.008s
Eu-152	11265.37	1408.00	26.	9.	0.002	171.09	2.008s
K-40	11689.32	1460.95	52.	1229.	0.228	5.94	1.825
Bi-214	12081.51	1509.94	19.	7.	0.001	203.33	2.076s
Bi-212	12965.52	1620.36	16.	9.	0.002	146.82	2.147s
Bi-214	14121.75	1764.76	32.	6.	0.001	76.66	2.234s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	4.0139E-01				3.65E+11	
			911.07	4.014E-01	(P	3.395E-02 1.11E+01 2.90E+01	G
			968.90	2.126E-01	- P	8.890E-02 2.47E+01 1.75E+01	GA
			338.40	3.007E-01	- P	6.870E-02 1.63E+01 1.20E+01	GA
			964.77	-2.846E-03	% P	3.562E-01 6.45E+02 4.99E+00	GA
			463.00	2.553E-01	- P	1.931E-01 4.27E+01 4.40E+00	GA
			794.95	1.405E-01	-	2.608E-01 1.18E+02 4.25E+00	GA
			270.25	3.417E-01	? P	2.445E-01 4.38E+01 3.46E+00	GA
Am-241	I	5.9148E-02				3.65E+11	
			59.54	5.915E-02	?(	1.139E-01 1.20E+02 3.63E+01	G
Bi-212	N	3.9774E-01				3.65E+11	
			727.17	3.977E-01	(P	6.406E-02 1.64E+01 1.18E+01	G
			1620.56	3.769E-01	?	4.039E-01 7.34E+01 2.75E+00	GA
			785.42	4.336E-01	?	6.156E-01 9.08E+01 2.00E+00	GA
Bi-214	N	2.7120E-01				3.65E+11	
			609.69	2.712E-01	(P	2.659E-02 8.97E+00 4.61E+01	G
			1764.51	5.074E-02	- P	1.074E-01 3.83E+01 1.59E+01	GA
			1120.28	1.876E-01	- P	1.123E-01 3.05E+01 1.50E+01	GA
			768.36	8.911E-02	-	2.643E-01 1.84E+02 4.89E+00	GA
			1377.65	1.184E+00	+	6.130E-02 1.49E+01 4.02E+00	GA
			934.05	4.876E-02	-	4.053E-01 5.10E+02 3.17E+00	GA
			1407.98	4.024E-01	+	5.103E-01 8.37E+01 2.48E+00	GA
			1509.19	3.410E-01	?	5.275E-01 1.02E+02 2.19E+00	GA
			665.45	2.837E-01	? P	4.283E-01 9.80E+01 1.56E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	2.7159E-03					3.65E+11	
			1173.24	1.187E-03	&(	1.528E-02	7.87E+02	9.99E+01 G
			1332.50	4.243E-03	&(	1.585E-02	2.32E+02	1.00E+02 G
Cs-137	I	7.3956E-03					3.65E+11	
			661.66	7.396E-03	?(	1.193E-02	1.03E+02	8.46E+01 G
Eu-152	I	1.0088E-02					3.65E+11	
			344.30	1.009E-02	&(	2.997E-02	1.84E+02	2.70E+01 G
			121.87	1.968E-02	&	3.537E-02	1.12E+02	2.86E+01 GA
			1408.08	4.622E-02	?	6.006E-02	8.55E+01	2.12E+01 GA
			964.05	-1.267E-03	%	1.403E-01	6.72E+03	1.46E+01 GA
			778.90	1.745E-03	&	7.234E-02	2.52E+03	1.30E+01 GA
			411.09	-3.195E-03	&	4.041E-01	7.68E+03	2.26E+00 GA
Eu-154	I	1.4797E-04					3.65E+11	
			1274.80	1.480E-04	%(	3.251E-02	1.33E+04	3.55E+01 G
			123.10	6.771E-03	?	2.516E-02	2.28E+02	4.05E+01 GA
			723.30	4.887E-03	&	4.293E-02	5.40E+02	1.97E+01 GA
K-40	N	1.2712E+01					3.65E+11	
			1460.80	1.271E+01	(P	1.735E-01	2.97E+00	1.07E+01 G
Pa-234	N	1.1759E-02					3.65E+11	
			883.24	1.176E-02	?(	8.660E-02	4.52E+02	1.50E+01 G
			98.44	3.821E-02		4.897E-02	8.02E+01	2.51E+01 GA
			946.00	3.332E-02	&	9.975E-02	1.87E+02	1.20E+01 GA
Pb-212	N	3.0955E-01					3.65E+11	
			238.63	3.096E-01	(P	1.850E-02	6.35E+00	4.31E+01 G
			77.11	6.154E-01	+ P	1.102E-01	1.26E+01	1.75E+01 GA
			74.81	3.411E-01	?	2.590E-01	4.81E+01	9.60E+00 GA
			87.20	3.718E-01	? P	2.804E-01	4.62E+01	6.30E+00 GA
			300.09	2.710E-01	? P	2.418E-01	4.95E+01	3.27E+00 GA
Pb-214	N	3.3905E-01					3.65E+11	
			351.79	3.391E-01	(P	2.127E-02	6.31E+00	3.71E+01 G
			295.22	3.981E-01	P	3.887E-02	9.81E+00	1.92E+01 GA
			241.92	5.849E-01	+ P	1.043E-01	1.52E+01	7.47E+00 GA
Ra-226	N	3.4819E-01					3.65E+11	
			186.20	3.482E-01	(	2.285E-01	4.26E+01	3.60E+00 G
Th-234	N	2.0322E-01					3.65E+11	
			92.60	2.032E-01	(	2.713E-01	8.32E+01	5.60E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 16:42:08
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_009.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Tl-208   N   9.5366E-02                                     3.65E+11
                           583.14 9.537E-02 ?(P 1.358E-02 1.07E+01 8.60E+01 G
                           860.47 2.683E-03 %   1.105E-01 2.51E+03 1.20E+01 GA

U-235    N   2.0132E-02                                     3.65E+11
                           185.70 2.013E-02  (  1.556E-02 4.96E+01 5.40E+01 G
                           143.76-3.697E-03 &   9.591E-02 1.58E+03 1.05E+01 GA
                           163.35 1.147E-01     2.072E-01 1.12E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
```

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.83	173.	16.	0.003	239.02	5.915E-02
Th-234	92.86	263.	28.	0.005	166.39	2.032E-01
Pa-234	98.01	204.	26.	0.005	160.47	3.821E-02
Eu-152	121.95	205.	19.	0.003	223.05	1.968E-02
Eu-154	122.87	210.	9.	0.002	455.84	6.771E-03
Eu-152	344.34	78.	7.	0.001	368.58	1.009E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cs-137	662.22	48.	10.	0.002	205.68	7.396E-03	
Eu-154	720.17	30.	1.	0.000	1079.40	4.887E-03	
Pa-234	882.92	53.	2.	0.000	903.71	1.176E-02	
Pa-234	945.70	41.	5.	0.001	374.28	3.332E-02	
Co-60	1171.14	49.	1.	0.000	1573.71	1.187E-03	
Co-60	1331.48	43.	4.	0.001	463.90	4.243E-03	
Eu-152	1408.00	26.	9.	0.002	171.09	4.622E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.0139E-01	4.0139E-01	9.3280E-02	9.7139E-02	3.395E-02
Am-241 #A	5.9148E-02	5.9148E-02	1.4138E-01	1.4147E-01	1.139E-01
Bi-212	3.9774E-01	3.9774E-01	1.4358E-01	1.4609E-01	6.406E-02
Bi-214	2.7120E-01	2.7120E-01	5.6346E-02	5.9192E-02	2.659E-02
Co-60 #A	2.7159E-03	2.7159E-03	1.2599E-02	1.2600E-02	1.528E-02
Cs-137 #A	7.3956E-03	7.3956E-03	1.5212E-02	1.5220E-02	1.193E-02
Eu-152 #A	1.0088E-02	1.0088E-02	3.7181E-02	3.7187E-02	2.997E-02
Eu-154 #A	1.4797E-04	1.4797E-04	3.9491E-02	3.9491E-02	3.251E-02
K-40	1.2712E+01	1.2712E+01	7.7500E-01	1.1801E+00	1.735E-01
Pa-234 #A	1.1759E-02	1.1759E-02	1.0626E-01	1.0627E-01	8.660E-02
Pb-212	3.0955E-01	3.0955E-01	4.0902E-02	4.7053E-02	1.850E-02
Pb-214	3.3905E-01	3.3905E-01	4.7594E-02	5.2914E-02	2.127E-02
Ra-226	3.4819E-01	3.4819E-01	2.9661E-01	2.9778E-01	2.285E-01
Th-234 #A	2.0322E-01	2.0322E-01	3.3813E-01	3.3862E-01	2.713E-01
Tl-208 #	9.5366E-02	9.5366E-02	2.2394E-02	2.3276E-02	1.358E-02
U-235	2.0132E-02	2.0132E-02	1.9981E-02	2.0039E-02	1.556E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (196.1 to 2041.3 keV) 1.489E+01 pCi/g
Total Decayed Activity (196.1 to 2041.3 keV) 1.4894615E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 16:42:08
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_009.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE07
Seqnum : 1564011942004
File : 7_20140108_004
IDF : 1.0
PDF : 1.0
Lab ID : 251445-006
Matrix : Soil
Batch : 206637
Time : 08-JAN-2014 08:19
Sample Amount : 364.34 g
Live Time : 2700 sec
Dead Time : 0.07 %
Cal : 08-JAN-2014 07:13:44,21-FEB-2013 11:46:56
Units : pCi/g

Type : IDUP
Inst : HPGE07
Seqnum : 1564011942006.4
File : 7_20140108_006
IDF : 1.0
PDF : 1.0
Lab ID : QC722415
Matrix : Soil
Batch : 206637
Time : 08-JAN-2014 10:53
Sample Amount : 364.34 g
Live Time : 2700 sec
Dead Time : 0.07 %
Cal : 08-JAN-2014 07:13:44,21-FEB-2013 11:46:56

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.01627	0.1607		.1963	.1963	0.05933	0.1529		.1904	.19047		40		1	u
Bismuth-212	0.09106	0.1683		.20983	.20992	0.1514	0.1554		.20157	.20183		40		1	u
Bismuth-214	0.2164	0.04169		.065967	.067535	0.2121	0.03780		.062058	.063658	2	40	0.033	1	u
Cesium-137	0.01773	0.01782	0.07	.023952	.023982	0.005317	0.01969	0.07	.024563	.024565		20		1	u
Cobalt-60	0.0008273	0.01880		.010818	.010819	0.002703	0.02833		.0083594	.0083613		40		1	u
Europium-152	0	0.06247		.046456	.046456	0.01869	0.04160		.052641	.052656		40		1	u
Europium-154	-0.02134	0.07176		.08986	.089871	0.02423	0.07445		.09338	.093394		40		1	u
Lead-212	0.4019	0.02465		.061267	.068305	0.4292	0.02525		.063182	.070938	7	40	0.196	1	u
Lead-214	0.4362	0.03925		.091021	.09576	0.3316	0.03581		.076019	.079312	27	40	0.597	1	u
Potassium-40	13.41	0.1971		1.0732	1.4261	13.75	0.1971		1.0862	1.4513	2	40	0.116	1	u
Protactinium-234	0	0.2054		.041307	.041307	-0.01776	0.1217		.15025	.15026		40		1	u
Radium-226	0.7453	0.3151	1.3	.44081	.4444	0.3560	0.3534	1.3	.45491	.4557	71	20	0.432	1	u
Thallium-208	0.1017	0.02225		.035044	.035692	0.1497	0.01383		.036684	.038015	38	40	0.652	1	u
Thorium-232 (By Actinium-228)	0.1893	0.07720		.11175	.11247	0.2683	0.06602		.10888	.11037	35	40	0.354	1	u
Thorium-234	1.023	0.3206		.58934	.59643	0.3341	0.3226		.41565	.41673	102	40	0.680	1	u
Uranium-235	0.01712	0.02608		.032796	.032821	0.03909	0.02227		.029977	.030123		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0039-06DUP
Sample Description: QC722415, 206637, IDUP

Detector: HPGE07 51-TP32743A
Spectrum ID: 7_20140108_006
Contract: ITSI
Sample Type: DUP
Unit Number: PD-D0039
Matrix: S
Sample Time: 11/29/2013 15:34
Live Time: 2700 sec
Acquisition Time: 1/8/2014 10:53:43
Real Time: 2702 sec
Analysis Time: 1/8/2014 11:38
Dead Time: 0.07 %
Analysis Quantity: 3.643E+02 g

Efficiency: HPGE07 S21603 7_20130220002_EffCal
Efficiency Cal Date: 2/21/2013 11:46
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		2.683E-01	1.089E-01	1.104E-01	6.602E-02
Am-241	#AB	5.933E-02	1.904E-01	1.905E-01	1.529E-01
Bi-212	#AB	1.514E-01	2.016E-01	2.018E-01	1.554E-01
Bi-214		2.121E-01	6.206E-02	6.366E-02	3.780E-02
Co-60	#AB	2.703E-03	8.359E-03	8.361E-03	2.833E-02
Cs-137	#AB	5.317E-03	2.456E-02	2.457E-02	1.969E-02
Eu-152	#AB	1.869E-02	5.264E-02	5.266E-02	4.160E-02
Eu-154	#AB	2.423E-02	9.338E-02	9.339E-02	7.445E-02
K-40		1.375E+01	1.086E+00	1.451E+00	1.971E-01
Pa-234	#AB	-1.776E-02	1.503E-01	1.503E-01	1.217E-01
Pb-212		4.292E-01	6.318E-02	7.094E-02	2.525E-02
Pb-214		3.316E-01	7.602E-02	7.931E-02	3.581E-02
Ra-226		3.560E-01	4.549E-01	4.557E-01	3.534E-01
Th-234	#	3.341E-01	4.157E-01	4.167E-01	3.226E-01
Tl-208	#	1.497E-01	3.668E-02	3.801E-02	1.383E-02
U-235		3.909E-02	2.998E-02	3.012E-02	2.227E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.613E+01

Analyst: Chris Fluty

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 11:38:59
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_006.An1

Sample description
     QC722415, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det7\7_20140108_006.An1

Acquisition information
       Start time:                 1/8/2014 10:53:43
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.6434E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.6434E+02) =
                                   7.4181E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 11:38:59
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_006.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 15:34:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2013-12-28_0940.PBC 12/28/2013 09:40:25
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 23 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0753

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.60	28.	32.04	0.40	0.000E+00				
41.42	18.	49.62	0.43	0.000E+00				
59.53	8.	160.46	0.82	1.006E-02	59.54	36.300	PBC<MDA	Am241
74.82	66.	25.02	0.84	2.221E-02	74.81	9.600	8.495E-01	Pb212
77.08	100.	17.12	0.84	2.389E-02	77.11	17.500	6.345E-01	Pb212
87.26	82.	26.51	0.51	3.065E-02	87.20	6.300	1.163E+00	Pb212
93.10	23.	62.20	0.86	3.375E-02	92.60	5.600	3.341E-01	Th234
96.49	2.	603.98	0.86	3.673E-02	98.44	25.100	PBC<MDA	Pa234
122.36	13.	109.75	0.89	4.476E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	1.933E-02	Eu154
					121.87	28.590	2.752E-02	Eu152
122.55	13.	109.52	0.89	4.503E-02	121.87	28.590	PBC<MDA	Eu152
					123.10	40.460	1.937E-02	Eu154
131.25	31.	41.90	0.50	4.649E-02				
143.36	12.	114.58	0.91	4.783E-02	143.76	10.500	PBC<MDA	U235
185.73	36.	38.35	0.95	4.747E-02	185.70	54.000	3.908E-02	U235
186.07	83.	24.54	0.18	4.744E-02				
186.23	22.	63.88	0.96	4.744E-02	186.20	3.600	3.560E-01	Ra226
194.08	18.	43.53	0.43	4.691E-02				
238.63	299.	7.15	0.51	4.311E-02	238.63	43.100	4.292E-01	Pb212
244.58	-5.	741.73	1.01	4.281E-02	241.92	7.470	PBC<MDA	Pb214
270.08	3.	284.84	1.04	4.027E-02	270.25	3.460	PBC<MDA	Ac228
295.18	148.	13.81	0.25	3.816E-02	295.22	19.200	5.173E-01	Pb214
300.26	16.	59.39	1.07	3.777E-02	300.09	3.270	PBC<MDA	Pb212
338.28	82.	15.39	0.52	3.491E-02	338.40	12.010	5.248E-01	Ac228
345.83	6.	140.82	1.12	3.449E-02	344.30	27.000	PBC<MDA	Eu152
					344.30	27.000	1.869E-02	Eu152

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 11:38:59
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_006.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
351.96	170.	10.26	0.80	3.398E-02	351.79	37.100	3.316E-01	Pb214
411.41	1.	866.50	1.18	3.050E-02	411.09	2.264	PBC<MDA	Eu152
					411.09	2.264	4.497E-02	Eu152
411.91	13.	38.87	0.14	3.046E-02				
463.07	41.	23.59	0.27	2.803E-02				
463.25	12.	62.33	1.23	2.803E-02	463.00	4.400	PBC<MDA	Ac228
583.29	118.	11.56	0.50	2.378E-02	583.14	86.000	1.497E-01	Tl208
609.27	138.	9.32	0.90	2.306E-02	609.69	46.090	3.125E-01	Bi214
660.88	4.	230.98	1.42	2.175E-02	661.66	84.620	PBC<MDA	Cs137
665.49	4.	174.96	1.42	2.166E-02	665.45	1.560	PBC<MDA	Bi214
727.26	13.	52.24	1.47	2.034E-02	727.17	11.800	PBC<MDA	Bi212
768.11	8.	114.69	1.51	1.957E-02	768.36	4.890	PBC<MDA	Bi214
768.24	39.	25.03	0.16	1.957E-02				
784.82	9.	84.56	1.53	1.927E-02	785.42	2.000	PBC<MDA	Bi212
794.63	10.	66.99	1.53	1.911E-02	794.95	4.250	3.323E-01	Ac228
860.50	13.	58.34	1.59	1.807E-02	860.47	12.000	1.685E-01	Tl208
911.14	99.	10.05	0.59	1.735E-02	911.07	29.000	5.209E-01	Ac228
934.03	6.	122.36	1.65	1.705E-02	934.05	3.170	PBC<MDA	Bi214
969.26	19.	40.70	1.68	1.661E-02	968.90	17.460	1.834E-01	Ac228
1120.35	26.	32.19	1.80	1.497E-02	1120.28	15.040	3.224E-01	Bi214
1274.14	4.	192.67	1.91	1.361E-02	1274.80	35.500	PBC<MDA	Eu154
1332.58	4.	154.61	1.96	1.316E-02	1332.50	99.980	PBC<MDA	Co60
1460.96	673.	3.85	1.35	1.226E-02	1460.80	10.700	1.375E+01	K40
1765.05	10.	40.83	2.23	1.053E-02	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
244.71	30.60	21.	28.	0.000E+00	64.09	0.403	-	s
331.24	41.42	29.	18.	0.000E+00	99.24	0.433	-	s
1049.64	131.25	51.	31.	6.668E+02	83.80	0.502	PA-234	sM
1552.09	194.08	19.	18.	3.794E+02	87.06	0.433	-	s
3294.48	411.91	6.	12.	3.917E+02	82.24	0.138	-	s
3703.72	463.07	11.	41.	1.459E+03	47.17	0.273	AC-228	l
6145.25	768.24	19.	31.	1.577E+03	53.88	0.157	BI-214	sM

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 11:38:59
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_006.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	476.06	59.53	76.	8.	0.003	320.92	0.821s
Pb-212	598.10	74.79	205.	35.	0.013	121.59	0.838s
Pb-212	617.24	77.19	93.	85.	0.032	42.04	0.501s
Pb-212	697.80	87.26	102.	82.	0.030	53.02	0.510s
Th-234	744.52	93.10	91.	23.	0.009	124.39	0.857s
Pa-234	771.61	96.49	64.	2.	0.001	1207.97	0.863s
Eu-152	978.50	122.36	93.	13.	0.005	219.50	0.888s
Eu-154	980.03	122.55	93.	13.	0.005	219.04	0.889s
U-235	1146.50	143.36	87.	12.	0.004	229.16	0.911
U-235	1287.75	161.03	43.	-1.	-0.001	1311.27	0.931
U-235	1485.10	185.70	80.	36.	0.014	76.70	0.955D
Ra-226	1489.10	186.20	89.	22.	0.008	127.77	0.955D
Pb-212	1908.41	238.63	54.	290.	0.108	14.29	0.507s
Ac-228	2159.96	270.08	63.	3.	0.001	569.67	1.042s
Pb-214	2361.14	295.23	68.	89.	0.033	29.36	1.067s
Pb-212	2401.36	300.26	51.	16.	0.006	118.79	1.072s
Ac-228	2705.51	338.28	25.	80.	0.030	30.78	0.521s
Eu-152	2765.86	345.83	37.	6.	0.002	281.65	1.116s
Pb-214	2814.88	351.96	50.	152.	0.056	20.53	0.797s
Eu-152	3290.45	411.41	47.	1.	0.000	1732.99	1.182s
Ac-228	3705.17	463.25	31.	12.	0.004	124.66	1.232s
Tl-208	4665.50	583.29	20.	111.	0.041	23.13	0.499s
Bi-214	4873.66	609.31	39.	82.	0.030	24.28	1.369s
Cs-137	5286.24	660.88	32.	4.	0.001	461.96	1.417s
Bi-214	5323.14	665.49	29.	4.	0.002	349.93	1.420
Bi-212	5817.32	727.26	34.	13.	0.005	104.49	1.475s
Bi-214	6144.16	768.11	35.	8.	0.003	229.38	1.511
Bi-212	6277.87	784.82	27.	9.	0.003	169.13	1.526s
Ac-228	6356.41	794.63	17.	10.	0.004	133.99	1.534s
Tl-208	6883.47	860.50	23.	13.	0.005	116.67	1.590s
Pa-234	7064.21	883.09	26.	-2.	-0.001	846.27	1.609s
Ac-228	7290.13	911.32	27.	49.	0.018	37.82	1.632s
Bi-214	7471.86	934.03	24.	6.	0.002	244.72	1.651
Pa-234	7565.56	945.74	28.	-4.	-0.001	432.93	1.661s
Ac-228	7753.81	969.26	36.	19.	0.007	81.40	1.680s
Bi-214	8962.97	1120.35	39.	26.	0.010	64.38	1.799
Co-60	9395.85	1174.44	41.	-1.	0.000	1402.91	1.839s
Eu-154	10193.88	1274.14	32.	4.	0.002	385.35	1.915s
Co-60	10661.68	1332.58	15.	4.	0.001	309.22	1.956s
K-40	11689.37	1460.96	16.	657.	0.243	7.71	1.354s
Bi-214	14124.07	1765.05	21.	10.	0.004	81.66	2.234

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 11:38:59
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_006.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.6829E-01				3.65E+11	
			911.07	2.683E-01	?(P	6.602E-02 1.89E+01	2.90E+01 G
			968.90	1.834E-01	- P	1.332E-01 4.07E+01	1.75E+01 GA
			338.40	5.248E-01	+ P	7.627E-02 1.54E+01	1.20E+01 GA
			964.77	-3.278E-02	% P	5.173E-01 8.21E+03	4.99E+00 GA
			463.00	2.597E-01	? P	2.879E-01 6.23E+01	4.40E+00 GA
			794.95	3.323E-01	?	3.225E-01 6.70E+01	4.25E+00 GA
			270.25	5.786E-02	& P	3.660E-01 2.85E+02	3.46E+00 GA
Am-241	I	5.9329E-02				3.65E+11	
			59.54	5.933E-02	&(	1.529E-01 1.60E+02	3.63E+01 G
Bi-212	N	1.5143E-01				3.65E+11	
			727.17	1.514E-01	?(P	1.554E-01 5.22E+01	1.18E+01 G
			1620.56	0.000E+00	-	1.608E+00 1.00E+03	2.75E+00 GA
			785.42	6.708E-01	&	8.624E-01 8.46E+01	2.00E+00 GA
Bi-214	N	2.1212E-01				3.65E+11	
			609.69	2.121E-01	?(P	3.780E-02 1.21E+01	4.61E+01 G
			1764.51	1.609E-01	- P	1.766E-01 4.08E+01	1.59E+01 GA
			1120.28	3.224E-01	+ P	1.769E-01 3.22E+01	1.50E+01 GA
			768.36	2.221E-01		3.986E-01 1.15E+02	4.89E+00 GA
			1377.65	0.000E+00	-	8.417E-01 1.00E+03	4.02E+00 GA
			934.05	3.038E-01		5.772E-01 1.22E+02	3.17E+00 GA
			1407.98	0.000E+00	-	2.045E-01 1.00E+03	2.48E+00 GA
			1509.19	0.000E+00	-	2.445E-01 1.00E+03	2.19E+00 GA
			665.45	3.635E-01	+ P	1.018E+00 1.75E+02	1.56E+00 GA
Co-60	T	2.7034E-03				3.65E+11	
			1173.24	-2.470E-03	?(	2.833E-02 7.01E+02	9.99E+01 G
			1332.50	7.871E-03	?(	1.890E-02 1.55E+02	1.00E+02 G
Cs-137	I	5.3170E-03				3.65E+11	
			661.66	5.317E-03	&(	1.969E-02 2.31E+02	8.46E+01 G
Eu-152	I	1.8690E-02				3.65E+11	
			344.30	1.869E-02	?(	4.160E-02 1.41E+02	2.70E+01 G
			121.87	2.752E-02	?	4.813E-02 1.10E+02	2.86E+01 GA
			1408.08	0.000E+00	-	1.669E-01 1.00E+03	2.12E+01 GA
			964.05	0.000E+00	-	2.882E-01 1.00E+03	1.46E+01 GA
			778.90	0.000E+00	-	1.953E-01 1.00E+03	1.30E+01 GA
			411.09	4.497E-02	?	6.382E-01 8.66E+02	2.26E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 11:38:59
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108_006.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Eu-154   I   2.4232E-02                                     3.65E+11
                         1274.80 2.423E-02 &(  7.445E-02 1.93E+02 3.55E+01 G
                          123.10 1.937E-02 &   3.380E-02 1.10E+02 4.05E+01 GA
                          723.30 0.000E+00 -   2.057E-01 1.00E+03 1.97E+01 GA

K-40     N   1.3748E+01                                     3.65E+11
                         1460.80 1.375E+01  (P 1.971E-01 3.85E+00 1.07E+01 G

Pa-234   N  -1.7755E-02                                     3.65E+11
                          883.24-1.775E-02 ?(  1.217E-01 4.23E+02 1.50E+01 G
                           98.44 5.613E-03 ?   5.545E-02 6.04E+02 2.51E+01 GA
                          946.00-4.840E-02 +   1.674E-01 2.16E+02 1.20E+01 GA

Pb-212   N   4.2923E-01                                     3.65E+11
                          238.63 4.292E-01  (P 2.525E-02 7.15E+00 4.31E+01 G
                           77.11 5.630E-01 + P 1.477E-01 2.10E+01 1.75E+01 GA
                           74.81 4.485E-01 ?   4.314E-01 6.08E+01 9.60E+00 GA
                           87.20 1.163E+00 + P 3.358E-01 2.65E+01 6.30E+00 GA
                          300.09 3.601E-01 - P 3.693E-01 5.94E+01 3.27E+00 GA

Pb-214   N   3.3162E-01                                     3.65E+11
                          351.79 3.316E-01  (P 3.581E-02 1.03E+01 3.71E+01 G
                          295.22 3.355E-01 ? P 7.222E-02 1.47E+01 1.92E+01 GA
                          241.92-4.473E-02 % P 1.536E-01 7.42E+02 7.47E+00 GA

Ra-226   N   3.5604E-01                                     3.65E+11
                          186.20 3.560E-01  (  3.534E-01 6.39E+01 3.60E+00 G

Th-234   N   3.3414E-01                                     3.65E+11
                           92.60 3.341E-01 ?(  3.226E-01 6.22E+01 5.60E+00 G

Tl-208   N   1.4974E-01                                     3.65E+11
                          583.14 1.497E-01 @(P 1.383E-02 1.16E+01 8.60E+01 G
                          860.47 1.685E-01 ?   1.429E-01 5.83E+01 1.20E+01 GA

U-235    N   3.9085E-02                                     3.65E+11
                          185.70 3.908E-02  (  2.227E-02 3.83E+01 5.40E+01 G
                          143.76 6.517E-02     1.190E-01 1.15E+02 1.05E+01 GA
                          163.35-1.725E-02 -   1.848E-01 6.56E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 11:38:59
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_006.An1

% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	59.53	76.	8.	0.003	320.92	5.933E-02	
Th-234	93.10	91.	23.	0.009	124.39	3.341E-01	
Pa-234	96.49	64.	2.	0.001	1207.97	5.613E-03	
Eu-152	122.36	93.	13.	0.005	219.50	2.752E-02	
Eu-154	122.55	93.	13.	0.005	219.04	1.937E-02	
Eu-152	345.83	37.	6.	0.002	281.65	1.869E-02	
Eu-152	411.41	47.	1.	0.000	1732.99	4.497E-02	
Cs-137	660.88	32.	4.	0.001	461.96	5.317E-03	
Bi-212	727.26	34.	13.	0.005	104.49	1.514E-01	P
Bi-212	784.82	27.	9.	0.003	169.13	6.708E-01	
Pa-234	883.09	26.	-2.	-0.001	846.27	-1.775E-02	
Pa-234	945.74	28.	-4.	-0.001	432.93	-4.840E-02	
Co-60	1174.44	41.	-1.	0.000	1402.91	-2.470E-03	
Eu-154	1274.14	32.	4.	0.002	385.35	2.423E-02	
Co-60	1332.58	15.	4.	0.001	309.22	7.871E-03	

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 11:38:59
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108_006.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	2.6829E-01	2.6829E-01	1.0888E-01	1.1037E-01	6.602E-02
Am-241 #A	5.9329E-02	5.9329E-02	1.9040E-01	1.9047E-01	1.529E-01
Bi-212 #A	1.5143E-01	1.5143E-01	2.0157E-01	2.0183E-01	1.554E-01
Bi-214	2.1212E-01	2.1212E-01	6.2058E-02	6.3658E-02	3.780E-02
Co-60 #A	2.7034E-03	2.7034E-03	8.3594E-03	8.3613E-03	2.833E-02
Cs-137 #A	5.3170E-03	5.3170E-03	2.4563E-02	2.4565E-02	1.969E-02
Eu-152 #A	1.8690E-02	1.8690E-02	5.2641E-02	5.2656E-02	4.160E-02
Eu-154 #A	2.4232E-02	2.4232E-02	9.3380E-02	9.3394E-02	7.445E-02
K-40	1.3748E+01	1.3748E+01	1.0862E+00	1.4513E+00	1.971E-01
Pa-234 #A	-1.7755E-02	-1.7755E-02	1.5025E-01	1.5026E-01	1.217E-01
Pb-212	4.2923E-01	4.2923E-01	6.3182E-02	7.0938E-02	2.525E-02
Pb-214	3.3162E-01	3.3162E-01	7.6019E-02	7.9312E-02	3.581E-02
Ra-226	3.5604E-01	3.5604E-01	4.5491E-01	4.5570E-01	3.534E-01
Th-234 #	3.3414E-01	3.3414E-01	4.1565E-01	4.1673E-01	3.226E-01
Tl-208 #	1.4974E-01	1.4974E-01	3.6684E-02	3.8015E-02	1.383E-02
U-235	3.9085E-02	3.9085E-02	2.9977E-02	3.0123E-02	2.227E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (194.1 to 2041.3 keV) 1.532E+01 pCi/g
Total Decayed Activity (194.1 to 2041.3 keV) 1.5321563E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE08
Seqnum : 1574011955013
File : 8_20140108_013
IDF : 1.0
PDF : 1.0
Lab ID : 251449-007
Matrix : Soil
Batch : 206637
Time : 08-JAN-2014 17:52
Sample Amount : 339.57 g
Live Time : 2700 sec
Dead Time : 0.13 %
Cal : 08-JAN-2014 07:40:12,08-APR-2013 11:06:59
Units : pCi/g

Type : IDUP
Inst : HPGE08
Seqnum : 1574011955014.4
File : 8_20140108_014
IDF : 1.0
PDF : 1.0
Lab ID : QC722417
Matrix : Soil
Batch : 206637
Time : 08-JAN-2014 18:45
Sample Amount : 339.57 g
Live Time : 2700 sec
Dead Time : 0.13 %
Cal : 08-JAN-2014 07:40:12,08-APR-2013 11:06:59

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.01614	0.1975		.24109	.24109	-0.05048	0.2126		.26212	.26216		40		1	u
Bismuth-212	0.1405	0.1628		.2154	.21561	0.07982	0.1578		.20213	.2022		40		1	u
Bismuth-214	0.2265	0.04552		.071745	.073326	0.2985	0.03761		.080361	.082802	27	40	0.461	1	u
Cesium-137	0.01709	0.02071	0.07	.027367	.027392	0.02613	0.02280	0.07	.030734	.030785		20		1	u
Cobalt-60	-0.006453	0.02836		.035234	.035237	0.0003491	0.03059		.00076955	.0007699		40		1	u
Europium-152	-0.03181	0.06175		.07782	.07785	0	0.06692		.036982	.036982		40		1	u
Europium-154	0.003052	0.07623		.092961	.092961	0.03341	0.06375		.082785	.082815		40		1	u
Lead-212	0.3558	0.02950		.06707	.072202	0.3555	0.03341		.069103	.074086	0	40	0.002	1	u
Lead-214	0.3552	0.03572		.071666	.07565	0.3455	0.03362		.074246	.077897	3	40	0.063	1	u
Potassium-40	18.22	0.2846		1.3977	1.8921	18.90	0.2114		1.3543	1.8935	4	40	0.181	1	u
Protactinium-234	-0.001164	0.1505		.18279	.18279	-0.003618	0.1312		.1598	.1598		40		1	u
Radium-226	0.2546	0.4249	1.3	.53406	.5344	0.3784	0.3833	1.3	.4949	.49572		20		1	u
Thallium-208	0.06005	0.02395		.03432	.034552	0.08646	0.02276		.035493	.035957	36	40	0.375	1	u
Thorium-232 (By Actinium-228)	0.3285	0.07954		.13232	.13416	0.2022	0.06894		.10973	.11058	48	40	0.516	1	u
Thorium-234	0.4599	0.4119		.53081	.53241	0.5528	0.3936		.51623	.5186	18	40	0.088	1	u
Uranium-235	0.03073	0.02786		.036016	.036091	0.02425	0.02696		.034525	.034574		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0037-07DUP
Sample Description: QC722417, 206637, IDUP

Detector: HPGE08 50-TP42229A
Spectrum ID: 8_20140108_014
Contract: ITSI
Sample Type: DUP
Unit Number: PD-D0037
Matrix: S
Sample Time: 11/29/2013 13:55
Live Time: 2700 sec
Acquisition Time: 1/8/2014 18:45:50
Real Time: 2703 sec
Analysis Time: 1/8/2014 19:31
Dead Time: 0.13 %
Analysis Quantity: 3.396E+02 g

Efficiency: HPGE08 S22147 8_20130407002_EffCal
Efficiency Cal Date: 4/8/2013 11:06
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.022E-01	1.097E-01	1.106E-01	6.894E-02
Am-241	#AB	-5.048E-02	2.621E-01	2.622E-01	2.126E-01
Bi-212	#AB	7.982E-02	2.021E-01	2.022E-01	1.578E-01
Bi-214		2.985E-01	8.036E-02	8.280E-02	3.761E-02
Co-60	#AB	3.491E-04	7.696E-04	7.699E-04	3.059E-02
Cs-137	#	2.613E-02	3.073E-02	3.078E-02	2.280E-02
Eu-152	#AB	0.000E+00	3.698E-02	3.698E-02	6.692E-02
Eu-154	#AB	3.341E-02	8.278E-02	8.281E-02	6.375E-02
K-40		1.890E+01	1.354E+00	1.894E+00	2.114E-01
Pa-234	#AB	-3.618E-03	1.598E-01	1.598E-01	1.312E-01
Pb-212		3.555E-01	6.910E-02	7.409E-02	3.341E-02
Pb-214		3.455E-01	7.425E-02	7.790E-02	3.362E-02
Ra-226	AB	3.784E-01	4.949E-01	4.957E-01	3.833E-01
Th-234	#	5.528E-01	5.162E-01	5.186E-01	3.936E-01
Tl-208	#	8.646E-02	3.549E-02	3.596E-02	2.276E-02
U-235	AB	2.425E-02	3.453E-02	3.457E-02	2.696E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.129E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:31:00
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_014.An1

Sample description
     QC722417, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det8\8_20140108_014.An1

Acquisition information
       Start time:                 1/8/2014 18:45:50
       Live time:               2700
       Real time:               2703
       Dead time:                  0.13 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_04-07-2013.Clb
     HPGE08 S22147 8_20130407002_EffCal


       Energy Calibration
            Created:               1/8/2014 07:40:12
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.420E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/8/2013 11:06:59
            Type:                  Polynomial
            Uncertainty:           1.344 %
            Coefficients:         -0.359632  -4.215465   0.446712
                                  -0.054338   0.002307  -0.000047

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3957E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3957E+02) =
                                   7.9592E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:31:00
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:55:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2013-12-28_0941.PBC 12/28/2013 09:41:06
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 23 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1161

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
46.19	30.	44.14	0.41	9.662E-04				
74.99	18.	100.03	0.81	1.910E-02	74.81	9.600	PBC<MDA	Pb212
77.25	89.	23.85	0.26	2.085E-02	77.11	17.500	6.799E-01	Pb212
87.36	25.	51.12	0.83	2.741E-02	87.20	6.300	4.347E-01	Pb212
89.43	28.	42.65	0.14	2.873E-02				
93.10	32.	46.69	0.83	3.050E-02	92.60	5.600	5.528E-01	Th234
163.30	14.	83.05	0.91	4.451E-02	163.35	4.700	PBC<MDA	U235
185.73	19.	71.20	0.93	4.366E-02	185.70	54.000	PBC<MDA	U235
186.23	20.	65.39	0.93	4.363E-02	186.20	3.600	PBC<MDA	Ra226
194.38	27.	31.22	0.20	4.312E-02				
209.31	51.	28.75	0.30	4.202E-02				
235.40	22.	39.97	0.98	3.990E-02				
238.68	219.	8.50	0.99	3.963E-02	238.63	43.100	3.576E-01	Pb212
241.86	53.	26.02	0.99	3.937E-02				
244.72	-3.	147.24	0.99	3.936E-02	241.92	7.470	PBC<MDA	Pb214
270.53	27.	36.85	0.18	3.703E-02	270.25	3.460	6.209E-01	Ac228
295.33	95.	15.85	0.60	3.513E-02	295.22	19.200	3.690E-01	Pb214
300.04	8.	121.79	1.05	3.479E-02	300.09	3.270	PBC<MDA	Pb212
337.96	84.	21.24	0.75	3.223E-02				
338.40	3.	393.71	1.08	3.221E-02	338.40	12.010	PBC<MDA	Ac228
351.91	150.	9.79	0.62	3.138E-02	351.79	37.100	3.455E-01	Pb214
463.35	14.	62.36	1.20	2.603E-02	463.00	4.400	3.566E-01	Ac228
583.43	92.	14.45	0.17	2.219E-02	583.14	86.000	1.353E-01	Tl208
609.33	117.	11.52	0.31	2.154E-02	609.69	46.090	2.985E-01	Bi214
661.49	15.	58.82	1.37	2.035E-02	661.66	84.620	2.613E-02	Cs137
668.55	6.	112.03	1.37	2.027E-02	665.45	1.560	PBC<MDA	Bi214
689.12	14.	37.11	0.15	1.979E-02				

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:31:00
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
727.45	6.	126.62	1.42	1.907E-02	727.17	11.800	PBC<MDA	Bi212
768.39	3.	119.11	1.45	1.836E-02	768.36	4.890	PBC<MDA	Bi214
782.20	7.	81.65	1.46	1.819E-02	778.90	12.990	PBC<MDA	Eu152
785.31	1.	709.97	1.46	1.809E-02	785.42	2.000	PBC<MDA	Bi212
860.81	12.	67.42	1.52	1.698E-02	860.47	12.000	PBC<MDA	Tl208
911.30	32.	27.13	1.55	1.632E-02	911.07	29.000	2.022E-01	Ac228
968.88	25.	35.37	1.59	1.563E-02	964.77	4.990	9.256E-01	Ac228
					968.90	17.460	2.653E-01	Ac228
969.00	33.	22.44	1.59	1.568E-02	964.77	4.990	1.233E+00	Ac228
					968.90	17.460	3.534E-01	Ac228
1120.43	17.	46.08	1.68	1.410E-02	1120.28	15.040	2.308E-01	Bi214
1186.67	7.	47.38	0.15	1.353E-02				
1273.62	5.	123.88	1.77	1.283E-02	1274.80	35.500	PBC<MDA	Eu154
1333.00	5.	126.48	1.79	1.241E-02	1332.50	99.980	PBC<MDA	Co60
1408.72	1.	427.43	1.83	1.190E-02	1408.08	21.210	PBC<MDA	Eu152
1460.85	808.	3.52	1.53	1.156E-02	1460.80	10.700	1.890E+01	K40
1764.92	6.	51.99	1.95	9.913E-03	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
369.41	46.19	46.	30.	3.084E+04	88.28	0.414	PB-210	s
715.29	89.43	45.	28.	9.790E+02	77.20	0.139	-	sM
1554.70	194.38	18.	27.	6.355E+02	62.43	0.196	-	s
1674.13	209.31	51.	51.	1.223E+03	57.50	0.301	AC-228	s
1882.57	235.37	20.	16.	4.135E+02	94.94	0.182	-	sM
1934.45	241.82	69.	53.	1.463E+03	52.05	0.988	PB-214	lD
2703.16	337.96	41.	84.	2.594E+03	42.49	0.752	AC-228	l
5512.04	689.12	3.	14.	7.024E+02	74.22	0.147	-	s
9492.24	1186.67	2.	7.	5.175E+02	94.76	0.146	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:31:00
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_014.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	475.95	59.51	79.	-5.	-0.002	519.23	0.798s
Pb-212	599.82	74.99	150.	18.	0.007	200.06	0.814s
Pb-212	617.88	77.25	102.	84.	0.031	47.69	0.258s
Pb-212	698.73	87.36	79.	25.	0.009	102.24	0.828s
Th-234	744.63	93.10	96.	32.	0.012	93.38	0.834s
Pa-234	779.87	97.51	78.	-3.	-0.001	824.58	0.840s
Eu-152	969.62	121.23	74.	-2.	-0.001	1370.64	0.865s
Eu-154	969.68	121.24	49.	-5.	-0.002	372.98	0.866s
U-235	1150.58	143.85	94.	-5.	-0.002	597.47	0.888s
U-235	1306.12	163.30	65.	14.	0.005	166.10	0.908
U-235	1485.29	185.70	86.	19.	0.007	142.40	0.931D
Ra-226	1489.29	186.20	77.	20.	0.007	130.78	0.932D
Pb-212	1909.08	238.68	69.	206.	0.076	18.38	1.023
Pb-214	1957.39	244.72	52.	-3.	-0.001	294.48	0.988s
Ac-228	2163.40	270.48	48.	21.	0.008	102.08	1.017s
Pb-214	2362.20	295.33	40.	84.	0.031	31.70	0.597s
Pb-212	2399.82	300.04	46.	8.	0.003	243.57	1.046s
Ac-228	2706.67	338.40	72.	3.	0.001	787.43	1.083s
Pb-214	2814.70	351.91	32.	137.	0.051	19.58	0.621s
Ac-228	3706.10	463.35	30.	14.	0.005	124.73	1.198s
Tl-208	4665.97	583.35	40.	56.	0.021	38.33	1.302s
Bi-214	4873.85	609.33	30.	100.	0.037	23.04	0.308s
Cs-137	5291.03	661.49	33.	15.	0.006	117.64	1.366s
Bi-214	5347.53	668.55	19.	6.	0.002	224.06	1.369
Eu-154	5788.97	723.74	31.	-1.	0.000	1773.98	1.415s
Bi-212	5818.67	727.45	27.	6.	0.002	253.23	1.418s
Bi-214	6146.17	768.39	39.	3.	0.001	238.21	1.449s
Eu-152	6256.62	782.20	12.	7.	0.003	163.30	1.457s
Bi-212	6281.49	785.31	26.	1.	0.000	1419.95	1.462s
Tl-208	6885.46	860.81	26.	12.	0.004	134.84	1.516s
Ac-228	7289.36	911.30	23.	32.	0.012	54.27	1.551s
Pa-234	7536.02	942.14	31.	-5.	-0.002	312.98	1.574s
Ac-228	7750.94	969.00	11.	33.	0.012	44.87	1.587s
Ac-228	7750.00	968.88	25.	25.	0.009	70.74	1.589s
Bi-214	8962.32	1120.43	36.	17.	0.006	92.15	1.682s
Co-60	9387.40	1173.57	37.	-5.	-0.002	361.07	1.712s
Eu-154	10187.83	1273.62	18.	5.	0.002	247.76	1.766s
Co-60	10662.92	1333.00	16.	5.	0.002	252.97	1.794s
Eu-152	11268.66	1408.72	17.	1.	0.001	854.85	1.829
K-40	11685.70	1460.85	15.	794.	0.294	7.04	1.529
Bi-214	14118.45	1764.92	11.	6.	0.002	103.98	1.955s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:31:00
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_014.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.0220E-01				3.65E+11	
			911.07	2.022E-01	?(	6.894E-02 2.71E+01	2.90E+01 G
			968.90	2.653E-01	?	1.270E-01 3.54E+01	1.75E+01 GA
			338.40	2.342E-02	-	1.503E-01 3.94E+02	1.20E+01 GA
			964.77	1.233E+00	+	2.857E-01 2.24E+01	4.99E+00 GA
			463.00	3.566E-01	?	3.306E-01 6.24E+01	4.40E+00 GA
			794.95	0.000E+00	-	4.081E-01 1.00E+03	4.25E+00 GA
			270.25	4.876E-01	+	3.711E-01 5.10E+01	3.46E+00 GA
Am-241	I	-5.0483E-02				3.65E+11	
			59.54	-5.048E-02	?(	2.126E-01 2.60E+02	3.63E+01 G
Bi-212	N	7.9818E-02				3.65E+11	
			727.17	7.982E-02	?(	1.578E-01 1.27E+02	1.18E+01 G
			1620.56	0.000E+00	-	2.347E-01 1.00E+03	2.75E+00 GA
			785.42	8.407E-02	?	9.739E-01 7.10E+02	2.00E+00 GA
Bi-214	N	2.9850E-01				3.65E+11	
			609.69	2.985E-01	(P	3.761E-02 1.15E+01	4.61E+01 G
			1764.51	1.209E-01	& P	1.460E-01 5.20E+01	1.59E+01 GA
			1120.28	2.308E-01	- P	1.946E-01 4.61E+01	1.50E+01 GA
			768.36	1.035E-01	- P	4.753E-01 1.19E+02	4.89E+00 GA
			1377.65	-1.166E-01	% P	1.959E-01 1.00E+03	4.02E+00 GA
			934.05	0.000E+00	-	1.351E-01 1.00E+03	3.17E+00 GA
			1407.98	0.000E+00	}	9.839E-01 5.48E+02	2.48E+00 GA
			1509.19	0.000E+00	-	2.782E-01 1.00E+03	2.19E+00 GA
			665.45	5.454E-01	+	9.357E-01 1.12E+02	1.56E+00 GA
Co-60	T	3.4911E-04				3.65E+11	
			1173.24	-1.062E-02	?(	3.059E-02 1.81E+02	9.99E+01 G
			1332.50	1.130E-02	&(	2.196E-02 1.26E+02	1.00E+02 G
Cs-137	I	2.6126E-02				3.65E+11	
			661.66	2.613E-02	?(	2.280E-02 5.88E+01	8.46E+01 G
Eu-154	I	3.3413E-02				3.65E+11	
			1274.80	3.341E-02	?(	6.375E-02 1.24E+02	3.55E+01 G
			123.10	-9.539E-03	-	2.852E-02 1.86E+02	4.05E+01 GA
			723.30	-7.025E-03	-	1.019E-01 8.87E+02	1.97E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 19:31:00
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

K-40     N   1.8902E+01                                      3.65E+11
                          1460.80 1.890E+01  (P 2.114E-01 3.52E+00 1.07E+01 G

Pa-234   N  -3.6179E-03                                      3.65E+11
                           883.24-3.618E-03 %(  1.312E-01 2.21E+03 1.50E+01 G
                            98.44-1.072E-02 +   7.214E-02 4.12E+02 2.51E+01 GA
                           946.00-8.148E-02 +   2.018E-01 1.56E+02 1.20E+01 GA

Pb-212   N   3.5545E-01                                      3.65E+11
                           238.63 3.555E-01  (P 3.341E-02 9.19E+00 4.31E+01 G
                            77.11 6.799E-01 + P 1.913E-01 2.38E+01 1.75E+01 GA
                            74.81 2.865E-01 -   4.587E-01 1.00E+02 9.60E+00 GA
                            87.20 4.347E-01 ? P 3.542E-01 5.11E+01 6.30E+00 GA
                           300.09 2.138E-01 -   4.110E-01 1.22E+02 3.27E+00 GA

Pb-214   N   3.4554E-01                                      3.65E+11
                           351.79 3.455E-01  (P 3.362E-02 9.79E+00 3.71E+01 G
                           295.22 3.690E-01   P 6.401E-02 1.58E+01 1.92E+01 GA
                           241.92-3.452E-02 - P 1.688E-01 1.47E+02 7.47E+00 GA

Ra-226   N   3.7841E-01                                      3.65E+11
                           186.20 3.784E-01  (  3.833E-01 6.54E+01 3.60E+00 G

Th-234   N   5.5280E-01                                      3.65E+11
                            92.60 5.528E-01 &(  3.936E-01 4.67E+01 5.60E+00 G

Tl-208   N   8.6460E-02                                      3.65E+11
                           583.14 8.646E-02 ?(P 2.276E-02 1.92E+01 8.60E+01 G
                           860.47 1.725E-01 +   1.731E-01 6.74E+01 1.20E+01 GA

U-235    N   2.4246E-02                                      3.65E+11
                           185.70 2.425E-02  (  2.696E-02 7.12E+01 5.40E+01 G
                           143.76-2.964E-02 -   1.441E-01 2.99E+02 1.05E+01 GA
                           163.35 2.035E-01     2.641E-01 8.30E+01 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:31:00
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_014.An1

= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.51	79.	-5.	-0.002	519.23	-5.048E-02
Pa-234	97.51	78.	-3.	-0.001	824.58	-1.072E-02
Eu-152	121.23	74.	-2.	-0.001	1370.64	-4.466E-03
Eu-154	121.24	49.	-5.	-0.002	372.98	-9.539E-03
Eu-154	723.74	31.	-1.	0.000	1773.98	-7.025E-03
Bi-212	727.45	27.	6.	0.002	253.23	7.982E-02
Eu-152	782.20	12.	7.	0.003	163.30	8.489E-02
Bi-212	785.31	26.	1.	0.000	1419.95	8.407E-02
Pa-234	942.14	31.	-5.	-0.002	312.98	-8.148E-02
Co-60	1173.57	37.	-5.	-0.002	361.07	-1.062E-02
Eu-154	1273.62	18.	5.	0.002	247.76	3.341E-02
Co-60	1333.00	16.	5.	0.002	252.97	1.130E-02
Eu-152	1408.72	17.	1.	0.001	854.85	1.634E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.0220E-01	2.0220E-01	1.0973E-01	1.1058E-01	6.894E-02
Am-241 #A	-5.0483E-02	-5.0483E-02	2.6212E-01	2.6216E-01	2.126E-01
Bi-212 #A	7.9818E-02	7.9818E-02	2.0213E-01	2.0220E-01	1.578E-01
Bi-214	2.9850E-01	2.9850E-01	8.0361E-02	8.2802E-02	3.761E-02
Co-60 #A	3.4911E-04	3.4911E-04	7.6955E-04	7.6990E-04	3.059E-02
Cs-137 #	2.6126E-02	2.6126E-02	3.0734E-02	3.0785E-02	2.280E-02
Eu-152 #A	0.0000E+00	0.0000E+00	3.6982E-02	3.6982E-02	6.692E-02
Eu-154 #A	3.3413E-02	3.3413E-02	8.2785E-02	8.2815E-02	6.375E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 19:31:00
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108_014.An1

K-40	1.8902E+01	1.8902E+01	1.3543E+00	1.8935E+00	2.114E-01
Pa-234 #A	-3.6179E-03	-3.6179E-03	1.5980E-01	1.5980E-01	1.312E-01
Pb-212	3.5545E-01	3.5545E-01	6.9103E-02	7.4086E-02	3.341E-02
Pb-214	3.4554E-01	3.4554E-01	7.4246E-02	7.7897E-02	3.362E-02
Ra-226 A	3.7841E-01	3.7841E-01	4.9490E-01	4.9572E-01	3.833E-01
Th-234 #	5.5280E-01	5.5280E-01	5.1623E-01	5.1860E-01	3.936E-01
Tl-208 #	8.6460E-02	8.6460E-02	3.5493E-02	3.5957E-02	2.276E-02
U-235 A	2.4246E-02	2.4246E-02	3.4525E-02	3.4574E-02	2.696E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1408.0 to 2042.1 keV) 2.077E+01 pCi/g
Total Decayed Activity (1408.0 to 2042.1 keV) 2.0769312E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE06
Seqnum : 1554011902009
File : 6_20140108_009
IDF : 1.0
PDF : 1.0
Lab ID : 251491-009
Matrix : Soil
Batch : 206637
Time : 08-JAN-2014 15:24
Sample Amount : 328.86 g
Live Time : 2700 sec
Dead Time : 0.07 %
Cal : 08-JAN-2014 06:45:06,06-JAN-2014 16:42:07
Units : pCi/g

Type : IDUP
Inst : HPGE06
Seqnum : 1554011902011.4
File : 6_20140108_011
IDF : 1.0
PDF : 1.0
Lab ID : QC722418
Matrix : Soil
Batch : 206637
Time : 08-JAN-2014 17:02
Sample Amount : 328.86 g
Live Time : 2700 sec
Dead Time : 0.07 %
Cal : 08-JAN-2014 06:45:06,06-JAN-2014 16:42:07

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.004235	0.1058		.12887	.12887	-0.001714	0.1243		.15102	.15102		40		1	u
Bismuth-212	0	0.1915		.13054	.13054	0.1613	0.1325		.18561	.18597		40		1	u
Bismuth-214	0.3893	0.03663		.083699	.088071	0.4464	0.03601		.088585	.093992	14	40	0.314	1	u
Cesium-137	-0.009770	0.02061	0.07	.026343	.026352	0.0006930	0.02086	0.07	.025415	.025415		20		1	u
Cobalt-60	-0.005893	0.04444		.23573	.23573	-0.003561	0.01970		.089531	.089532		40		1	u
Europium-152	-0.008480	0.05531		.068017	.06802	-0.01264	0.05826		.071954	.07196		40		1	u
Europium-154	0.007089	0.08447		.10345	.10345	0.006049	0.06696		.082264	.082265		40		1	u
Lead-212	0.3798	0.03280		.074208	.079604	0.3409	0.03024		.06646	.07131	11	40	0.258	1	u
Lead-214	0.4603	0.02628		.080437	.08674	0.4557	0.02545		.081243	.087368	1	40	0.027	1	u
Potassium-40	12.29	0.2701		1.1215	1.4135	13.07	0.2701		1.1552	1.4738	6	40	0.272	1	u
Protactinium-234	0.05143	0.1100		.14246	.14251	-0.004273	0.1417		.17256	.17256		40		1	u
Radium-226	0.6051	0.3725	1.3	.50009	.50218	0.6639	0.3856	1.3	.51882	.52125	9	20	0.057	1	u
Thallium-208	0.07129	0.01773		.030181	.030592	0.1592	0.01534		.044	.045394	76	40	1.156	1	u
Thorium-232 (By Actinium-228)	0.2495	0.06982		.11626	.11756	0.2989	0.07727		.128	.12968	18	40	0.200	1	u
Thorium-234	-0.01085	0.4095		.4978	.4978	-0.2285	0.3486		.43963	.44011		40		1	u
Uranium-235	0.04079	0.02815		.037044	.037173	0.04650	0.02453		.033469	.033654	13	40	0.081	1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0033-09DUP
Sample Description: QC722418, 206637, IDUP

Detector: HPGE06 51-TP32744A
Spectrum ID: 6_20140108_011
Contract: ITSI
Sample Type: DUP
Unit Number: PD-D0033
Matrix: S
Sample Time: 12/8/2013 14:03
Live Time: 2700 sec
Acquisition Time: 1/8/2014 17:02:13
Real Time: 2702 sec
Analysis Time: 1/8/2014 17:47
Dead Time: 0.07 %
Analysis Quantity: 3.289E+02 g

Efficiency: HPGE06 S23325 6_20140104002_EffCal
Efficiency Cal Date: 1/6/2014 16:42
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.989E-01	1.280E-01	1.297E-01	7.727E-02
Am-241	#AB	-1.714E-03	1.510E-01	1.510E-01	1.243E-01
Bi-212	#	1.613E-01	1.856E-01	1.860E-01	1.325E-01
Bi-214		4.464E-01	8.858E-02	9.399E-02	3.601E-02
Co-60	#AB	-3.561E-03	8.953E-02	8.953E-02	1.970E-02
Cs-137	#AB	6.930E-04	2.541E-02	2.541E-02	2.086E-02
Eu-152	#AB	-1.264E-02	7.195E-02	7.196E-02	5.826E-02
Eu-154	#AB	6.049E-03	8.226E-02	8.227E-02	6.696E-02
K-40		1.307E+01	1.155E+00	1.474E+00	2.701E-01
Pa-234	#AB	-4.273E-03	1.726E-01	1.726E-01	1.417E-01
Pb-212		3.409E-01	6.646E-02	7.131E-02	3.024E-02
Pb-214		4.557E-01	8.124E-02	8.737E-02	2.545E-02
Ra-226	#	6.639E-01	5.188E-01	5.213E-01	3.856E-01
Th-234	#AB	-2.285E-01	4.396E-01	4.401E-01	3.486E-01
Tl-208		1.592E-01	4.400E-02	4.539E-02	1.534E-02
U-235	#	4.650E-02	3.347E-02	3.365E-02	2.453E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.565E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:47:22
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_011.An1

Sample description
     QC722418, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det6\6_20140108_011.An1

Acquisition information
       Start time:                 1/8/2014 17:02:13
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_Soil 250ml TunaCan_01-04-2014.Clb
     HPGE06 S23325 6_20140104002_EffCal


       Energy Calibration
            Created:               1/8/2014 06:45:06
            Zero offset:           0.078 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.421E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 16:42:07
            Type:                  Polynomial
            Uncertainty:           1.262 %
            Coefficients:         -0.387239  -4.158640   0.426222
                                  -0.050686   0.002155  -0.000042

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2041.45keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2886E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2886E+02) =
                                   8.2184E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:22
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 14:03:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	6_2014-01-07_0843.PBC 1/7/2014 08:43:34
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1512

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.22	3.	123.74	0.00	0.000E+00				
72.68	32.	34.66	0.81	2.236E-02				
74.98	63.	23.88	0.81	2.406E-02	74.81	9.600	8.311E-01	Pb212
77.24	80.	17.35	0.82	2.568E-02	77.11	17.500	5.321E-01	Pb212
87.59	49.	35.22	0.26	3.202E-02	87.20	6.300	7.425E-01	Pb212
98.16	12.	99.71	0.84	3.754E-02	98.44	25.100	PBC<MDA	Pa234
123.16	5.	272.98	0.86	4.438E-02	123.10	40.460	PBC<MDA	Eu154
163.27	7.	169.51	0.91	4.613E-02	163.35	4.700	PBC<MDA	U235
185.87	37.	35.99	0.93	4.488E-02	185.70	54.000	4.650E-02	U235
					186.20	3.600	6.980E-01	Ra226
186.00	35.	39.07	0.93	4.485E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	6.639E-01	Ra226
238.52	202.	9.42	0.75	4.040E-02	238.63	43.100	3.408E-01	Pb212
241.22	42.	34.46	0.99	4.010E-02	241.92	7.470	4.231E-01	Pb214
270.22	11.	93.64	1.02	3.767E-02	270.25	3.460	PBC<MDA	Ac228
					270.25	3.460	2.640E-01	Ac228
295.16	132.	15.62	0.50	3.571E-02	295.22	19.200	5.875E-01	Pb214
299.81	10.	96.49	1.05	3.534E-02	300.09	3.270	PBC<MDA	Pb212
338.29	80.	14.96	0.47	3.271E-02	338.40	12.010	6.216E-01	Ac228
					338.40	12.010	6.216E-01	Ac228
351.73	177.	8.92	0.85	3.187E-02	351.79	37.100	4.557E-01	Pb214
463.29	1.	905.45	1.21	2.644E-02	463.00	4.400	PBC<MDA	Ac228
					463.00	4.400	2.523E-02	Ac228
583.21	101.	13.82	0.21	2.255E-02	583.14	86.000	1.592E-01	Tl208
609.44	174.	8.70	0.65	2.187E-02	609.69	46.090	4.812E-01	Bi214
727.18	12.	57.53	1.45	1.936E-02	727.17	11.800	1.613E-01	Bi212
785.08	8.	95.71	1.50	1.835E-02	785.42	2.000	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:22
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
860.75	14.	47.48	1.56	1.722E-02	860.47	12.000	2.126E-01	Tl208
911.38	47.	21.41	1.61	1.654E-02	911.07	29.000	2.989E-01	Ac228
					911.07	29.000	2.989E-01	Ac228
934.32	9.	84.36	1.63	1.625E-02	934.05	3.170	PBC<MDA	Bi214
969.14	17.	52.73	1.65	1.583E-02	968.90	17.460	1.902E-01	Ac228
					968.90	17.460	1.902E-01	Ac228
1120.59	14.	60.23	1.77	1.425E-02	1120.28	15.040	2.010E-01	Bi214
1150.69	18.	23.57	0.19	1.397E-02				
1177.66	-2.	473.52	1.82	1.377E-02	1173.24	99.860	PBC<MDA	Co60
1238.32	35.	22.56	0.21	1.322E-02				
1273.65	1.	679.97	1.89	1.293E-02	1274.80	35.500	PBC<MDA	Eu154
1460.84	556.	4.24	1.20	1.161E-02	1460.80	10.700	1.307E+01	K40
1620.19	4.	122.14	2.12	1.065E-02	1620.56	2.750	PBC<MDA	Bi212
1765.21	17.	25.26	2.21	9.890E-03	1764.51	15.920	3.314E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
241.00	30.22	8.	3.	0.000E+00	247.49	0.000	-	
580.12	72.63	42.	27.	1.225E+03	76.76	0.191	-	sM
2704.62	338.29	61.	36.	1.098E+03	69.98	0.472	AC-228	s
9204.36	1150.69	0.	18.	1.288E+03	47.14	0.187	-	s
9905.71	1238.32	7.	35.	2.677E+03	45.12	0.214	BI-214	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	600.18	75.14	103.	62.	0.023	53.17	0.813s
Pb-212	616.97	77.24	115.	56.	0.021	59.35	0.815s
Pb-212	699.76	87.59	81.	49.	0.018	70.44	0.260s
Th-234	728.84	91.23	92.	-15.	-0.005	192.38	0.832s
Pa-234	784.29	98.16	68.	12.	0.005	199.43	0.838s
Eu-152	971.94	121.63	99.	-7.	-0.002	436.07	0.863s
Eu-154	984.17	123.16	77.	5.	0.002	545.96	0.864s
U-235	1143.15	143.04	100.	-7.	-0.002	440.85	0.886s

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:22
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	1304.93	163.27	65.	7.	0.003	339.01	0.906s
U-235	1485.63	185.87	70.	37.	0.014	71.98	0.930s
Ra-226	1486.71	186.00	77.	35.	0.013	78.14	0.930s
Pb-212	1906.67	238.52	55.	195.	0.072	18.84	0.747s
Pb-214	1928.32	241.22	82.	42.	0.015	68.92	0.987s
Ac-228	2160.26	270.22	50.	11.	0.004	187.28	1.016s
Pb-214	2360.00	295.20	49.	113.	0.042	32.32	0.484s
Pb-212	2396.91	299.81	47.	10.	0.004	192.97	1.046s
Ac-228	2705.06	338.34	41.	44.	0.016	50.90	1.085s
Eu-152	2751.98	344.21	51.	-4.	-0.001	569.07	1.091s
Pb-214	2812.10	351.73	18.	177.	0.066	17.83	0.849s
Ac-228	3704.42	463.29	38.	1.	0.000	1810.89	1.206s
Tl-208	4663.68	583.21	18.	101.	0.038	27.64	0.206s
Bi-214	4874.03	609.50	26.	148.	0.055	18.01	0.644s
Eu-154	5788.58	723.82	38.	-5.	-0.002	354.14	1.446s
Bi-212	5815.47	727.18	18.	12.	0.004	115.05	1.450s
Bi-214	6146.99	768.62	33.	-4.	-0.001	466.58	1.486s
Eu-152	6236.61	779.82	37.	-4.	-0.002	402.70	1.495s
Bi-212	6278.69	785.08	26.	8.	0.003	191.41	1.501s
Tl-208	6884.17	860.75	16.	14.	0.005	94.95	1.565s
Ac-228	7289.30	911.38	27.	47.	0.017	42.83	1.607s
Bi-214	7472.80	934.32	23.	9.	0.003	168.71	1.626s
Pa-234	7567.04	946.09	32.	-3.	-0.001	510.48	1.636s
Eu-152	7709.78	963.93	40.	-5.	-0.002	380.65	1.651s
Ac-228	7751.44	969.14	33.	17.	0.006	105.47	1.655s
Bi-214	8963.48	1120.59	32.	14.	0.005	120.46	1.775s
Eu-154	10188.50	1273.65	19.	1.	0.000	1359.94	1.890s
Bi-214	11261.83	1407.74	15.	-1.	0.000	1810.93	1.985s
K-40	11686.88	1460.84	22.	534.	0.198	8.48	1.199s
Bi-212	12962.62	1620.19	10.	4.	0.001	244.28	2.125s
Bi-214	14123.76	1765.21	14.	17.	0.006	50.53	2.212s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	2.9886E-01				3.65E+11	
			911.07	2.989E-01	(	7.727E-02 2.14E+01 2.90E+01	G
			968.90	1.902E-01	&	1.471E-01 5.27E+01 1.75E+01	GA
			338.40	3.431E-01	?	1.161E-01 2.55E+01 1.20E+01	GA
			964.77	1.318E-02	%	5.615E-01 2.59E+03 4.99E+00	GA
			463.00	2.523E-02	-	3.739E-01 9.05E+02 4.40E+00	GA
			794.95	0.000E+00	-	5.267E-01 1.00E+03 4.25E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:22
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			270.25	2.640E-01	?	3.863E-01	9.36E+01	3.46E+00 GA
Am-241	I	-1.7137E-03					3.65E+11	
			59.54	-1.714E-03	%(	1.243E-01	4.41E+03	3.63E+01 G
Bi-212	N	1.6133E-01					3.65E+11	
			727.17	1.613E-01	&(	1.325E-01	5.75E+01	1.18E+01 G
			1620.56	4.114E-01	?	7.546E-01	1.22E+02	2.75E+00 GA
			785.42	6.725E-01	&	9.865E-01	9.57E+01	2.00E+00 GA
Bi-214	N	4.4643E-01					3.65E+11	
			609.69	4.464E-01	(P	3.601E-02	9.00E+00	4.61E+01 G
			1764.51	3.314E-01	- P	1.695E-01	2.53E+01	1.59E+01 GA
			1120.28	2.010E-01	- P	1.884E-01	6.02E+01	1.50E+01 GA
			768.36	-1.192E-01	-	4.461E-01	2.33E+02	4.89E+00 GA
			1377.65	0.000E+00	-	9.877E-01	1.00E+03	4.02E+00 GA
			934.05	5.137E-01	&	6.536E-01	8.44E+01	3.17E+00 GA
			1407.98	-6.169E-02	-	9.108E-01	9.05E+02	2.48E+00 GA
			1509.19	-2.485E-02	% P	2.113E+00	1.00E+03	2.19E+00 GA
			665.45	-2.187E-01	% P	1.125E+00	8.61E+03	1.56E+00 GA
Co-60	T	-3.5606E-03					3.65E+11	
			1173.24	-3.561E-03	%(P	1.970E-02	4.74E+02	9.99E+01 G
			1332.50	-6.533E-03	% P	2.482E-02	6.67E+02	1.00E+02 G
Cs-137	I	6.9299E-04					3.65E+11	
			661.66	6.930E-04	%(	2.086E-02	1.83E+03	8.46E+01 G
Eu-152	I	-1.2644E-02					3.65E+11	
			344.30	-1.264E-02	?(	5.826E-02	2.85E+02	2.70E+01 G
			121.87	-1.582E-02	+	5.592E-02	2.18E+02	2.86E+01 GA
			1408.08	0.000E+00	+	2.716E-01	1.00E+03	2.12E+01 GA
			964.05	-6.390E-02	+	1.946E-01	1.90E+02	1.46E+01 GA
			778.90	-5.548E-02	+	1.788E-01	2.01E+02	1.30E+01 GA
			411.09	2.557E-02	%	6.153E-01	1.47E+03	2.26E+00 GA
Eu-154	I	6.0491E-03					3.65E+11	
			1274.80	6.049E-03	?(	6.696E-02	6.80E+02	3.55E+01 G
			123.10	7.808E-03	&	3.460E-02	2.73E+02	4.05E+01 GA
			723.30	-4.022E-02	+	1.136E-01	1.77E+02	1.97E+01 GA
K-40	N	1.3071E+01					3.65E+11	
			1460.80	1.307E+01	(P	2.701E-01	4.24E+00	1.07E+01 G
Pa-234	N	-4.2731E-03					3.65E+11	
			883.24	-4.273E-03	%(	1.417E-01	2.02E+03	1.50E+01 G
			98.44	3.948E-02	?	6.214E-02	9.97E+01	2.51E+01 GA
			946.00	-5.083E-02	+	2.086E-01	2.55E+02	1.20E+01 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/8/2014 17:47:22
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   3.4085E-01                                     3.65E+11
                          238.63 3.408E-01  (P 3.024E-02 9.42E+00 4.31E+01 G
                           77.11 3.778E-01 ? P 1.696E-01 2.97E+01 1.75E+01 GA
                           74.81 8.146E-01 +   3.131E-01 2.66E+01 9.60E+00 GA
                           87.20 7.425E-01 + P 3.160E-01 3.52E+01 6.30E+00 GA
                          300.09 2.622E-01 & P 4.216E-01 9.65E+01 3.27E+00 GA

Pb-214   N   4.5565E-01                                     3.65E+11
                          351.79 4.557E-01 *(  2.545E-02 8.92E+00 3.71E+01 G
                          295.22 5.018E-01     7.242E-02 1.62E+01 1.92E+01 GA
                          241.92 4.231E-01 &   2.145E-01 3.45E+01 7.47E+00 GA

Ra-226   N   6.6394E-01                                     3.65E+11
                          186.20 6.639E-01  (  3.856E-01 3.91E+01 3.60E+00 G

Th-234   N  -2.2852E-01                                     3.65E+11
                           92.60-2.285E-01 ?(  3.486E-01 9.62E+01 5.60E+00 G

Tl-208   N   1.5916E-01                                     3.65E+11
                          583.14 1.592E-01  (  1.534E-02 1.38E+01 8.60E+01 G
                          860.47 2.126E-01 ?   1.384E-01 4.75E+01 1.20E+01 GA

U-235    N   4.6498E-02                                     3.65E+11
                          185.70 4.650E-02  (  2.453E-02 3.60E+01 5.40E+01 G
                          143.76-4.090E-02 -   1.462E-01 2.20E+02 1.05E+01 GA
                          163.35 9.675E-02 ?   2.633E-01 1.70E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
```

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:22
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_011.An1

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	91.23	92.	-15.	-0.005	192.38	-2.285E-01
Pa-234	98.16	68.	12.	0.005	199.43	3.948E-02
Eu-152	121.63	99.	-7.	-0.002	436.07	-1.582E-02
Eu-154	123.16	77.	5.	0.002	545.96	7.808E-03
U-235	143.04	100.	-7.	-0.002	440.85	-4.090E-02
U-235	163.27	65.	7.	0.003	339.01	9.675E-02
U-235	185.87	70.	37.	0.014	71.98	4.650E-02
Ra-226	186.00	77.	35.	0.013	78.14	6.639E-01
Ac-228	270.22	50.	11.	0.004	187.28	2.640E-01
Ac-228	338.34	41.	44.	0.016	50.90	3.431E-01
Eu-152	344.21	51.	-4.	-0.001	569.07	-1.264E-02
Ac-228	463.29	38.	1.	0.000	1810.89	2.523E-02
Eu-154	723.82	38.	-5.	-0.002	354.14	-4.022E-02
Bi-212	727.18	18.	12.	0.004	115.05	1.613E-01
Eu-152	779.82	37.	-4.	-0.002	402.70	-5.548E-02
Bi-212	785.08	26.	8.	0.003	191.41	6.725E-01
Ac-228	911.38	27.	47.	0.017	42.83	2.989E-01
Pa-234	946.09	32.	-3.	-0.001	510.48	-5.083E-02
Eu-152	963.93	40.	-5.	-0.002	380.65	-6.390E-02
Ac-228	969.14	33.	17.	0.006	105.47	1.902E-01
Eu-154	1273.65	19.	1.	0.000	1359.94	6.049E-03
Bi-212	1620.19	10.	4.	0.001	244.28	4.114E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.9886E-01	2.9886E-01	1.2800E-01	1.2968E-01	7.727E-02
Am-241 #A	-1.7137E-03	-1.7137E-03	1.5102E-01	1.5102E-01	1.243E-01
Bi-212 #	1.6133E-01	1.6133E-01	1.8561E-01	1.8597E-01	1.325E-01
Bi-214	4.4643E-01	4.4643E-01	8.8585E-02	9.3992E-02	3.601E-02
Co-60 #A	-3.5606E-03	-3.5606E-03	8.9531E-02	8.9532E-02	1.970E-02
Cs-137 #A	6.9299E-04	6.9299E-04	2.5415E-02	2.5415E-02	2.086E-02
Eu-152 #A	-1.2644E-02	-1.2644E-02	7.1954E-02	7.1960E-02	5.826E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/8/2014 17:47:22
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108_011.An1

Eu-154	#A	6.0491E-03	6.0491E-03	8.2264E-02	8.2265E-02	6.696E-02
K-40		1.3071E+01	1.3071E+01	1.1552E+00	1.4738E+00	2.701E-01
Pa-234	#A	-4.2731E-03	-4.2731E-03	1.7256E-01	1.7256E-01	1.417E-01
Pb-212		3.4085E-01	3.4085E-01	6.6460E-02	7.1310E-02	3.024E-02
Pb-214		4.5565E-01	4.5565E-01	8.1243E-02	8.7368E-02	2.545E-02
Ra-226	#	6.6394E-01	6.6394E-01	5.1882E-01	5.2125E-01	3.856E-01
Th-234	#A	-2.2852E-01	-2.2852E-01	4.3963E-01	4.4011E-01	3.486E-01
Tl-208		1.5916E-01	1.5916E-01	4.4000E-02	4.5394E-02	1.534E-02
U-235	#	4.6498E-02	4.6498E-02	3.3469E-02	3.3654E-02	2.453E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2041.5 keV) 1.447E+01 pCi/g
Total Decayed Activity (25.1 to 2041.5 keV) 1.4472978E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE11
Seqnum : 1604010485008
File : 11_20140107_008
IDF : 1.0
PDF : 1.0
Lab ID : 251492-016
Matrix : Soil
Batch : 206637
Time : 07-JAN-2014 13:25
Sample Amount : 306.37 g
Live Time : 2700 sec
Dead Time : 0.07 %
Cal : 07-JAN-2014 07:07:34,03-JAN-2014 14:18:33
Units : pCi/g

Type : IDUP
Inst : HPGE11
Seqnum : 1604010485009.4
File : 11_20140107_009
IDF : 1.0
PDF : 1.0
Lab ID : QC722419
Matrix : Soil
Batch : 206637
Time : 07-JAN-2014 14:13
Sample Amount : 306.37 g
Live Time : 2700 sec
Dead Time : 0.07 %
Cal : 07-JAN-2014 07:07:34,03-JAN-2014 14:18:33

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	0.01692	0.1496		.18335	.18336	-0.03582	0.1692		.20878	.20881		40		1	u
Bismuth-212	0.1240	0.1935		.25216	.25231	0.2375	0.1701		.2423	.24288		40		1	u
Bismuth-214	0.2339	0.05516		.086688	.088238	0.2267	0.05407		.085026	.08651	3	40	0.041	1	u
Cesium-137	0	0.005158	0.07	.012522	.012522	0.005082	0.02530	0.07	.031435	.031437		20		1	u
Cobalt-60	-0.02055	0.03416		.044159	.044181	0.001461	0.03000		.0037644	.0037656		40		1	u
Europium-152	-0.01680	0.06057		.075554	.075563	0.001745	0.07209		.087694	.087695		40		1	u
Europium-154	0	0.1786		.023733	.023733	-0.02849	0.08766		.11082	.11083		40		1	u
Lead-212	0.4714	0.03388		.084592	.091835	0.4074	0.04107		.089657	.094832	15	40	0.342	1	u
Lead-214	0.4026	0.04870		.11036	.11396	0.4272	0.03649		.090222	.095118	6	40	0.117	1	u
Potassium-40	15.63	0.3507		1.4657	1.8292	14.94	0.3063		1.3857	1.7361	5	40	0.195	1	u
Protactinium-234	-0.04857	0.1483		.18809	.18812	0.06609	0.1581		.20214	.20219		40		1	u
Radium-226	0.7725	0.4013	1.3	.56104	.56409	0.7371	0.4641	1.3	.6256	.62809	5	20	0.030	1	u
Thallium-208	0.1026	0.02735		.042555	.043159	0.1244	0.01731		.03982	.040765	19	40	0.260	1	u
Thorium-232 (By Actinium-228)	-0.009209	0.1547		.30654	.30654	0.1878	0.1044		.14461	.1452		40		1	u
Thorium-234	-0.1064	0.5054		.62106	.62114	1.003	0.3627		.68927	.6951		40		1	u
Uranium-235	0.01769	0.03402		.042706	.042727	0.04542	0.03260		.04324	.043376		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0042-16DUP
Sample Description: QC722419, 206637, IDUP

Detector: HPGE11 50-TP50818A
Contract: ITSI
Unit Number: PD-D0042
Sample Time: 12/9/2013 11:26
Acquisition Time: 1/7/2014 14:13:39
Analysis Time: 1/7/2014 14:58
Analysis Quantity: 3.064E+02 g

Spectrum ID: 11_20140107_009
Sample Type: DUP
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE11 S23325 11_20140102002_EffCal
Efficiency Cal Date: 1/3/2014 14:18
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	1.878E-01	1.446E-01	1.452E-01	1.044E-01
Am-241	#AB	-3.582E-02	2.088E-01	2.088E-01	1.692E-01
Bi-212	#	2.375E-01	2.423E-01	2.429E-01	1.701E-01
Bi-214	#	2.267E-01	8.503E-02	8.651E-02	5.407E-02
Co-60	#AB	1.461E-03	3.764E-03	3.766E-03	3.000E-02
Cs-137	#AB	5.082E-03	3.143E-02	3.144E-02	2.530E-02
Eu-152	#AB	1.745E-03	8.769E-02	8.769E-02	7.209E-02
Eu-154	#AB	-2.849E-02	1.108E-01	1.108E-01	8.766E-02
K-40		1.494E+01	1.386E+00	1.736E+00	3.063E-01
Pa-234	#AB	6.609E-02	2.021E-01	2.022E-01	1.581E-01
Pb-212		4.074E-01	8.966E-02	9.483E-02	4.107E-02
Pb-214		4.272E-01	9.022E-02	9.512E-02	3.649E-02
Ra-226	#	7.371E-01	6.256E-01	6.281E-01	4.641E-01
Th-234		1.003E+00	6.893E-01	6.951E-01	3.627E-01
Tl-208		1.244E-01	3.982E-02	4.077E-02	1.731E-02
U-235	#	4.542E-02	4.324E-02	4.338E-02	3.260E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.841E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/7/2014 14:58:47
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107_009.An1

Sample description
     QC722419, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det11\11_20140107_009.An1

Acquisition information
       Start time:                 1/7/2014 14:13:39
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/7/2014 07:07:34
            Zero offset:           0.117 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.072E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.14keV )
       Stop channel:           16336 (  2041.22keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.0637E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.0637E+02) =
                                   8.8217E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/7/2014 14:58:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107_009.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/9/2013 11:26:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	11_2014-01-04_0721.PBC 1/4/2014 07:21:07
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1600

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.69	16.	78.66	0.80	1.832E-02	74.81	9.600	PBC<MDA	Pb212
77.11	91.	16.85	0.32	1.957E-02	77.11	17.500	8.682E-01	Pb212
87.36	12.	100.53	0.81	2.451E-02	87.20	6.300	PBC<MDA	Pb212
92.89	46.	34.37	0.47	2.677E-02	92.60	5.600	1.003E+00	Th234
121.67	7.	148.63	0.85	3.453E-02	121.87	28.590	PBC<MDA	Eu152
123.37	2.	418.18	0.85	3.472E-02	123.10	40.460	PBC<MDA	Eu154
185.89	27.	47.60	0.92	3.622E-02	185.70	54.000	4.542E-02	U235
					186.20	3.600	6.817E-01	Ra226
					185.70	54.000	4.542E-02	U235
185.89	29.	42.44	0.92	3.620E-02	185.70	54.000	PBC<MDA	U235
					186.20	3.600	7.371E-01	Ra226
195.23	37.	33.18	0.20	3.575E-02				
238.54	181.	9.23	0.97	3.309E-02	238.63	43.100	4.039E-01	Pb212
241.41	45.	27.88	0.97	3.291E-02	241.92	7.470	5.350E-01	Pb214
270.35	9.	111.68	1.00	3.105E-02	270.25	3.460	PBC<MDA	Ac228
295.05	72.	18.26	0.26	2.955E-02	295.22	19.200	3.846E-01	Pb214
300.32	7.	123.73	1.03	2.926E-02	300.09	3.270	PBC<MDA	Pb212
337.92	33.	29.70	1.07	2.720E-02	338.40	12.010	3.314E-01	Ac228
351.78	138.	9.85	0.83	2.654E-02	351.79	37.100	4.272E-01	Pb214
463.21	10.	81.15	1.19	2.218E-02	463.00	4.400	PBC<MDA	Ac228
583.18	62.	14.39	0.31	1.900E-02	583.14	86.000	1.244E-01	Tl208
609.13	113.	11.47	0.77	1.845E-02	609.69	46.090	3.992E-01	Bi214
662.11	2.	309.25	1.38	1.744E-02	661.66	84.620	PBC<MDA	Cs137
727.57	14.	51.01	1.44	1.636E-02	727.17	11.800	2.375E-01	Bi212
795.72	4.	173.79	1.50	1.539E-02	794.95	4.250	PBC<MDA	Ac228
860.51	9.	86.34	1.55	1.457E-02	860.47	12.000	PBC<MDA	Tl208
883.28	4.	152.94	1.57	1.431E-02	883.24	15.000	PBC<MDA	Pa234

ORTEC g v - i (3263) Env32 G53W4.26 1/7/2014 14:58:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107_009.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
911.09	23.	32.19	1.60	1.401E-02	911.07	29.000	1.878E-01	Ac228
946.46	1.	691.47	1.63	1.364E-02	946.00	12.000	PBC<MDA	Pa234
963.90	7.	112.96	1.64	1.345E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	3.613E-01	Ac228
969.12	18.	45.76	1.65	1.341E-02	968.90	17.460	2.523E-01	Ac228
1120.16	18.	41.80	1.77	1.208E-02	1120.28	15.040	3.248E-01	Bi214
1331.46	4.	158.41	1.94	1.060E-02	1332.50	99.980	PBC<MDA	Co60
1460.82	500.	4.47	0.75	9.854E-03	1460.80	10.700	1.494E+01	K40
1763.99	16.	32.20	2.24	8.394E-03	1764.51	15.920	3.794E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1559.57	195.23	31.	37.	1.029E+03	66.37	0.204	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	475.15	59.57	56.	-4.	-0.001	582.92	0.784s
Pb-212	596.01	74.69	106.	16.	0.006	157.32	0.800s
Pb-212	615.40	77.11	48.	91.	0.034	33.69	0.323s
Pb-212	697.32	87.36	102.	12.	0.004	201.06	0.813s
Th-234	741.54	92.89	51.	46.	0.017	68.75	0.473s
Pa-234	787.29	98.62	73.	-7.	-0.002	374.05	0.825s
Eu-152	971.57	121.67	50.	7.	0.003	297.26	0.850s
Eu-154	985.12	123.37	52.	2.	0.001	836.35	0.851s
U-235	1149.10	143.88	84.	-14.	-0.005	195.30	0.873s
U-235	1484.92	185.89	70.	27.	0.010	95.20	0.916s
Ra-226	1484.96	185.89	63.	29.	0.011	84.88	0.916s
Pb-212	1905.54	238.50	59.	178.	0.066	21.38	0.808
Pb-214	1929.23	241.46	88.	29.	0.011	83.28	0.973s
Ac-228	2160.16	270.35	48.	9.	0.003	223.37	1.002s
Pb-214	2357.66	295.05	30.	67.	0.025	36.53	0.263s
Pb-212	2399.81	300.32	39.	7.	0.003	247.47	1.032s
Ac-228	2700.47	337.92	38.	33.	0.012	59.41	1.070s
Pb-214	2811.24	351.78	22.	129.	0.048	19.70	0.829s

ORTEC g v - i (3263) Env32 G53W4.26 1/7/2014 14:58:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107_009.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	3702.33	463.21	36.	10.	0.004	162.31	1.192s
Tl-208	4661.88	583.18	14.	62.	0.023	28.77	0.307s
Bi-214	4871.04	609.33	36.	59.	0.022	32.27	1.330s
Cs-137	5293.26	662.11	24.	2.	0.001	618.50	1.378s
Bi-214	5311.23	664.36	29.	-5.	-0.002	303.60	1.381s
Bi-212	5816.94	727.57	19.	14.	0.005	102.03	1.437s
Eu-152	6230.52	779.27	27.	-3.	-0.001	453.83	1.483s
Ac-228	6362.16	795.72	20.	4.	0.001	347.58	1.497s
Tl-208	6880.60	860.51	25.	9.	0.003	172.67	1.555s
Pa-234	7062.75	883.28	20.	4.	0.002	305.88	1.574s
Ac-228	7285.32	911.09	31.	23.	0.009	64.39	1.598s
Pa-234	7568.40	946.46	22.	1.	0.000	1382.94	1.628s
Ac-228	7707.94	963.90	31.	7.	0.003	225.92	1.643s
Ac-228	7749.70	969.12	25.	18.	0.007	91.51	1.647s
Bi-214	8958.58	1120.16	29.	18.	0.007	83.59	1.771s
Co-60	9390.41	1174.10	21.	-3.	-0.001	406.34	1.813s
Eu-154	10212.86	1276.84	20.	-3.	-0.001	388.99	1.892s
Co-60	10650.21	1331.46	18.	4.	0.001	316.82	1.935s
K-40	11686.10	1460.82	18.	482.	0.179	8.94	0.751s
Bi-214	14114.44	1763.99	5.	16.	0.006	64.41	2.236s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.8778E-01					3.65E+11
			911.07	1.878E-01	?(P	1.044E-01	3.22E+01 2.90E+01 G
			968.90	2.523E-01	? P	1.638E-01	4.58E+01 1.75E+01 GA
			338.40	3.314E-01	? P	1.430E-01	2.97E+01 1.20E+01 GA
			964.77	3.613E-01	?	6.359E-01	1.13E+02 4.99E+00 GA
			463.00	3.221E-01	? P	4.667E-01	8.12E+01 4.40E+00 GA
			794.95	1.828E-01	? P	5.236E-01	1.74E+02 4.25E+00 GA
			270.25	2.781E-01	?	4.888E-01	1.12E+02 3.46E+00 GA
Am-241	I	-3.5817E-02					3.65E+11
			59.54	-3.582E-02	?(	1.692E-01	2.91E+02 3.63E+01 G
Bi-212	N	2.3749E-01					3.65E+11
			727.17	2.375E-01	?(	1.701E-01	5.10E+01 1.18E+01 G
			1620.56	1.052E-03	%	6.943E-01	4.01E+04 2.75E+00 GA
			785.42	1.409E-02	%	1.429E+00	6.16E+03 2.00E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/7/2014 14:58:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107_009.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	2.2670E-01					3.65E+11	
			609.69	2.267E-01	?(P	5.407E-02	1.61E+01	4.61E+01 G
			1764.51	3.794E-01	+ P	1.276E-01	3.22E+01	1.59E+01 GA
			1120.28	3.248E-01	? P	2.273E-01	4.18E+01	1.50E+01 GA
			768.36	-3.613E-02	& P	5.665E-01	6.53E+03	4.89E+00 GA
			1377.65	0.000E+00	-	1.834E-01	1.00E+03	4.02E+00 GA
			934.05	0.000E+00	-	1.745E-01	1.00E+03	3.17E+00 GA
			1407.98	-7.963E-03	% P	1.183E+00	1.30E+04	2.48E+00 GA
			1509.19	0.000E+00	-	3.623E-01	1.00E+03	2.19E+00 GA
			665.45	-6.365E-01	-	1.525E+00	1.52E+02	1.56E+00 GA
Co-60	T	1.4612E-03					3.65E+11	
			1173.24	-9.308E-03	?(	3.000E-02	2.03E+02	9.99E+01 G
			1332.50	1.222E-02	?(	3.024E-02	1.58E+02	1.00E+02 G
Cs-137	I	5.0824E-03					3.65E+11	
			661.66	5.082E-03	?(	2.530E-02	3.09E+02	8.46E+01 G
Eu-152	I	1.7445E-03					3.65E+11	
			344.30	1.745E-03	%(	7.209E-02	2.51E+03	2.70E+01 G
			121.87	2.309E-02	?	5.467E-02	1.49E+02	2.86E+01 GA
			1408.08	-2.268E-03	%	1.366E-01	3.67E+03	2.12E+01 GA
			964.05	0.000E+00	&	5.782E-01	1.00E+03	1.46E+01 GA
			778.90	-5.378E-02	&	1.951E-01	2.27E+02	1.30E+01 GA
			411.09	0.000E+00	-	1.042E+00	1.00E+03	2.26E+00 GA
Eu-154	I	-2.8488E-02					3.65E+11	
			1274.80	-2.849E-02	?(	8.766E-02	1.94E+02	3.55E+01 G
			123.10	5.716E-03	+	3.892E-02	4.18E+02	4.05E+01 GA
			723.30	0.000E+00	&	2.050E-01	1.00E+03	1.97E+01 GA
K-40	N	1.4935E+01					3.65E+11	
			1460.80	1.494E+01	(P	3.063E-01	4.47E+00	1.07E+01 G
Pa-234	N	6.6085E-02					3.65E+11	
			883.24	6.609E-02	?(	1.581E-01	1.53E+02	1.50E+01 G
			98.44	-2.974E-02	-	8.964E-02	1.87E+02	2.51E+01 GA
			946.00	1.927E-02	?	2.172E-01	6.91E+02	1.20E+01 GA
Pb-212	N	4.0744E-01					3.65E+11	
			238.63	4.074E-01	(P	4.107E-02	1.07E+01	4.31E+01 G
			77.11	8.682E-01	+	1.540E-01	1.68E+01	1.75E+01 GA
			74.81	3.029E-01	- P	4.454E-01	7.87E+01	9.60E+00 GA
			87.20	2.477E-01	- P	4.990E-01	1.01E+02	6.30E+00 GA
			300.09	2.543E-01	&	4.951E-01	1.24E+02	3.27E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/7/2014 14:58:47
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107_009.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   4.2716E-01                                     3.65E+11
                           351.79 4.272E-01  (P 3.649E-02 9.85E+00 3.71E+01 G
                           295.22 3.846E-01   P 7.381E-02 1.83E+01 1.92E+01 GA
                           241.92 3.815E-01 & P 2.907E-01 4.16E+01 7.47E+00 GA

Ra-226   N   7.3708E-01                                     3.65E+11
                           186.20 7.371E-01  (  4.641E-01 4.24E+01 3.60E+00 G

Th-234   N   1.0026E+00                                     3.65E+11
                            92.60 1.003E+00  (  3.627E-01 3.44E+01 5.60E+00 G

Tl-208   N   1.2440E-01                                     3.65E+11
                           583.14 1.244E-01  (P 1.731E-02 1.44E+01 8.60E+01 G
                           860.47 1.669E-01 ?   2.188E-01 8.63E+01 1.20E+01 GA

U-235    N   4.5422E-02                                     3.65E+11
                           185.70 4.542E-02 ?(  3.260E-02 4.76E+01 5.40E+01 G
                           143.76-1.173E-01 -   1.814E-01 9.76E+01 1.05E+01 GA
                           163.35 0.000E+00 -   4.601E-01 1.00E+03 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/7/2014 14:58:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107_009.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.57	56.	-4.	-0.001	582.92	-3.582E-02
Pa-234	98.62	73.	-7.	-0.002	374.05	-2.974E-02
Eu-152	121.67	50.	7.	0.003	297.26	2.309E-02
Eu-154	123.37	52.	2.	0.001	836.35	5.716E-03
U-235	143.88	84.	-14.	-0.005	195.30	-1.173E-01
U-235	185.89	70.	27.	0.010	95.20	4.542E-02
Ra-226	185.89	63.	29.	0.011	84.88	7.371E-01
Cs-137	662.11	24.	2.	0.001	618.50	5.082E-03
Bi-212	727.57	19.	14.	0.005	102.03	2.375E-01
Eu-152	779.27	27.	-3.	-0.001	453.83	-5.378E-02
Pa-234	883.28	20.	4.	0.002	305.88	6.609E-02
Pa-234	946.46	22.	1.	0.000	1382.94	1.927E-02
Co-60	1174.10	21.	-3.	-0.001	406.34	-9.308E-03
Eu-154	1276.84	20.	-3.	-0.001	388.99	-2.849E-02
Co-60	1331.46	18.	4.	0.001	316.82	1.222E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	1.8778E-01	1.8778E-01	1.4461E-01	1.4520E-01	1.044E-01
Am-241 #A	-3.5817E-02	-3.5817E-02	2.0878E-01	2.0881E-01	1.692E-01
Bi-212 #	2.3749E-01	2.3749E-01	2.4230E-01	2.4288E-01	1.701E-01
Bi-214 #	2.2670E-01	2.2670E-01	8.5026E-02	8.6510E-02	5.407E-02
Co-60 #A	1.4612E-03	1.4612E-03	3.7644E-03	3.7656E-03	3.000E-02
Cs-137 #A	5.0824E-03	5.0824E-03	3.1435E-02	3.1437E-02	2.530E-02
Eu-152 #A	1.7445E-03	1.7445E-03	8.7694E-02	8.7695E-02	7.209E-02
Eu-154 #A	-2.8488E-02	-2.8488E-02	1.1082E-01	1.1083E-01	8.766E-02
K-40	1.4935E+01	1.4935E+01	1.3857E+00	1.7361E+00	3.063E-01
Pa-234 #A	6.6085E-02	6.6085E-02	2.0214E-01	2.0219E-01	1.581E-01
Pb-212	4.0744E-01	4.0744E-01	8.9657E-02	9.4832E-02	4.107E-02
Pb-214	4.2716E-01	4.2716E-01	9.0222E-02	9.5118E-02	3.649E-02
Ra-226 #	7.3708E-01	7.3708E-01	6.2560E-01	6.2809E-01	4.641E-01
Th-234	1.0026E+00	1.0026E+00	6.8927E-01	6.9510E-01	3.627E-01
Tl-208	1.2440E-01	1.2440E-01	3.9820E-02	4.0765E-02	1.731E-02
U-235 #	4.5422E-02	4.5422E-02	4.3240E-02	4.3376E-02	3.260E-02

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/7/2014 14:58:47
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107_009.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2041.2 keV)     1.731E+01  pCi/g
 Total Decayed Activity (   25.1 to  2041.2 keV) 1.7311495E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE09
Seqnum : 1584014752009
File : 9_20140110_009
IDF : 1.0
PDF : 1.0
Lab ID : 251785-009
Matrix : Soil
Batch : 206637
Time : 10-JAN-2014 16:57
Sample Amount : 346.66 g
Live Time : 5400 sec
Dead Time : 0.1 %
Cal : 10-JAN-2014 06:14:13,30-DEC-2013 12:17:54
Units : pCi/g

Type : IDUP
Inst : HPGE09
Seqnum : 1584014752011.1
File : 9_20140110_011
IDF : 1.0
PDF : 1.0
Lab ID : QC723810
Matrix : Soil
Batch : 206637
Time : 10-JAN-2014 19:22
Sample Amount : 346.66 g
Live Time : 5400 sec
Dead Time : 0.09 %
Cal : 10-JAN-2014 06:14:13,30-DEC-2013 12:17:54

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.02562	0.2790		.33955	.33956	0.01261	0.2868		.3485	.3485		40		1	u
Bismuth-212	0.06155	0.1357		.16946	.16951	0.4699	0.1008		.22568	.22812		40		1	u
Bismuth-214	3.556	0.03784		.16003	.29709	3.441	0.03754		.15987	.29019	3	40	0.196	1	u
Cesium-137	0.09671	0.02034	0.07	.030518	.031276	0.1233	0.01534	0.07	.03399	.035091	24	20	0.401	1	u
Cobalt-60	-0.002301	0.02087		.025529	.02553	0	0.02030		.022528	.022528		40		1	u
Europium-152	0.02658	0.06222		.076693	.076716	-0.06463	0.06260		.078779	.078911		40		1	u
Europium-154	-0.009794	0.05758		.070782	.070786	-0.003540	0.05657		.068996	.068996		40		1	u
Lead-212	0.3466	0.04645		.065519	.070595	0.3970	0.03442		.067052	.073502	14	40	0.350	1	u
Lead-214	3.729	0.04472		.16026	.30798	3.672	0.04654		.16278	.30589	2	40	0.093	1	u
Potassium-40	9.210	0.2351		.80383	1.0306	9.466	0.2138		.77961	1.0233	3	40	0.124	1	u
Protactinium-234	-0.01854	0.1189		.14584	.14585	-0.005142	0.1039		.12654	.12654		40		1	u
Radium-226	4.691	0.4136	1.3	.65201	.74253	3.971	0.4448	1.3	.66185	.727	17	20	0.490	1	u
Thallium-208	0.1607	0.01698		.040097	.04165	0.1073	0.01946		.029656	.030596	40	40	0.739	1	u
Thorium-232 (By Actinium-228)	0.2884	0.05844		.092409	.094573	0.3129	0.05497		.090861	.093444	8	40	0.130	1	u
Thorium-234	0.2207	0.4869		.59745	.59777	0.8327	0.3638		.60034	.60497		40		1	u
Uranium-235	0.005327	0.04214		.051284	.051286	0.03615	0.03874		.047964	.048042		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 11-EXC-HS09-004DUP
Sample Description: QC723810, 206637, IDUP

Detector: HPGE09 50-TP42232A
Spectrum ID: 9_20140110_011
Contract: Tetra Tech EC
Sample Type: DUP
Unit Number: EXC-HS09
Matrix: S
Sample Time: 12/16/2013 14:15
Live Time: 5400 sec
Acquisition Time: 1/10/2014 19:22:22
Real Time: 5405 sec
Analysis Time: 1/10/2014 20:52
Dead Time: 0.09 %
Analysis Quantity: 3.467E+02 g

Efficiency: HPGE09 S23325 9_20131229002_EffCal
Efficiency Cal Date: 12/30/2013 12:17
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.129E-01	9.086E-02	9.344E-02	5.497E-02
Am-241	#AB	1.261E-02	3.485E-01	3.485E-01	2.868E-01
Bi-212		4.699E-01	2.257E-01	2.281E-01	1.008E-01
Bi-214		3.441E+00	1.599E-01	2.902E-01	3.754E-02
Co-60	#AB	0.000E+00	2.253E-02	2.253E-02	2.030E-02
Cs-137		1.233E-01	3.399E-02	3.509E-02	1.534E-02
Eu-152	#AB	-6.463E-02	7.878E-02	7.891E-02	6.260E-02
Eu-154	#AB	-3.540E-03	6.900E-02	6.900E-02	5.657E-02
K-40		9.466E+00	7.796E-01	1.023E+00	2.138E-01
Pa-234	#AB	-5.142E-03	1.265E-01	1.265E-01	1.039E-01
Pb-212		3.970E-01	6.705E-02	7.350E-02	3.442E-02
Pb-214		3.672E+00	1.628E-01	3.059E-01	4.654E-02
Ra-226		3.971E+00	6.619E-01	7.270E-01	4.448E-01
Th-234		8.327E-01	6.003E-01	6.050E-01	3.638E-01
Tl-208	#	1.073E-01	2.966E-02	3.060E-02	1.946E-02
U-235	AB	3.615E-02	4.796E-02	4.804E-02	3.874E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.284E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 20:52:33
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110_011.An1

Sample description
     QC723810, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det9\9_20140110_011.An1

Acquisition information
       Start time:                 1/10/2014 19:22:22
       Live time:               5400
       Real time:               5405
       Dead time:                  0.09 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               1/10/2014 06:14:13
            Zero offset:           0.150 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -3.168E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.16keV )
       Stop channel:           16336 (  2041.98keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4666E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4666E+02) =
                                   7.7964E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/16/2013 14:15:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	9_2013-12-31_0939.PBC 12/31/2013 09:39:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 31 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1022

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.64	52.	32.02	0.27	0.000E+00				
74.92	358.	9.80	0.84	1.828E-02	74.81	9.600	2.958E+00	Pb212
77.26	675.	5.58	0.85	1.997E-02	77.11	17.500	2.778E+00	Pb212
79.41	92.	27.58	0.85	2.148E-02				
84.07	50.	58.53	0.68	2.460E-02				
87.26	211.	14.80	0.86	2.659E-02	87.20	6.300	1.820E+00	Pb212
90.05	139.	19.66	0.86	2.826E-02				
92.61	96.	36.05	0.26	2.972E-02	92.60	5.600	8.327E-01	Th234
97.59	14.	210.28	0.87	3.272E-02	98.44	25.100	PBC<MDA	Pa234
120.44	11.	239.62	0.89	4.070E-02	121.87	28.590	PBC<MDA	Eu152
					121.87	28.590	1.410E-02	Eu152
163.23	19.	172.44	0.93	4.426E-02	163.35	4.700	PBC<MDA	U235
185.75	59.	66.35	0.95	4.351E-02	185.70	54.000	PBC<MDA	U235
186.30	550.	9.30	0.94	4.348E-02	186.20	3.600	5.071E+00	Ra226
236.19	59.	41.71	1.00	3.986E-02				
238.61	464.	6.90	1.00	3.967E-02	238.63	43.100	3.748E-01	Pb212
241.96	768.	4.76	1.00	3.940E-02	241.92	7.470	3.753E+00	Pb214
260.37	102.	27.42	0.14	3.792E-02				
270.03	32.	87.90	1.03	3.715E-02	270.25	3.460	PBC<MDA	Ac228
295.09	1763.	3.28	1.04	3.529E-02	295.22	19.200	3.719E+00	Pb214
299.79	68.	35.81	0.15	3.494E-02	300.09	3.270	8.594E-01	Pb212
338.28	138.	23.32	0.41	3.240E-02	338.40	12.010	5.121E-01	Ac228
351.78	3000.	2.20	1.11	3.159E-02	351.79	37.100	3.672E+00	Pb214
386.18	44.	33.75	0.59	2.970E-02				
437.41	21.	64.39	1.18	2.731E-02				
438.89	35.	47.00	1.18	2.724E-02				
463.13	24.	76.94	1.20	2.626E-02	463.00	4.400	PBC<MDA	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
507.08	30.	40.31	1.24	2.467E-02				
510.72	182.	12.14	1.24	2.455E-02				
583.26	188.	14.36	0.39	2.240E-02	583.14	86.000	1.412E-01	Tl208
609.33	2432.	2.28	1.26	2.173E-02	609.69	46.090	3.479E+00	Bi214
661.69	151.	10.78	1.36	2.052E-02	661.66	84.620	1.251E-01	Cs137
665.64	93.	15.09	1.37	2.044E-02				
727.58	74.	24.01	0.19	1.922E-02	727.17	11.800	4.699E-01	Bi212
768.40	243.	9.63	0.59	1.849E-02	768.36	4.890	3.884E+00	Bi214
779.18	2.	549.49	1.45	1.831E-02	778.90	12.990	PBC<MDA	Eu152
					778.90	12.990	1.281E-02	Eu152
786.15	36.	37.90	1.46	1.820E-02	785.42	2.000	1.430E+00	Bi212
794.33	6.	192.07	1.47	1.805E-02	794.95	4.250	PBC<MDA	Ac228
848.47	16.	35.79	0.17	1.724E-02				
860.51	17.	79.76	1.52	1.706E-02	860.47	12.000	PBC<MDA	Tl208
911.37	141.	14.13	0.78	1.638E-02	911.07	29.000	4.298E-01	Ac228
934.26	110.	15.68	1.57	1.609E-02	934.05	3.170	3.110E+00	Bi214
963.99	30.	48.76	1.59	1.572E-02	964.05	14.580	PBC<MDA	Eu152
					964.77	4.990	5.457E-01	Ac228
					964.05	14.580	1.867E-01	Eu152
964.04	31.	46.91	1.59	1.572E-02	964.05	14.580	1.935E-01	Eu152
					964.77	4.990	5.656E-01	Ac228
968.98	106.	14.31	0.48	1.567E-02	968.90	17.460	5.616E-01	Ac228
1015.54	12.	41.83	0.14	1.514E-02				
1120.46	588.	5.05	0.97	1.407E-02	1120.28	15.040	3.942E+00	Bi214
1233.00	7.	111.41	1.77	1.307E-02				
1238.45	213.	8.04	1.77	1.303E-02				
1377.69	191.	10.10	1.07	1.197E-02	1377.65	4.020	5.729E+00	Bi214
1407.97	97.	14.43	0.37	1.176E-02	1407.98	2.480	4.804E+00	Bi214
					1408.08	21.210	5.617E-01	Eu152
					1408.08	21.210	5.617E-01	Eu152
1460.94	830.	3.97	1.36	1.140E-02	1460.80	10.700	9.466E+00	K40
1508.86	75.	15.18	0.18	1.110E-02				
1509.24	29.	37.61	1.93	1.109E-02	1509.19	2.190	1.731E+00	Bi214
1624.36	1.	434.28	1.98	1.043E-02	1620.56	2.750	PBC<MDA	Bi212
1764.73	476.	4.88	1.20	9.659E-03	1764.51	15.920	4.399E+00	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
243.87	30.64	99.	52.	0.000E+00	64.05	0.272	-	sM
598.14	74.94	727.	120.	6.554E+03	66.22	0.832	-	M
634.03	79.43	198.	60.	2.812E+03	75.14	0.216	TH-227	sM
671.17	84.07	288.	50.	2.032E+03	100.08	0.678	TH-231	sM
696.28	87.21	620.	95.	3.557E+03	77.29	0.831	-	sM
718.60	90.00	270.	156.	5.528E+03	39.23	0.408	-	sM

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
1887.52	236.16	187.	54.	1.350E+03	89.37	0.396	TH-227	sM
2081.16	260.37	190.	102.	2.695E+03	54.85	0.141	-	s
3087.44	386.18	67.	44.	1.475E+03	67.50	0.588	-	s
3497.19	437.36	77.	21.	7.534E+02	128.77	1.177	-	D
3509.08	438.85	120.	35.	1.294E+03	94.01	1.179	-	D
4054.29	507.05	25.	19.	7.579E+02	90.64	0.275	-	s
4083.43	510.70	122.	272.	1.110E+04	22.51	0.816	TL-208	s
5322.90	665.65	52.	93.	3.719E+03	30.19	1.367	BI-214	lD
6785.50	848.47	7.	16.	9.283E+02	71.59	0.170	-	s
8122.08	1015.54	6.	12.	7.927E+02	83.67	0.141	-	s
9861.10	1232.89	7.	10.	7.955E+02	94.72	0.250	-	s
9904.71	1238.34	36.	256.	1.965E+04	18.34	1.093	BI-214	s
12069.35	1508.86	10.	75.	6.796E+03	30.37	0.179	BI-214	l

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	598.21	74.95	899.	245.	0.045	36.93	0.843
Pb-212	616.86	77.28	416.	605.	0.112	14.18	0.756
Pb-212	696.86	87.28	650.	178.	0.033	43.19	0.855
Th-234	739.48	92.61	324.	96.	0.018	72.10	0.262s
Pa-234	779.25	97.59	414.	14.	0.003	420.56	0.866s
Eu-152	962.01	120.44	365.	11.	0.002	479.24	0.889s
Eu-154	981.37	122.86	546.	-14.	-0.003	484.97	0.890s
U-235	1304.25	163.23	543.	19.	0.004	344.88	0.929s
U-235	1483.96	185.70	732.	59.	0.011	132.70	0.950D
Ra-226	1487.96	186.20	428.	431.	0.080	16.67	0.950D
Pb-212	1906.84	238.57	306.	470.	0.087	16.19	0.981
Pb-214	1933.63	241.92	307.	807.	0.149	11.19	0.965
Ac-228	2158.46	270.03	369.	32.	0.006	175.80	1.028s
Pb-214	2358.89	295.09	306.	1745.	0.323	6.56	1.036
Pb-212	2396.50	299.79	150.	68.	0.013	71.62	0.146s
Ac-228	2704.32	338.28	204.	138.	0.026	46.64	0.412s
Eu-152	2751.89	344.23	259.	-39.	-0.007	121.89	1.096s
Pb-214	2812.27	351.78	263.	2981.	0.552	4.40	1.115
Ac-228	3702.95	463.13	164.	24.	0.005	153.87	1.199s
Tl-208	4664.04	583.28	124.	143.	0.027	27.65	1.300s
Bi-214	4872.52	609.34	125.	2386.	0.442	4.61	1.253

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cs-137	5291.39	661.70	63.	148.	0.027	27.57	0.646s
Bi-214	5329.36	666.45	132.	-5.	-0.001	679.27	1.367s
Bi-212	5818.33	727.58	46.	74.	0.014	48.02	0.190s
Bi-214	6144.95	768.40	59.	243.	0.045	19.27	0.591s
Eu-152	6231.17	779.18	66.	2.	0.000	1098.99	1.455s
Bi-212	6286.89	786.15	75.	36.	0.007	75.81	1.460
Ac-228	6352.32	794.33	75.	6.	0.001	384.14	1.467s
Tl-208	6881.80	860.51	80.	17.	0.003	159.52	1.515s
Ac-228	7288.45	911.34	60.	103.	0.019	29.04	1.552s
Bi-214	7471.84	934.26	95.	110.	0.020	31.36	1.569
Pa-234	7567.12	946.17	61.	-1.	0.000	1851.11	1.577s
Eu-152	7710.05	964.04	88.	31.	0.006	93.82	1.590s
Ac-228	7709.68	963.99	90.	30.	0.005	97.51	1.590s
Ac-228	7749.62	968.98	25.	106.	0.020	28.62	0.478s
Bi-214	8961.51	1120.46	52.	578.	0.107	10.10	0.974s
Eu-154	10192.82	1274.35	58.	-1.	0.000	1948.79	1.792s
Co-60	10660.17	1332.75	57.	-8.	-0.001	286.95	1.827s
Bi-214	11019.73	1377.69	22.	191.	0.035	20.21	1.068s
Bi-214	11262.01	1407.97	18.	97.	0.018	28.87	0.372s
K-40	11685.87	1460.94	60.	800.	0.148	7.94	1.357s
Bi-214	12072.44	1509.24	45.	29.	0.005	75.22	1.926s
Bi-212	12993.62	1624.36	18.	1.	0.000	868.55	1.983s
Bi-214	14116.97	1764.73	14.	469.	0.087	9.75	1.197s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	3.1286E-01					3.65E+11	
			911.07	3.129E-01	?(	5.497E-02	1.45E+01	2.90E+01 G
			968.90	5.616E-01	+	6.099E-02	1.43E+01	1.75E+01 GA
			338.40	5.121E-01	+	1.235E-01	2.33E+01	1.20E+01 GA
			964.77	5.457E-01	+	4.060E-01	4.88E+01	4.99E+00 GA
			463.00	3.052E-01	&	3.732E-01	7.69E+01	4.40E+00 GA
			794.95	1.222E-01	&	3.786E-01	1.92E+02	4.25E+00 GA
			270.25	3.544E-01	?	5.026E-01	8.79E+01	3.46E+00 GA
Am-241	I	1.2607E-02					3.65E+11	
			59.54	1.261E-02	%(	2.868E-01	1.38E+03	3.63E+01 G
Bi-212	N	4.6992E-01					3.65E+11	
			727.17	4.699E-01	(	1.008E-01	2.40E+01	1.18E+01 G
			1620.56	7.050E-02	-	4.948E-01	4.34E+02	2.75E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		785.42	1.430E+00	+	8.021E-01	3.79E+01	2.00E+00 GA
Bi-214	N 3.4409E+00					3.65E+11	
		609.69	3.441E+00	(P	3.754E-02	2.30E+00	4.61E+01 G
		1764.51	4.399E+00	+ P	8.324E-02	4.88E+00	1.59E+01 GA
		1120.28	3.942E+00	+ P	1.149E-01	5.05E+00	1.50E+01 GA
		768.36	3.884E+00		2.853E-01	9.63E+00	4.89E+00 GA
		1377.65	5.729E+00	+ P	3.288E-01	1.01E+01	4.02E+00 GA
		934.05	3.110E+00	? P	6.412E-01	1.57E+01	3.17E+00 GA
		1407.98	4.804E+00	+	4.895E-01	1.44E+01	2.48E+00 GA
		1509.19	1.731E+00	-	9.338E-01	3.76E+01	2.19E+00 GA
		665.45	-2.185E-01	-	1.212E+00	3.40E+02	1.56E+00 GA
Cs-137	I 1.2329E-01					3.65E+11	
		661.66	1.233E-01	(	1.534E-02	1.38E+01	8.46E+01 G
Eu-152	I -6.4631E-02					3.65E+11	
		344.30	-6.463E-02	?(	6.260E-02	6.09E+01	2.70E+01 G
		121.87	1.410E-02	&	5.523E-02	2.40E+02	2.86E+01 GA
		1408.08	0.000E+00	+	1.193E-01	1.00E+03	2.12E+01 GA
		964.05	1.935E-01	+	1.380E-01	4.69E+01	1.46E+01 GA
		778.90	1.281E-02	+	1.150E-01	5.49E+02	1.30E+01 GA
		411.09	-1.030E-02	%	6.054E-01	3.57E+03	2.26E+00 GA
Eu-154	I -3.5404E-03					3.65E+11	
		1274.80	-3.540E-03	?(	5.657E-02	9.74E+02	3.55E+01 G
		123.10	-1.195E-02	+	4.743E-02	2.42E+02	4.05E+01 GA
		723.30	2.621E-04	&	8.448E-02	1.96E+04	1.97E+01 GA
K-40	N 9.4660E+00					3.65E+11	
		1460.80	9.466E+00	(P	2.138E-01	3.97E+00	1.07E+01 G
Pa-234	N -5.1417E-03					3.65E+11	
		883.24	-5.142E-03	&(	1.039E-01	1.23E+03	1.50E+01 G
		98.44	2.425E-02	?	8.331E-02	2.10E+02	2.51E+01 GA
		946.00	-9.034E-03	+	1.371E-01	9.26E+02	1.20E+01 GA
Pb-212	N 3.9702E-01					3.65E+11	
		238.63	3.970E-01	(P	3.442E-02	8.09E+00	4.31E+01 G
		77.11	2.516E+00	+ P	1.976E-01	7.09E+00	1.75E+01 GA
		74.81	2.024E+00	+	5.777E-01	1.85E+01	9.60E+00 GA
		87.20	1.532E+00	+ P	5.123E-01	2.16E+01	6.30E+00 GA
		300.09	8.594E-01	+	3.607E-01	3.58E+01	3.27E+00 GA
Pb-214	N 3.6722E+00					3.65E+11	
		351.79	3.672E+00	(P	4.654E-02	2.20E+00	3.71E+01 G
		295.22	3.719E+00	P	8.688E-02	3.28E+00	1.92E+01 GA
		241.92	3.960E+00	P	2.002E-01	5.60E+00	7.47E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 20:52:33
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   3.9712E+00                                     3.65E+11
                           186.20 3.971E+00  (  4.448E-01 8.33E+00 3.60E+00 G

Th-234   N   8.3269E-01                                     3.65E+11
                            92.60 8.327E-01  (  3.638E-01 3.60E+01 5.60E+00 G

Tl-208   N   1.0727E-01                                     3.65E+11
                           583.14 1.073E-01 ?(  1.946E-02 1.38E+01 8.60E+01 G
                           860.47 1.178E-01 ?   1.473E-01 7.98E+01 1.20E+01 GA

U-235    N   3.6146E-02                                     3.65E+11
                           185.70 3.615E-02  (  3.874E-02 6.63E+01 5.40E+01 G
                           143.76 5.951E-04 %   1.787E-01 1.82E+04 1.05E+01 GA
                           163.35 1.338E-01 ?   3.769E-01 1.72E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Pa-234	97.59	414.	14.	0.003	420.56	2.425E-02
Eu-152	120.44	365.	11.	0.002	479.24	1.410E-02
Eu-154	122.86	546.	-14.	-0.003	484.97	-1.195E-02
Eu-152	344.23	259.	-39.	-0.007	121.89	-6.463E-02
Eu-152	779.18	66.	2.	0.000	1098.99	1.281E-02
Pa-234	946.17	61.	-1.	0.000	1851.11	-9.034E-03
Eu-152	964.04	88.	31.	0.006	93.82	1.935E-01
Eu-154	1274.35	58.	-1.	0.000	1948.79	-3.540E-03
Co-60	1332.75	57.	-8.	-0.001	286.95	-9.057E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.1286E-01	3.1286E-01	9.0861E-02	9.3444E-02	5.497E-02
Am-241 #A	1.2607E-02	1.2607E-02	3.4850E-01	3.4850E-01	2.868E-01
Bi-212	4.6992E-01	4.6992E-01	2.2568E-01	2.2812E-01	1.008E-01
Bi-214	3.4409E+00	3.4409E+00	1.5987E-01	2.9019E-01	3.754E-02
Co-60 #A	0.0000E+00	0.0000E+00	2.2528E-02	2.2528E-02	2.030E-02
Cs-137	1.2329E-01	1.2329E-01	3.3990E-02	3.5091E-02	1.534E-02
Eu-152 #A	-6.4631E-02	-6.4631E-02	7.8779E-02	7.8911E-02	6.260E-02
Eu-154 #A	-3.5404E-03	-3.5404E-03	6.8996E-02	6.8996E-02	5.657E-02
K-40	9.4660E+00	9.4660E+00	7.7961E-01	1.0233E+00	2.138E-01
Pa-234 #A	-5.1417E-03	-5.1417E-03	1.2654E-01	1.2654E-01	1.039E-01
Pb-212	3.9702E-01	3.9702E-01	6.7052E-02	7.3502E-02	3.442E-02
Pb-214	3.6722E+00	3.6722E+00	1.6278E-01	3.0589E-01	4.654E-02
Ra-226	3.9712E+00	3.9712E+00	6.6185E-01	7.2700E-01	4.448E-01
Th-234	8.3269E-01	8.3269E-01	6.0034E-01	6.0497E-01	3.638E-01
Tl-208 #	1.0727E-01	1.0727E-01	2.9656E-02	3.0596E-02	1.946E-02
U-235 A	3.6146E-02	3.6146E-02	4.7964E-02	4.8042E-02	3.874E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 20:52:33
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110_011.An1

---------- S U M M A R Y ----------
Total Activity (462.9 to 2042.0 keV) 2.279E+01 pCi/g
Total Decayed Activity (462.9 to 2042.0 keV) 2.2793371E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE10
Seqnum : 1594014792009
File : 10_20140110_009
IDF : 1.0
PDF : 1.0
Lab ID : 251786-003
Matrix : Soil
Batch : 206637
Time : 10-JAN-2014 16:58
Sample Amount : 317.98 g
Live Time : 2700 sec
Dead Time : 0.08 %
Cal : 10-JAN-2014 06:53:23,30-DEC-2013 19:08:15
Units : pCi/g

Type : IDUP
Inst : HPGE10
Seqnum : 1594014792011.1
File : 10_20140110_011
IDF : 1.0
PDF : 1.0
Lab ID : QC723811
Matrix : Soil
Batch : 206637
Time : 10-JAN-2014 18:37
Sample Amount : 317.98 g
Live Time : 2700 sec
Dead Time : 0.09 %
Cal : 10-JAN-2014 06:53:23,30-DEC-2013 19:08:15

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	0.04042	0.4118		.50308	.50309	0	0.3876		.15783	.15784		40		1	u
Bismuth-212	0.2955	0.1681		.24422	.24512	0.2487	0.1600		.22988	.23056	17	40	0.099	1	u
Bismuth-214	0.4359	0.04862		.095271	.10009	0.5774	0.02793		.095567	.10385	28	40	0.694	1	u
Cesium-137	-0.004163	0.02359	0.07	.029203	.029204	0.009553	0.02171	0.07	.02775	.027758		20		1	u
Cobalt-60	-0.00009298	0.03183		.038648	.038648	-0.001654	0.03514		.042855	.042855		40		1	u
Europium-152	-0.0001387	0.05567		.067592	.067592	0.0009036	0.06437		.078237	.078237		40		1	u
Europium-154	0	0.1150		.015311	.015311	0.001920	0.09109		.11084	.11084		40		1	u
Lead-212	0.5080	0.03583		.086923	.09508	0.5108	0.04184		.096114	.10363	1	40	0.014	1	u
Lead-214	0.4634	0.04323		.097793	.10311	0.5957	0.04862		.11836	.12559	25	40	0.579	1	u
Potassium-40	11.64	0.2714		1.1731	1.4286	11.71	0.3126		1.2245	1.4739	1	40	0.024	1	u
Protactinium-234	0.02876	0.1536		.1907	.19071	-0.02999	0.1581		.19619	.1962		40		1	u
Radium-226	0.9502	0.5128	1.3	.68594	.6897	0.7292	0.4449	1.3	.59609	.59864	26	20	0.172	1	u
Thallium-208	0.1719	0.01491		.042925	.044585	0.1161	0.01559		.036099	.037006	39	40	0.683	1	u
Thorium-232 (By Actinium-228)	0.3310	0.08468		.14211	.14397	0.2974	0.06550		.12237	.12411	11	40	0.125	1	u
Thorium-234	0.7660	0.5367		.70244	.70579	0.4166	0.4513		.58107	.58227		40		1	u
Uranium-235	0.06768	0.03260		.044263	.044559	0.03514	0.03211		.041512	.041597	63	40	0.378	1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 11-EXC-SU04-003DUP
Sample Description: QC723811, 206637, IDUP

Detector: HPGE10 51-TP42231A
Spectrum ID: 10_20140110_011
Contract: Tetra Tech EC
Sample Type: DUP
Unit Number: EXC-SU04
Matrix: S
Sample Time: 12/17/2013 15:27
Live Time: 2700 sec
Acquisition Time: 1/10/2014 18:37:19
Real Time: 2702 sec
Analysis Time: 1/10/2014 19:22
Dead Time: 0.09 %
Analysis Quantity: 3.180E+02 g

Efficiency: HPGE10 S23325 10_20131230002_EffCal
Efficiency Cal Date: 12/30/2013 19:08
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		2.974E-01	1.224E-01	1.241E-01	6.550E-02
Am-241	#AB	0.000E+00	1.578E-01	1.578E-01	3.876E-01
Bi-212	#	2.487E-01	2.299E-01	2.306E-01	1.600E-01
Bi-214		5.774E-01	9.557E-02	1.038E-01	2.793E-02
Co-60	#AB	-1.654E-03	4.285E-02	4.285E-02	3.514E-02
Cs-137	#AB	9.553E-03	2.775E-02	2.776E-02	2.171E-02
Eu-152	#AB	9.036E-04	7.824E-02	7.824E-02	6.437E-02
Eu-154	#AB	1.920E-03	1.108E-01	1.108E-01	9.109E-02
K-40		1.171E+01	1.225E+00	1.474E+00	3.126E-01
Pa-234	#AB	-2.999E-02	1.962E-01	1.962E-01	1.581E-01
Pb-212		5.108E-01	9.611E-02	1.036E-01	4.184E-02
Pb-214		5.957E-01	1.184E-01	1.256E-01	4.862E-02
Ra-226		7.292E-01	5.961E-01	5.986E-01	4.449E-01
Th-234	#AB	4.166E-01	5.811E-01	5.823E-01	4.513E-01
Tl-208		1.161E-01	3.610E-02	3.701E-02	1.559E-02
U-235		3.514E-02	4.151E-02	4.160E-02	3.211E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.525E+01

Analyst: Andrew Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 19:22:29
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110_011.An1

Sample description
     QC723811, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det10\10_20140110_011.An1

Acquisition information
       Start time:                 1/10/2014 18:37:19
       Live time:               2700
       Real time:               2702
       Dead time:                  0.09 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               1/10/2014 06:53:23
            Zero offset:           0.031 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.401E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.69keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.1798E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.1798E+02) =
                                   8.4996E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 19:22:29
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/17/2013 15:27:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_2014-01-01_0202.PBC 1/1/2014 02:02:27
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 21 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0843

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.72	37.	34.32	0.89	1.371E-02	74.81	9.600	8.948E-01	Pb212
77.45	63.	24.09	0.89	1.554E-02	77.11	17.500	7.412E-01	Pb212
89.66	11.	109.66	0.90	2.179E-02	87.20	6.300	PBC<MDA	Pb212
92.45	18.	69.75	0.90	2.495E-02	92.60	5.600	PBC<MDA	Th234
143.03	4.	351.49	0.94	3.987E-02	143.76	10.500	PBC<MDA	U235
171.98	16.	66.10	0.16	4.056E-02				
185.69	24.	59.07	0.97	4.010E-02	185.70	54.000	3.514E-02	U235
186.19	33.	40.87	0.97	4.008E-02	186.20	3.600	7.292E-01	Ra226
238.53	256.	9.41	0.52	3.661E-02	238.63	43.100	5.108E-01	Pb212
241.83	81.	23.58	0.31	3.636E-02	241.92	7.470	9.389E-01	Pb214
270.00	10.	116.30	1.03	3.426E-02	270.25	3.460	PBC<MDA	Ac228
295.17	114.	16.81	0.52	3.251E-02	295.22	19.200	5.361E-01	Pb214
337.84	63.	18.52	0.62	2.984E-02	338.40	12.010	5.576E-01	Ac228
351.91	212.	9.57	1.39	2.904E-02	351.79	37.100	5.957E-01	Pb214
463.00	8.	102.08	1.18	2.407E-02	463.00	4.400	PBC<MDA	Ac228
583.09	69.	14.56	0.33	2.049E-02	583.14	86.000	1.161E-01	Tl208
609.34	176.	7.87	0.19	1.986E-02	609.69	46.090	5.774E-01	Bi214
660.89	5.	145.25	1.33	1.875E-02	661.66	84.620	PBC<MDA	Cs137
726.99	16.	46.22	1.39	1.754E-02	727.17	11.800	2.487E-01	Bi212
742.31	9.	39.30	0.18	1.728E-02				
795.23	4.	171.50	1.44	1.646E-02	794.95	4.250	PBC<MDA	Ac228
814.12	7.	37.80	0.16	1.618E-02				
861.06	8.	99.33	1.49	1.555E-02	860.47	12.000	PBC<MDA	Tl208
911.04	41.	20.57	1.54	1.493E-02	911.07	29.000	2.974E-01	Ac228
935.68	5.	133.61	1.55	1.466E-02	934.05	3.170	PBC<MDA	Bi214
949.25	3.	182.85	1.56	1.452E-02	946.00	12.000	PBC<MDA	Pa234
					946.00	12.000	5.477E-02	Pa234

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 19:22:29
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
969.05	21.	39.98	1.58	1.427E-02	968.90	17.460	2.709E-01	Ac228
1120.47	16.	36.11	1.71	1.281E-02	1120.28	15.040	2.643E-01	Bi214
1377.56	6.	99.24	1.94	1.088E-02	1377.65	4.020	PBC<MDA	Bi214
1460.80	445.	4.74	1.79	1.036E-02	1460.80	10.700	1.215E+01	K40
1508.57	6.	80.35	2.06	1.008E-02	1509.19	2.190	PBC<MDA	Bi214
1764.65	11.	32.64	2.29	8.775E-03	1764.51	15.920	2.487E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1374.91	171.98	32.	16.	3.846E+02	132.19	0.162	-	s
5936.54	742.31	1.	9.	5.034E+02	78.60	0.180	-	s
6511.00	814.12	0.	7.	4.325E+02	75.59	0.156	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-212	598.00	74.82	132.	23.	0.008	148.56	0.890s
Pb-212	619.81	77.55	96.	86.	0.032	51.44	0.852s
Pb-212	716.65	89.66	69.	11.	0.004	219.33	0.899s
Th-234	739.01	92.45	74.	18.	0.007	139.50	0.902s
U-235	1143.43	143.03	78.	4.	0.001	702.98	0.939s
U-235	1302.96	162.98	93.	-5.	-0.002	552.82	0.954s
U-235	1484.65	185.70	90.	24.	0.009	118.14	0.970D
Ra-226	1488.65	186.20	77.	33.	0.012	81.74	0.970D
Pb-212	1907.11	238.53	81.	256.	0.095	18.81	0.522s
Pb-214	1933.50	241.83	66.	81.	0.030	47.16	0.306s
Ac-228	2158.79	270.00	63.	10.	0.004	232.61	1.032s
Pb-214	2360.10	295.17	66.	106.	0.039	33.62	0.520s
Ac-228	2702.29	337.96	36.	48.	0.018	45.46	1.083s
Pb-214	2813.83	351.91	51.	204.	0.076	19.13	1.391s
Eu-152	3298.85	412.55	40.	-3.	-0.001	523.23	1.138s
Ac-228	3702.34	463.00	33.	8.	0.003	204.15	1.178s
Tl-208	4662.90	583.09	14.	65.	0.024	29.11	0.329s
Bi-214	4872.84	609.34	12.	168.	0.062	15.75	0.188s
Cs-137	5285.26	660.89	22.	5.	0.002	290.50	1.333s

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 19:22:29
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-214	5323.47	665.67	26.	-3.	-0.001	627.69	1.336s
Eu-154	5789.83	723.97	47.	-10.	-0.004	210.12	1.383s
Bi-212	5814.04	726.99	20.	16.	0.006	92.45	1.386s
Eu-152	6228.19	778.76	25.	-3.	-0.001	428.09	1.427s
Bi-212	6254.18	782.01	22.	-2.	-0.001	841.96	1.433s
Ac-228	6359.92	795.23	24.	4.	0.002	343.01	1.440s
Tl-208	6886.56	861.06	27.	8.	0.003	198.65	1.494s
Pa-234	7077.52	884.93	24.	-2.	-0.001	654.23	1.513s
Ac-228	7286.43	911.04	15.	41.	0.015	41.15	1.536s
Bi-214	7483.60	935.68	16.	5.	0.002	267.22	1.555s
Pa-234	7592.17	949.25	14.	3.	0.001	365.70	1.565s
Eu-152	7735.59	967.18	34.	-5.	-0.002	331.38	1.580s
Ac-228	7750.57	969.05	26.	21.	0.008	79.97	1.584s
Bi-214	8962.12	1120.47	23.	16.	0.006	72.23	1.712s
Bi-214	11019.57	1377.56	16.	6.	0.002	198.49	1.937s
K-40	11686.45	1460.89	22.	413.	0.153	10.04	1.786
Bi-214	12068.09	1508.57	8.	6.	0.002	160.71	2.056s
Bi-214	14117.99	1764.65	7.	11.	0.004	65.28	2.293s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g		COMMENTS
Ac-228	N	2.9739E-01					3.65E+11	
			911.07	2.974E-01	?(	6.550E-02	2.06E+01 2.90E+01	G
			968.90	2.709E-01	?	1.502E-01	4.00E+01 1.75E+01	GA
			338.40	4.229E-01	&	1.224E-01	2.27E+01 1.20E+01	GA
			964.77	0.000E+00	-	9.763E-01	1.00E+03 4.99E+00	GA
			463.00	2.499E-01	?	3.955E-01	1.02E+02 4.40E+00	GA
			794.95	1.913E-01	-	5.185E-01	1.72E+02 4.25E+00	GA
			270.25	2.657E-01	?	4.900E-01	1.16E+02 3.46E+00	GA
Bi-212	N	2.4866E-01					3.65E+11	
			727.17	2.487E-01	?(	1.600E-01	4.62E+01 1.18E+01	G
			1620.56	0.000E+00	-	2.814E-01	1.00E+03 2.75E+00	GA
			785.42	-1.515E-01	-	1.032E+00	4.21E+02 2.00E+00	GA
Bi-214	N	5.7739E-01					3.65E+11	
			609.69	5.774E-01	(P	2.793E-02	7.87E+00 4.61E+01	G
			1764.51	2.487E-01	- P	1.437E-01	3.26E+01 1.59E+01	GA
			1120.28	2.643E-01	- P	1.820E-01	3.61E+01 1.50E+01	GA
			768.36	-8.827E-02	% P	5.478E-01	1.00E+03 4.89E+00	GA
			1377.65	4.263E-01	- P	6.693E-01	9.92E+01 4.02E+00	GA

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 19:22:29
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			934.05	3.068E-01	&	6.321E-01	1.34E+02	3.17E+00 GA
			1407.98	0.000E+00	-	2.767E-01	1.00E+03	2.48E+00 GA
			1509.19	8.498E-01	&	9.679E-01	8.04E+01	2.19E+00 GA
			665.45	-3.715E-01	- P	1.287E+00	3.14E+02	1.56E+00 GA
Co-60	T	-1.6538E-03					3.65E+11	
			1173.24	-1.654E-03	%(	3.514E-02	1.30E+03	9.99E+01 G
			1332.50	-2.097E-04	%	2.109E-02	6.12E+03	1.00E+02 G
Cs-137	I	9.5525E-03					3.65E+11	
			661.66	9.552E-03	&(	2.171E-02	1.45E+02	8.46E+01 G
Eu-152	I	9.0356E-04					3.65E+11	
			344.30	9.036E-04	%(	6.437E-02	4.33E+03	2.70E+01 G
			121.87	1.543E-03	&	5.884E-02	2.32E+03	2.86E+01 GA
			1408.08	0.000E+00	-	3.236E-02	1.00E+03	2.12E+01 GA
			964.05	-7.817E-02	+	2.058E-01	1.66E+02	1.46E+01 GA
			778.90	-4.944E-02	+	1.687E-01	2.14E+02	1.30E+01 GA
			411.09	-1.850E-01	+	7.806E-01	2.62E+02	2.26E+00 GA
Eu-154	I	1.9204E-03					3.65E+11	
			1274.80	1.920E-03	%(	9.109E-02	2.89E+03	3.55E+01 G
			123.10	-9.504E-05	%	4.823E-02	3.08E+04	4.05E+01 GA
			723.30	-8.759E-02	+	1.443E-01	1.05E+02	1.97E+01 GA
K-40	N	1.1714E+01					3.65E+11	
			1460.80	1.171E+01	(P	3.126E-01	5.02E+00	1.07E+01 G
Pa-234	N	-2.9987E-02					3.65E+11	
			883.24	-2.999E-02	?(	1.581E-01	3.27E+02	1.50E+01 G
			98.44	0.000E+00	+	1.005E-01	1.00E+03	2.51E+01 GA
			946.00	5.477E-02	?	1.566E-01	1.83E+02	1.20E+01 GA
Pb-212	N	5.1084E-01					3.65E+11	
			238.63	5.108E-01	(	4.184E-02	9.41E+00	4.31E+01 G
			77.11	1.015E+00	+	2.693E-01	2.57E+01	1.75E+01 GA
			74.81	5.451E-01	?	6.400E-01	7.43E+01	9.60E+00 GA
			87.20	2.550E-01	-	4.432E-01	1.10E+02	6.30E+00 GA
			300.09	3.888E-03	%	4.169E-01	6.52E+03	3.27E+00 GA
Pb-214	N	5.9571E-01					3.65E+11	
			351.79	5.957E-01	(P	4.862E-02	9.57E+00	3.71E+01 G
			295.22	5.361E-01	P	9.525E-02	1.68E+01	1.92E+01 GA
			241.92	9.389E-01	+	2.194E-01	2.36E+01	7.47E+00 GA
Ra-226	N	7.2924E-01					3.65E+11	
			186.20	7.292E-01	(	4.449E-01	4.09E+01	3.60E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 19:22:29
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   4.1655E-01                                      3.65E+11
                            92.60 4.165E-01 ?(  4.513E-01 6.97E+01 5.60E+00 G

Tl-208   N   1.1610E-01                                      3.65E+11
                           583.14 1.161E-01  (P 1.559E-02 1.46E+01 8.60E+01 G
                           860.47 1.269E-01 ? P 2.050E-01 9.93E+01 1.20E+01 GA

U-235    N   3.5139E-02                                      3.65E+11
                           185.70 3.514E-02  (  3.211E-02 5.91E+01 5.40E+01 G
                           143.76 2.703E-02 ?   1.548E-01 3.51E+02 1.05E+01 GA
                           163.35-8.228E-02 -   3.698E-01 2.76E+02 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 19:22:29
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110_011.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	92.45	74.	18.	0.007	139.50	4.165E-01
Eu-152	412.55	40.	-3.	-0.001	523.23	-1.850E-01
Cs-137	660.89	22.	5.	0.002	290.50	9.552E-03
Eu-154	723.97	47.	-10.	-0.004	210.12	-8.759E-02
Eu-152	778.76	25.	-3.	-0.001	428.09	-4.944E-02
Pa-234	884.93	24.	-2.	-0.001	654.23	-2.999E-02
Pa-234	949.25	14.	3.	0.001	365.70	5.477E-02
Eu-152	967.18	34.	-5.	-0.002	331.38	-7.817E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	2.9739E-01	2.9739E-01	1.2237E-01	1.2411E-01	6.550E-02
Am-241 #A	0.0000E+00	0.0000E+00	1.5783E-01	1.5784E-01	3.876E-01
Bi-212 #	2.4866E-01	2.4866E-01	2.2988E-01	2.3056E-01	1.600E-01
Bi-214	5.7739E-01	5.7739E-01	9.5567E-02	1.0385E-01	2.793E-02
Co-60 #A	-1.6538E-03	-1.6538E-03	4.2855E-02	4.2855E-02	3.514E-02
Cs-137 #A	9.5525E-03	9.5525E-03	2.7750E-02	2.7758E-02	2.171E-02
Eu-152 #A	9.0356E-04	9.0356E-04	7.8237E-02	7.8237E-02	6.437E-02
Eu-154 #A	1.9204E-03	1.9204E-03	1.1084E-01	1.1084E-01	9.109E-02
K-40	1.1714E+01	1.1714E+01	1.2245E+00	1.4739E+00	3.126E-01
Pa-234 #A	-2.9987E-02	-2.9987E-02	1.9619E-01	1.9620E-01	1.581E-01
Pb-212	5.1084E-01	5.1084E-01	9.6114E-02	1.0363E-01	4.184E-02
Pb-214	5.9571E-01	5.9571E-01	1.1836E-01	1.2559E-01	4.862E-02
Ra-226	7.2924E-01	7.2924E-01	5.9609E-01	5.9864E-01	4.449E-01
Th-234 #A	4.1655E-01	4.1655E-01	5.8107E-01	5.8227E-01	4.513E-01
Tl-208	1.1610E-01	1.1610E-01	3.6099E-02	3.7006E-02	1.559E-02
U-235	3.5139E-02	3.5139E-02	4.1512E-02	4.1597E-02	3.211E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 19:22:29
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110_011.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.5 to  2041.7 keV)     1.482E+01  pCi/g
 Total Decayed Activity (  238.5 to  2041.7 keV) 1.4824090E+01  pCi/g

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE12
Seqnum : 1614014793011
File : 12_20140110_011
IDF : 1.0
PDF : 1.0
Lab ID : 251788-005
Matrix : Soil
Batch : 206637
Time : 10-JAN-2014 18:40
Sample Amount : 340.66 g
Live Time : 2700 sec
Dead Time : 0.2 %
Cal : 10-JAN-2014 06:54:40,03-JAN-2014 19:51:11
Units : pCi/g

Type : IDUP
Inst : HPGE12
Seqnum : 1614014793013.1
File : 12_20140110_013
IDF : 1.0
PDF : 1.0
Lab ID : QC723812
Matrix : Soil
Batch : 206637
Time : 10-JAN-2014 20:29
Sample Amount : 340.66 g
Live Time : 2700 sec
Dead Time : 0.19 %
Cal : 10-JAN-2014 06:54:40,03-JAN-2014 19:51:11

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.003289	0.3049		.37038	.37038	-0.09207	0.2921		.36215	.36224		40		1	u
Bismuth-212	0.1382	0.1468		.20047	.20071	0.1313	0.1413		.19349	.19371		40		1	u
Bismuth-214	0.3656	0.03190		.080427	.084442	0.3542	0.03220		.080241	.084025	3	40	0.067	1	u
Cesium-137	-0.005433	0.01927	0.07	.024298	.024301	0	0.03264	0.07	.0039746	.0039747		20		1	u
Cobalt-60	0	0.03567		.0072242	.0072243	0.004099	0.02990		.036864	.036865		40		1	u
Europium-152	-0.009219	0.06291		.077318	.077321	-0.02159	0.05674		.07131	.071326		40		1	u
Europium-154	0	0.1145		.021667	.021667	-0.008891	0.08241		.10139	.10139		40		1	u
Lead-212	0.2750	0.03561		.077595	.080349	0.3095	0.02438		.062527	.066786	12	40	0.234	1	u
Lead-214	0.3233	0.04288		.088694	.091578	0.3274	0.04213		.08887	.09182	1	40	0.022	1	u
Potassium-40	9.347	0.2497		1.0516	1.2386	8.723	0.2497		1.0174	1.1867	7	40	0.257	1	u
Protactinium-234	0.01647	0.1361		.16796	.16796	-0.002328	0.1395		.16967	.16967		40		1	u
Radium-226	0.4807	0.3564	1.3	.47878	.48016	0.6173	0.3170	1.3	.44946	.45188	25	20	0.146	1	u
Thallium-208	0.08946	0.02217		.035646	.036194	0.02689	0.02757		.03492	.034971		40		1	u
Thorium-232 (By Actinium-228)	0.1510	0.08420		.1162	.11667	0.1342	0.08953		.1199	.12027	12	40	0.071	1	u
Thorium-234	0.2710	0.3824		.48906	.48966	0.3072	0.4710		.59471	.59535		40		1	u
Uranium-235	0.03270	0.02213		.0302	.030302	0.002041	0.02619		.031981	.031981		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 11-EXC-HS06-005DUP
Sample Description: QC723812, 206637, IDUP

Detector: HPGE12 50-TP32731A
Spectrum ID: 12_20140110_013
Contract: Tetra Tech EC
Sample Type: DUP
Unit Number: EXC-HS06
Matrix: S
Sample Time: 12/16/2013 11:12
Live Time: 2700 sec
Acquisition Time: 1/10/2014 20:29:27
Real Time: 2705 sec
Analysis Time: 1/10/2014 21:14
Dead Time: 0.19 %
Analysis Quantity: 3.407E+02 g

Efficiency: HPGE12 S23325 12_20140103002_EffCal
Efficiency Cal Date: 1/3/2014 19:51
Library: GenericAnalysisReduced.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	1.342E-01	1.199E-01	1.203E-01	8.953E-02
Am-241	#AB	-9.207E-02	3.622E-01	3.622E-01	2.921E-01
Bi-212	#AB	1.313E-01	1.935E-01	1.937E-01	1.413E-01
Bi-214		3.542E-01	8.024E-02	8.402E-02	3.220E-02
Co-60	#AB	4.099E-03	3.686E-02	3.687E-02	2.990E-02
Cs-137	#AB	0.000E+00	3.975E-03	3.975E-03	3.264E-02
Eu-152	#AB	-2.159E-02	7.131E-02	7.133E-02	5.674E-02
Eu-154	#AB	-8.891E-03	1.014E-01	1.014E-01	8.241E-02
K-40		8.723E+00	1.017E+00	1.187E+00	2.497E-01
Pa-234	#AB	-2.328E-03	1.697E-01	1.697E-01	1.395E-01
Pb-212		3.095E-01	6.253E-02	6.679E-02	2.438E-02
Pb-214		3.274E-01	8.887E-02	9.182E-02	4.213E-02
Ra-226		6.173E-01	4.495E-01	4.519E-01	3.170E-01
Th-234	#AB	3.072E-01	5.947E-01	5.953E-01	4.710E-01
Tl-208	AB	2.689E-02	3.492E-02	3.497E-02	2.757E-02
U-235	AB	2.041E-03	3.198E-02	3.198E-02	2.619E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.094E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 21:14:39
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110_013.An1

Sample description
     QC723812, 206637, IDUP


Spectrum Filename: C:\User\SPC\Det12\12_20140110_013.An1

Acquisition information
       Start time:                 1/10/2014 20:29:27
       Live time:               2700
       Real time:               2705
       Dead time:                  0.19 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_Soil 250ml TunaCan_01-03-2014.Clb
     HPGE12 S23325 12_20140103002_EffCal


       Energy Calibration
            Created:               1/10/2014 06:54:40
            Zero offset:           0.076 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.351E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 19:51:11
            Type:                  Polynomial
            Uncertainty:           1.037 %
            Coefficients:         -0.383371  -4.365972   0.460548
                                  -0.057677   0.002462  -0.000050

Library Files
       Main analysis library:      GenericAnalysisReduced.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.07keV )
       Stop channel:           16336 (  2042.54keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4066E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4066E+02) =
                                   7.9337E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 21:14:39
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110_013.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/16/2013 11:12:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	12_2014-01-04_2135.PBC 1/4/2014 21:35:44
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 18 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1512

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.67	23.	62.76	0.87	1.432E-02	74.81	9.600	4.961E-01	Pb212
76.99	29.	53.27	0.87	1.568E-02	77.11	17.500	3.150E-01	Pb212
86.87	14.	74.96	0.88	2.134E-02	87.20	6.300	PBC<MDA	Pb212
92.50	14.	96.78	0.88	2.405E-02	92.60	5.600	PBC<MDA	Th234
100.39	12.	63.43	0.89	2.667E-02	98.44	25.100	5.482E-02	Pa234
					98.44	25.100	5.482E-02	Pa234
123.09	1.	858.77	0.91	3.425E-02	123.10	40.460	PBC<MDA	Eu154
185.67	1.	783.57	0.97	3.737E-02	185.70	54.000	PBC<MDA	U235
186.17	28.	36.41	0.97	3.735E-02	186.20	3.600	6.173E-01	Ra226
238.61	155.	10.10	0.71	3.424E-02	238.63	43.100	3.095E-01	Pb212
271.16	12.	69.41	1.04	3.207E-02	270.25	3.460	PBC<MDA	Ac228
282.50	23.	36.87	0.49	3.126E-02				
295.24	71.	21.32	0.61	3.045E-02	295.22	19.200	3.234E-01	Pb214
299.80	14.	73.25	1.07	3.014E-02	300.09	3.270	PBC<MDA	Pb212
338.50	26.	34.74	1.10	2.791E-02	338.40	12.010	2.248E-01	Ac228
352.04	132.	12.82	0.31	2.719E-02	351.79	37.100	3.454E-01	Pb214
463.20	10.	69.01	1.20	2.250E-02	463.00	4.400	PBC<MDA	Ac228
583.50	15.	43.72	1.30	1.911E-02	583.14	86.000	PBC<MDA	Tl208
609.43	115.	10.14	0.25	1.852E-02	609.69	46.090	3.542E-01	Bi214
665.97	7.	93.33	1.36	1.740E-02	665.45	1.560	PBC<MDA	Bi214
727.23	9.	73.70	1.41	1.634E-02	727.17	11.800	PBC<MDA	Bi212
767.37	8.	79.63	1.44	1.571E-02	768.36	4.890	PBC<MDA	Bi214
785.34	1.	403.64	1.46	1.546E-02	785.42	2.000	PBC<MDA	Bi212
793.95	2.	291.49	1.46	1.533E-02	794.95	4.250	PBC<MDA	Ac228
860.43	4.	176.16	1.51	1.448E-02	860.47	12.000	PBC<MDA	Tl208
911.09	18.	33.21	1.55	1.390E-02	911.07	29.000	1.342E-01	Ac228
934.01	3.	125.43	1.57	1.365E-02	934.05	3.170	PBC<MDA	Bi214

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 21:14:39
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110_013.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
946.02	2.	278.85	1.57	1.352E-02	946.00	12.000	PBC<MDA	Pa234
					946.00	12.000	3.209E-02	Pa234
969.17	12.	62.10	1.59	1.329E-02	968.90	17.460	PBC<MDA	Ac228
1120.16	19.	33.61	1.70	1.193E-02	1120.28	15.040	3.100E-01	Bi214
1174.78	2.	449.65	1.73	1.152E-02	1173.24	99.860	PBC<MDA	Co60
1377.64	5.	91.84	1.86	1.016E-02	1377.65	4.020	PBC<MDA	Bi214
1405.42	1.	908.25	1.88	9.983E-03	1407.98	2.480	PBC<MDA	Bi214
1461.10	322.	5.57	0.79	9.685E-03	1460.80	10.700	8.723E+00	K40
1765.40	8.	45.32	2.09	8.234E-03	1764.51	15.920	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
2259.75	282.50	19.	23.	7.453E+02	73.73	0.491	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisReduced.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	479.27	59.97	73.	-6.	-0.002	393.34	0.852s
Pb-212	596.85	74.67	94.	23.	0.009	125.52	0.866
Pb-212	615.42	76.99	108.	29.	0.011	106.55	0.868s
Pb-212	694.48	86.87	46.	14.	0.005	149.92	0.878s
Th-234	739.51	92.50	86.	14.	0.005	193.57	0.882s
Pa-234	802.63	100.39	25.	12.	0.005	126.86	0.888s
Eu-154	984.28	123.09	67.	1.	0.000	1717.55	0.910s
U-235	1153.71	144.26	82.	-11.	-0.004	248.84	0.928s
U-235	1485.24	185.70	60.	1.	0.001	1567.13	0.966D
Ra-226	1489.24	186.20	39.	28.	0.010	72.81	0.966D
Pb-212	1908.53	238.61	28.	155.	0.058	20.21	0.713s
Ac-228	2169.03	271.16	41.	12.	0.004	138.82	1.039s
Pb-214	2360.74	295.13	48.	51.	0.019	41.40	1.061s
Pb-212	2398.17	299.80	48.	14.	0.005	146.49	1.065
Ac-228	2707.74	338.50	40.	26.	0.009	69.48	1.098s
Eu-152	2758.60	344.86	38.	-5.	-0.002	330.37	1.103s
Pb-214	2816.10	352.04	39.	112.	0.042	24.34	0.313s
Eu-152	3286.45	410.83	34.	-2.	-0.001	884.31	1.159s

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 21:14:39
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110_013.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	3705.38	463.20	23.	10.	0.004	138.01	1.202s
Tl-208	4667.80	583.50	44.	15.	0.006	87.43	1.299s
Bi-214	4875.17	609.43	16.	103.	0.038	20.29	0.246s
Bi-214	5327.54	665.97	19.	7.	0.003	186.67	1.364s
Eu-154	5790.48	723.85	28.	-4.	-0.002	349.82	1.409s
Bi-212	5817.51	727.23	16.	9.	0.003	147.40	1.412s
Bi-214	6138.62	767.37	14.	8.	0.003	159.27	1.443s
Bi-212	6282.36	785.34	16.	1.	0.001	807.28	1.456s
Ac-228	6351.25	793.95	20.	2.	0.001	582.98	1.463s
Tl-208	6883.03	860.43	24.	4.	0.002	352.32	1.512
Ac-228	7288.19	911.09	28.	18.	0.007	66.42	1.549s
Bi-214	7471.51	934.01	12.	3.	0.001	250.86	1.565s
Pa-234	7567.62	946.02	11.	2.	0.001	557.70	1.574s
Ac-228	7752.74	969.17	31.	12.	0.005	124.20	1.590s
Bi-214	8960.35	1120.16	18.	19.	0.007	67.23	1.696s
Co-60	9397.18	1174.78	25.	2.	0.001	899.29	1.731s
Eu-154	10189.68	1273.87	21.	-1.	0.000	1140.33	1.798s
Bi-214	11019.53	1377.64	9.	5.	0.002	183.67	1.863s
Bi-214	11241.74	1405.42	12.	1.	0.000	1816.49	1.882s
K-40	11686.94	1461.10	14.	308.	0.114	11.15	0.792s
Bi-212	12929.43	1616.48	8.	-3.	-0.001	274.29	2.009s
Bi-214	14120.16	1765.40	11.	8.	0.003	90.64	2.089s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	1.3423E-01					3.65E+11
			911.07	1.342E-01	?(P	8.953E-02 3.32E+01	2.90E+01 G
			968.90	1.578E-01	? P	1.637E-01 6.21E+01	1.75E+01 GA
			338.40	2.248E-01	? P	1.291E-01 3.47E+01	1.20E+01 GA
			964.77	-7.206E-02	% P	1.456E+00 1.00E+03	4.99E+00 GA
			463.00	2.935E-01	? P	3.339E-01 6.90E+01	4.40E+00 GA
			794.95	9.980E-02	&	4.664E-01 2.91E+02	4.25E+00 GA
			270.25	3.168E-01	? P	3.955E-01 6.94E+01	3.46E+00 GA
Am-241	I	-9.2071E-02					3.65E+11
			59.54	-9.207E-02	?(	2.921E-01 1.97E+02	3.63E+01 G
Bi-212	N	1.3127E-01					3.65E+11
			727.17	1.313E-01	?(	1.413E-01 7.37E+01	1.18E+01 G
			1620.56	-3.880E-01	+	8.012E-01 1.37E+02	2.75E+00 GA
			785.42	1.349E-01	?	8.774E-01 4.04E+02	2.00E+00 GA

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 21:14:39
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110_013.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	3.5419E-01					3.65E+11	
			609.69	3.542E-01	(P	3.220E-02	1.01E+01	4.61E+01 G
			1764.51	1.742E-01	- P	1.770E-01	4.53E+01	1.59E+01 GA
			1120.28	3.100E-01	? P	1.606E-01	3.36E+01	1.50E+01 GA
			768.36	2.873E-01	?	3.351E-01	7.96E+01	4.89E+00 GA
			1377.65	3.863E-01	?	5.159E-01	9.18E+01	4.02E+00 GA
			934.05	1.993E-01	& P	5.560E-01	1.25E+02	3.17E+00 GA
			1407.98	6.569E-02	-	9.722E-01	9.08E+02	2.48E+00 GA
			1509.19	0.000E+00	-	3.316E-01	1.00E+03	2.19E+00 GA
			665.45	7.789E-01	+	1.098E+00	9.33E+01	1.56E+00 GA
Co-60	T	4.0992E-03					3.65E+11	
			1173.24	4.099E-03	?(	2.990E-02	4.50E+02	9.99E+01 G
			1332.50	0.000E+00	-	6.563E-03	1.00E+03	1.00E+02 G
Eu-152	I	-2.1585E-02					3.65E+11	
			344.30	-2.158E-02	?(	5.674E-02	1.65E+02	2.70E+01 G
			121.87	1.971E-04	%	5.736E-02	1.77E+04	2.86E+01 GA
			1408.08	0.000E+00	+	3.234E-02	1.00E+03	2.12E+01 GA
			964.05	0.000E+00	+	4.848E-01	1.00E+03	1.46E+01 GA
			778.90	1.232E-03	%	1.296E-01	6.39E+03	1.30E+01 GA
			411.09	-9.963E-02	+	7.158E-01	4.42E+02	2.26E+00 GA
Eu-154	I	-8.8910E-03					3.65E+11	
			1274.80	-8.891E-03	?(	8.241E-02	5.70E+02	3.55E+01 G
			123.10	2.863E-03	?	4.030E-02	8.59E+02	4.05E+01 GA
			723.30	-4.017E-02	+	1.114E-01	1.75E+02	1.97E+01 GA
K-40	N	8.7233E+00					3.65E+11	
			1460.80	8.723E+00	(P	2.497E-01	5.57E+00	1.07E+01 G
Pa-234	N	-2.3281E-03					3.65E+11	
			883.24	-2.328E-03	%(	1.395E-01	3.64E+03	1.50E+01 G
			98.44	5.482E-02	?	5.128E-02	6.34E+01	2.51E+01 GA
			946.00	3.209E-02	?	1.420E-01	2.79E+02	1.20E+01 GA
Pb-212	N	3.0946E-01					3.65E+11	
			238.63	3.095E-01	(	2.438E-02	1.01E+01	4.31E+01 G
			77.11	3.150E-01	?	2.594E-01	5.33E+01	1.75E+01 GA
			74.81	4.961E-01	+	4.841E-01	6.28E+01	9.60E+00 GA
			87.20	2.988E-01	?	3.442E-01	7.50E+01	6.30E+00 GA
			300.09	4.289E-01	+	4.829E-01	7.32E+01	3.27E+00 GA
Pb-214	N	3.2736E-01					3.65E+11	
			351.79	3.274E-01	(P	4.213E-02	1.22E+01	3.71E+01 G
			295.22	2.560E-01	? P	8.115E-02	2.07E+01	1.92E+01 GA
			241.92	-7.225E-02	& P	2.849E-01	5.90E+03	7.47E+00 GA

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/10/2014 21:14:39
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110_013.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   6.1727E-01                                      3.65E+11
                           186.20 6.173E-01  (  3.170E-01 3.64E+01 3.60E+00 G

Th-234   N   3.0724E-01                                      3.65E+11
                            92.60 3.072E-01 &(  4.710E-01 9.68E+01 5.60E+00 G

Tl-208   N   2.6889E-02                                      3.65E+11
                           583.14 2.689E-02 ?(P 2.757E-02 4.37E+01 8.60E+01 G
                           860.47 6.966E-02     1.941E-01 1.76E+02 1.20E+01 GA

U-235    N   2.0407E-03                                      3.65E+11
                           185.70 2.041E-03  (  2.619E-02 7.84E+02 5.40E+01 G
                           143.76-8.034E-02 +   1.596E-01 1.24E+02 1.05E+01 GA
                           163.35-1.466E-02 &   3.260E-01 1.35E+03 4.70E+00 GA
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 21:14:39
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110_013.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.97	73.	-6.	-0.002	393.34	-9.207E-02
Pa-234	100.39	25.	12.	0.005	126.86	5.482E-02
Eu-154	123.09	67.	1.	0.000	1717.55	2.863E-03
Eu-152	344.86	38.	-5.	-0.002	330.37	-2.158E-02
Eu-152	410.83	34.	-2.	-0.001	884.31	-9.963E-02
Eu-154	723.85	28.	-4.	-0.002	349.82	-4.017E-02
Pa-234	946.02	11.	2.	0.001	557.70	3.209E-02
Co-60	1174.78	25.	2.	0.001	899.29	4.099E-03
Eu-154	1273.87	21.	-1.	0.000	1140.33	-8.891E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#	1.3423E-01	1.3423E-01	1.1990E-01	1.2027E-01	8.953E-02
Am-241	#A	-9.2071E-02	-9.2071E-02	3.6215E-01	3.6224E-01	2.921E-01
Bi-212	#A	1.3127E-01	1.3127E-01	1.9349E-01	1.9371E-01	1.413E-01
Bi-214		3.5419E-01	3.5419E-01	8.0241E-02	8.4025E-02	3.220E-02
Co-60	#A	4.0992E-03	4.0992E-03	3.6864E-02	3.6865E-02	2.990E-02
Cs-137	#A	0.0000E+00	0.0000E+00	3.9746E-03	3.9747E-03	3.264E-02
Eu-152	#A	-2.1585E-02	-2.1585E-02	7.1310E-02	7.1326E-02	5.674E-02
Eu-154	#A	-8.8910E-03	-8.8910E-03	1.0139E-01	1.0139E-01	8.241E-02
K-40		8.7233E+00	8.7233E+00	1.0174E+00	1.1867E+00	2.497E-01
Pa-234	#A	-2.3281E-03	-2.3281E-03	1.6967E-01	1.6967E-01	1.395E-01
Pb-212		3.0946E-01	3.0946E-01	6.2527E-02	6.6786E-02	2.438E-02
Pb-214		3.2736E-01	3.2736E-01	8.8870E-02	9.1820E-02	4.213E-02
Ra-226		6.1727E-01	6.1727E-01	4.4946E-01	4.5188E-01	3.170E-01
Th-234	#A	3.0724E-01	3.0724E-01	5.9471E-01	5.9535E-01	4.710E-01
Tl-208	A	2.6889E-02	2.6889E-02	3.4920E-02	3.4971E-02	2.757E-02
U-235	A	2.0407E-03	2.0407E-03	3.1981E-02	3.1981E-02	2.619E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

ORTEC g v - i (3263) Env32 G53W4.26 1/10/2014 21:14:39
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110_013.An1

---------- S U M M A R Y ----------
Total Activity (238.5 to 2042.5 keV) 1.047E+01 pCi/g
Total Decayed Activity (238.5 to 2042.5 keV) 1.0465796E+01 pCi/g

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Initial Calibration Raw Data

```
     ORTEC g v - i (3135) Env32  G53W4.26  1/4/2014 11:49:44
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140104001_Energy.An1

Sample description
     RICAL,S19584,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\6_20140104001_Energy.An1

Acquisition information
       Start time:                 1/4/2014 11:03:21
       Live time:               1200
       Real time:               1255
       Dead time:                  4.42 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_QC.Clb
     HPGE06 S19584 6_20140104001_Energy


       Energy Calibration
            Created:               1/4/2014 11:48:20
            Zero offset:           0.019 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.086E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/4/2014 11:46:48
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2040.92keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (3135) Env32 G53W4.26 1/4/2014 11:49:44
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0833

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
39.92	11122.	2.23	1.15	1.628E-02				
45.45	6460.	2.02	0.81	1.616E-02				
46.88	1915.	6.61	0.81	1.612E-02				
121.92	154409.	0.28	0.88	1.440E-02	121.78	28.410	1.000E+00	QA122
244.58	32779.	0.61	1.01	1.159E-02	244.70	7.550	9.933E-01	Qa245
295.76	1797.	6.03	1.06	1.041E-02				
329.30	476.	18.08	0.71	9.641E-03				
344.19	93268.	0.35	1.12	9.299E-03	344.28	26.590	1.000E+00	Qa344
367.66	3235.	4.41	1.21	9.066E-03				
411.08	6937.	1.87	1.17	8.639E-03				
443.96	9207.	1.66	1.23	8.315E-03				
488.67	1208.	9.22	1.35	7.874E-03				
564.07	1271.	5.51	1.31	7.131E-03				
566.54	421.	15.26	1.31	7.107E-03				
586.37	1200.	8.18	0.97	6.912E-03				
674.57	474.	12.06	1.41	6.043E-03				
678.73	1107.	5.73	1.41	6.002E-03				
688.57	2090.	5.27	1.30	5.905E-03				
719.51	646.	9.64	1.45	5.601E-03				
723.85	296.	19.78	1.45	5.558E-03				
764.54	654.	14.94	1.39	5.157E-03				
778.93	24566.	0.86	1.47	5.015E-03	778.90	12.970	1.001E+00	Qa779
810.34	781.	12.58	1.19	4.897E-03				
867.34	7351.	2.28	1.60	4.681E-03				
919.31	752.	11.85	1.19	4.484E-03				
926.24	523.	12.67	1.26	4.458E-03				
964.00	23607.	0.81	1.65	4.315E-03	964.08	14.500	1.000E+00	Qa964

ORTEC g v - i (3135) Env32 G53W4.26 1/4/2014 11:49:44
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1005.18	1449.	7.58	1.12	4.222E-03				
1085.86	14964.	0.89	1.76	4.039E-03				
1089.83	2608.	3.02	1.76	4.030E-03				
1111.99	20395.	0.84	1.74	3.979E-03				
1212.85	2023.	4.88	1.61	3.750E-03				
1249.64	472.	13.47	1.58	3.667E-03				
1274.45	423.	12.53	0.85	3.610E-03				
1299.08	2126.	2.84	1.56	3.554E-03				
1407.86	26014.	0.65	2.04	3.307E-03	1408.01	20.850	1.000E+00	Qa1408
1433.90	53.	18.70	0.30	3.248E-03				
1457.35	666.	3.87	1.53	3.195E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.94	39.92	11158.	11122.	6.830E+05	4.45	1.146	-	s
363.14	45.45	5294.	6460.	3.999E+05	4.04	0.807	PB-210	D
374.54	46.88	7057.	1915.	1.188E+05	13.22	0.809	TH-227	D
2364.34	295.76	2490.	1797.	1.726E+05	12.07	1.059	PB-214	
2632.57	329.30	1980.	476.	4.937E+04	36.16	0.711	TH-227	s
2939.26	367.66	2805.	3235.	3.568E+05	8.82	1.207	-	s
3286.52	411.08	1984.	6937.	8.030E+05	3.74	1.167	AC-228	
3549.53	443.96	2380.	9207.	1.107E+06	3.33	1.234	RA-223	
3907.11	488.67	2072.	1208.	1.534E+05	18.44	1.349	PB-214	
4510.23	564.13	1816.	1271.	1.782E+05	11.02	1.311	-	D
4529.99	566.60	1851.	421.	5.920E+04	30.52	1.313	-	D
4688.56	586.37	1832.	1200.	1.736E+05	16.36	0.965	-	s
5393.99	674.55	1429.	515.	8.518E+04	32.71	0.794	-	s
5427.28	678.71	1595.	1223.	2.038E+05	15.82	1.279	-	
5506.18	688.57	1762.	2090.	3.540E+05	10.54	1.296	-	s
5753.56	719.49	1638.	752.	1.343E+05	24.68	1.308	-	
6114.07	764.54	1677.	654.	1.268E+05	29.87	1.386	TL-208	s
6480.54	810.34	1616.	781.	1.596E+05	25.16	1.192	-	s
6936.66	867.34	2645.	7351.	1.570E+06	4.55	1.604	-	
7352.59	919.31	1238.	752.	1.676E+05	23.70	1.187	-	s
7408.03	926.24	881.	523.	1.174E+05	25.34	1.262	-	s
8039.82	1005.18	1166.	1449.	3.431E+05	15.16	1.122	-	s
8685.63	1085.80	1309.	14964.	3.705E+06	1.77	1.761	-	D
8717.39	1089.77	1805.	2608.	6.471E+05	6.05	1.764	-	D
8894.81	1111.99	1104.	20395.	5.125E+06	1.67	1.739	-	
9702.30	1212.85	830.	2023.	5.394E+05	9.76	1.610	-	
9996.86	1249.64	431.	472.	1.288E+05	26.94	1.578	-	
10195.54	1274.45	269.	423.	1.173E+05	25.06	0.854	-	s
10392.70	1299.08	216.	2126.	5.981E+05	5.67	1.563	-	
11472.35	1433.90	6.	53.	1.626E+04	37.39	0.303	-	s

ORTEC g v - i (3135) Env32 G53W4.26 1/4/2014 11:49:44
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104001_Energy.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
11660.23	1457.35	0.	666.	2.085E+05	7.75	1.527	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.42	121.92	8639.	154409.	128.674	0.57	0.877
Qa-245	1955.02	244.57	5096.	32999.	27.499	1.45	1.008
Qa-344	2751.64	344.19	2868.	93268.	77.723	0.70	1.118
Qa-779	6229.21	778.93	2606.	24566.	20.471	1.72	1.475
Qa-964	7710.25	964.00	1605.	23607.	19.673	1.62	1.646
Qa-1408	11263.84	1407.86	255.	25965.	21.638	1.30	2.040

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	2.823E-03 2.84E-01 2.84E+01	G
Qa-245		1.0000E+00				4.94E+03	
			244.70	1.000E+00	(	1.016E-02 7.26E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	2.705E-03 3.52E-01 2.66E+01	G
Qa-779		1.0009E+00				4.94E+03	
			778.90	1.001E+00	(	9.804E-03 8.60E-01 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	8.022E-03 8.10E-01 1.45E+01	G
Qa-1408		9.9811E-01				4.94E+03	
			1408.01	9.981E-01	(	2.964E-03 6.51E-01 2.09E+01	G

ORTEC g v - i (3135) Env32 G53W4.26 1/4/2014 11:49:44
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104001_Energy.An1

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA µCi
QA-122	8.4977E-01	1.0000E+00	5.6818E-03	1.1431E-01	2.823E-03
Qa-245	8.4977E-01	1.0000E+00	1.4528E-02	1.1508E-01	1.016E-02
Qa-344	8.4977E-01	1.0000E+00	7.0343E-03	1.1438E-01	2.705E-03
Qa-779	8.5054E-01	1.0009E+00	1.7216E-02	1.1556E-01	9.804E-03
Qa-964	8.4977E-01	1.0000E+00	1.6209E-02	1.1531E-01	8.022E-03
Qa-1408	8.4815E-01	9.9811E-01	1.2988E-02	1.1469E-01	2.964E-03

```
     ORTEC g v - i (3135) Env32  G53W4.26  1/4/2014 11:49:44
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140104001_Energy.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity ( 1111.9 to  2040.9 keV)     5.098E+00  µCi
 Total Decayed Activity ( 1111.9 to  2040.9 keV) 5.9990406E+00  µCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 6_Soil 250ml TunaCan_01-04-2014.Clb
Energy Calibration Date: 1/8/2014 Time: 06:45:06
Efficiency Calibration Date: 1/6/2014 Time: 16:42:07

Calibration Description:
HPGE06 S23325 6_20140104002_EffCal

Energy Calibration Fit
Energy = 0.0778 +0.125066*Channel -6.42096e-009*Channel**2
FWHM (ch) = 5.8526 +0.001092*Channel -1.7813e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.37	121.78	121.93	-0.13%	0.85	0.86	-1.07%
1955.05	244.67	244.56	0.04%	1.00	0.99	0.94%
2751.68	344.30	344.17	0.04%	1.09	1.09	0.13%
6229.71	778.90	778.96	-0.01%	1.50	1.50	0.63%
7710.80	964.00	964.06	-0.01%	1.64	1.65	-0.92%
11264.26	1408.08	1408.04	0.00%	1.99	1.98	0.19%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.2625 %
Coefficients:
-0.387239 -4.158640 0.426222 -0.050686 0.002155 -0.000042

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.6698E-003	2.6649E-003	0.19%
59.54	1.1857E-002	1.1935E-002	-0.65%
88.03	3.3558E-002	3.2490E-002	3.18%
122.06	4.3548E-002	4.4209E-002	-1.52%
165.85	4.5149E-002	4.6035E-002	-1.96%
279.17	3.7320E-002	3.6951E-002	0.99%
391.71	3.0184E-002	2.9645E-002	1.79%
661.66	2.1250E-002	2.0666E-002	2.74%
898.02	1.5969E-002	1.6711E-002	-4.64%
1173.23	1.3652E-002	1.3771E-002	-0.88%
1332.51	1.2571E-002	1.2495E-002	0.61%
1836.01	9.6431E-003	9.5410E-003	1.06%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (3135) Env32  G53W4.26  1/6/2014 16:45:57
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140104002_EffCal.An1

Sample description
     RICAL,S23325,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\6_20140104002_EffCal.An1

Acquisition information
       Start time:                 1/4/2014 11:58:47
       Live time:              10800
       Real time:              10983
       Dead time:                  1.67 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_Soil 250ml TunaCan_01-04-2014.Clb
     HPGE06 S23325 6_20140104002_EffCal


       Energy Calibration
            Created:               1/6/2014 16:44:27
            Zero offset:          -0.025 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -8.721E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 16:42:07
            Type:                  Polynomial
            Uncertainty:           1.262 %
            Coefficients:         -0.387239  -4.158640   0.426222
                                  -0.050686   0.002155  -0.000042

Library Files
       Main analysis library:      EfficiencyCalibration.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    24.99keV )
       Stop channel:           16336 (  2041.02keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3135) Env32 G53W4.26 1/6/2014 16:45:57
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0571

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
30.74	4393.	4.17	1.39	0.000E+00				
46.48	17151.	2.18	0.84	2.630E-03	46.54	4.250	1.425E+04	Pb210
59.51	52268.	0.90	0.82	1.191E-02	59.54	35.900	1.130E+03	AM241
88.07	152664.	0.39	0.85	3.251E-02	88.03	3.610	1.595E+04	CD109
122.12	87915.	0.51	0.88	4.422E-02	122.06	85.600	3.467E+02	CO57
136.53	11216.	2.58	0.90	4.587E-02				
165.81	80201.	0.55	0.91	4.604E-02	165.85	79.900	5.182E+02	Ce139
238.57	1545.	13.20	0.77	4.039E-02				
254.92	2778.	7.13	1.00	3.896E-02				
278.99	22242.	1.46	1.03	3.697E-02	279.17	81.500	1.105E+03	Hg203
351.97	1242.	16.21	0.72	3.186E-02				
391.59	62322.	0.56	1.18	2.965E-02	391.71	64.000	9.386E+02	SN113
510.71	1237.	9.72	1.25	2.471E-02				
513.96	40418.	0.57	1.26	2.460E-02	513.99	95.700	1.175E+03	Sr85
609.16	779.	13.13	1.34	2.188E-02				
661.69	86424.	0.36	1.39	2.067E-02	661.66	85.100	4.604E+02	CS137
814.06	807.	14.64	0.76	1.790E-02				
897.97	74578.	0.45	1.58	1.671E-02	898.02	93.700	1.489E+03	Y898
1173.20	97140.	0.37	1.80	1.377E-02	1173.23	99.970	6.989E+02	Co1173
1324.85	1242.	8.68	1.06	1.255E-02				
1332.47	89480.	0.37	1.94	1.250E-02	1332.51	99.990	7.094E+02	Co1332
1461.10	693.	13.62	1.04	1.161E-02				
1835.93	46355.	0.49	2.26	9.542E-03	1836.01	99.200	1.531E+03	Y1836

ORTEC g v - i (3135) Env32 G53W4.26 1/6/2014 16:45:57
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
245.93	30.74	9714.	4393.	0.000E+00	8.34	1.392	-	s
1091.76	136.53	18569.	11216.	2.445E+05	5.16	0.902	-	
1907.70	238.57	11128.	1545.	3.825E+04	26.40	0.766	PB-212	s
2038.50	254.92	10122.	2778.	7.130E+04	14.26	1.004	TH-227	
2814.60	351.97	8939.	1242.	3.900E+04	32.43	0.716	PB-214	s
4084.28	510.69	6610.	1237.	1.431E+04	19.45	1.254	TL-208	lD
4871.65	609.13	5534.	973.	4.446E+04	34.45	0.636	BI-214	s
6511.24	814.06	3205.	807.	4.506E+04	29.28	0.757	-	s
10599.68	1324.85	1824.	1242.	9.898E+04	17.37	1.057	-	sM
11690.68	1461.10	1370.	693.	5.968E+04	27.25	1.044	K-40	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyCalibration.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.83	46.48	29280.	17151.	1.588	4.37	0.837
AM-241	476.00	59.51	35731.	52268.	4.840	1.80	0.817
CD-109	704.31	88.07	42532.	152664.	14.136	0.78	0.850
CO-57	976.60	122.12	26183.	87915.	8.140	1.03	0.876
Ce-139	1325.94	165.81	22784.	80201.	7.426	1.11	0.912
Hg-203	2230.99	278.99	15102.	22242.	2.059	2.92	1.027
SN-113	3131.48	391.59	10523.	62322.	5.771	1.12	1.176
Sr-85	4110.21	513.95	8824.	39850.	3.690	1.48	1.244
CS-137	5291.88	661.66	7022.	87963.	8.145	0.82	1.399
Y-898	7182.71	897.97	6280.	74578.	6.905	0.91	1.577
Co-1173	9385.68	1173.20	3934.	96999.	8.981	0.73	1.805
Co-1332	10660.74	1332.47	2580.	89480.	8.285	0.75	1.939
Y-1836	14691.64	1835.78	881.	48703.	4.510	0.98	2.285

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3135) Env32 G53W4.26 1/6/2014 16:45:57
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Peak Code	MDA Value Bq	COMMENTS
Pb-210		1.4247E+04				8.12E+03	
			46.54	1.425E+04	(	6.647E+02 2.18E+00 4.25E+00 G	
AM-241		1.1305E+03				1.58E+05	
			59.54	1.130E+03	(	1.911E+01 8.98E-01 3.59E+01 G	
CD-109		1.5952E+04				4.63E+02	
			88.03	1.595E+04	(	1.007E+02 3.89E-01 3.61E+00 G	
CO-57		3.4666E+02				2.72E+02	
			122.06	3.467E+02	(	2.984E+00 5.13E-01 8.56E+01 G	
Ce-139		5.1820E+02				1.38E+02	
			165.85	5.182E+02	(	4.562E+00 5.53E-01 7.99E+01 G	
Hg-203		1.1054E+03				4.66E+01	
			279.17	1.105E+03	(	2.859E+01 1.46E+00 8.15E+01 G	
SN-113		9.3862E+02				1.15E+02	
			391.71	9.386E+02	(	7.240E+00 5.61E-01 6.40E+01 G	
Sr-85		1.1586E+03				6.48E+01	
			513.99	1.159E+03	(	1.280E+01 7.39E-01 9.57E+01 G	
CS-137		4.6861E+02				1.10E+04	
			661.66	4.686E+02	(	2.095E+00 4.08E-01 8.51E+01 G	
Y-898		1.4889E+03				1.07E+02	
			898.02	1.489E+03	(	7.427E+00 4.54E-01 9.37E+01 G	
Co-1173		6.9787E+02				1.92E+03	
			1173.23	6.979E+02	(	2.122E+00 3.67E-01 1.00E+02 G	
Co-1332		7.0937E+02				1.92E+03	
			1332.51	7.094E+02	(	1.898E+00 3.74E-01 1.00E+02 G	
Y-1836		1.6086E+03				1.07E+02	
			1836.01	1.609E+03	(	4.658E+00 4.92E-01 9.92E+01 G	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (3135) Env32 G53W4.26 1/6/2014 16:45:57
Curtis & Tompkins HPS Lab Spectrum name: 6_20140104002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting Bq	2 Sigma Total Bq	MDA Bq
Pb-210	1.4022E+04	1.4247E+04	6.2193E+02	1.5381E+03	6.647E+02
AM-241	1.1296E+03	1.1305E+03	2.0299E+01	9.1422E+01	1.911E+01
CD-109	1.2052E+04	1.5952E+04	1.2409E+02	1.3244E+03	1.007E+02
CO-57	2.1510E+02	3.4666E+02	3.5543E+00	2.3109E+01	2.984E+00
Ce-139	2.0189E+02	5.1820E+02	5.7268E+00	3.2646E+01	4.562E+00
Hg-203	6.8386E+01	1.1054E+03	3.2254E+01	7.4511E+01	2.859E+01
SN-113	3.0415E+02	9.3862E+02	1.0534E+01	5.2548E+01	7.240E+00
Sr-85	1.5673E+02	1.1586E+03	1.7113E+01	6.6240E+01	1.280E+01
CS-137	4.6310E+02	4.6861E+02	3.8222E+00	2.7610E+01	2.095E+00
Y-898	4.4101E+02	1.4889E+03	1.3527E+01	8.3462E+01	7.427E+00
Co-1173	6.5239E+02	6.9787E+02	5.1257E+00	3.6818E+01	2.122E+00
Co-1332	6.6314E+02	7.0937E+02	5.3044E+00	3.7817E+01	1.898E+00

```
     ORTEC g v - i (3135) Env32  G53W4.26  1/6/2014 16:45:57
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140104002_EffCal.An1

 Y-1836       4.7646E+02    1.6086E+03   1.5830E+01    1.2841E+02  4.658E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.0 keV)     3.085E+04  Bq
 Total Decayed Activity (   25.0 to  2041.0 keV) 4.0371113E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 20:34:43
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140106002_EffVerif.An1

Sample description
     RICV|S22147|Efficiency Verification


Spectrum Filename: C:\User\SPC\Det6\6_20140106002_EffVerif.An1

Acquisition information
       Start time:                 1/6/2014 17:32:25
       Live time:              10800
       Real time:              10930
       Dead time:                  1.19 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_Soil 250ml TunaCan_01-04-2014.Clb
     HPGE06 S23325 6_20140104002_EffCal


       Energy Calibration
            Created:               1/6/2014 17:29:29
            Zero offset:           0.063 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -8.017E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 16:42:07
            Type:                  Polynomial
            Uncertainty:           1.262 %
            Coefficients:         -0.387239  -4.158640   0.426222
                                  -0.050686   0.002155  -0.000042

Library Files
       Main analysis library:      EfficiencyVerification.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.08keV )
       Stop channel:           16336 (  2041.37keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 20:34:43
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0532

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.62	14633.	1.42	0.81	2.675E-03	46.54	100.000	5.248E+02	Pb210
59.59	50263.	0.76	0.84	1.198E-02	59.54	100.000	3.906E+02	AM241
88.15	111352.	0.41	0.85	3.255E-02	88.03	100.000	5.527E+02	CD109
122.19	53425.	0.69	0.88	4.423E-02	122.06	100.000	2.877E+02	CO57
136.54	7112.	3.64	0.86	4.587E-02				
165.88	31344.	0.89	0.93	4.603E-02	165.85	100.000	4.073E+02	Ce139
238.54	1476.	8.39	1.00	4.040E-02				
255.01	1029.	16.22	1.35	3.896E-02				
279.13	1544.	11.80	1.03	3.695E-02	279.17	100.000	9.538E+02	Hg203
351.66	1076.	15.46	1.01	3.188E-02				
391.68	19948.	1.22	1.16	2.965E-02	391.71	100.000	5.796E+02	SN113
510.82	733.	13.16	1.26	2.471E-02				
514.04	5480.	2.13	1.26	2.460E-02	513.99	100.000	1.081E+03	Sr85
583.10	754.	14.36	1.28	2.255E-02				
609.38	841.	9.98	1.35	2.187E-02				
661.75	85658.	0.41	1.39	2.066E-02	661.66	100.000	3.929E+02	CS137
898.06	22565.	1.15	1.58	1.671E-02	898.02	100.000	1.390E+03	Y898
1173.32	90865.	0.37	1.80	1.377E-02	1173.23	100.000	6.981E+02	Co1173
1332.60	83552.	0.38	1.93	1.249E-02	1332.51	100.000	7.075E+02	Co1332
1460.83	891.	8.76	1.00	1.161E-02				
1835.98	14606.	0.92	2.15	9.541E-03	1836.01	100.000	1.575E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 20:34:43
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106002_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1091.10	136.54	13296.	7112.	1.550E+05	7.28	0.855	-	
1905.99	238.45	7128.	1486.	3.679E+04	21.87	0.957	-	
2038.37	255.01	7056.	1029.	2.641E+04	32.43	1.354	-	s
2811.31	351.66	6038.	1076.	3.374E+04	30.92	1.014	-	
4662.43	583.10	2813.	754.	3.344E+04	28.72	1.280	-	
4873.19	609.45	3499.	917.	4.192E+04	28.45	1.098	-	s
11686.64	1460.83	651.	891.	7.672E+04	17.53	0.998	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.72	46.56	19572.	15809.	1.464	3.84	0.813
AM-241	475.90	59.59	23098.	50263.	4.654	1.53	0.838
CD-109	704.19	88.15	24357.	111352.	10.310	0.83	0.853
CO-57	976.37	122.19	17431.	53425.	4.947	1.39	0.878
Ce-139	1325.73	165.88	10682.	31344.	2.902	1.77	0.929
Hg-203	2231.27	279.13	7362.	1544.	0.143	23.61	1.034
SN-113	3131.38	391.68	7348.	19948.	1.847	2.45	1.157
Sr-85	4109.59	513.99	5796.	5133.	0.475	7.38	1.298D
CS-137	5291.54	661.75	5606.	85587.	7.925	0.82	1.393
Y-898	7182.20	898.06	5714.	22527.	2.086	2.25	1.583
Co-1173	9385.11	1173.32	3077.	90865.	8.413	0.75	1.801
Co-1332	10660.08	1332.60	1638.	83523.	7.734	0.75	1.932
Y-1836	14690.81	1835.98	336.	14606.	1.352	1.85	2.153

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 20:34:43
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106002_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source		COMMENTS
Pb-210		5.6693E+02					8.12E+03	
			46.54	5.669E+02	(	1.169E+01	1.92E+00	1.00E+02 G
AM-241		3.9059E+02					1.58E+05	
			59.54	3.906E+02	(	2.752E+00	7.64E-01	1.00E+02 G
CD-109		5.5275E+02					4.63E+02	
			88.03	5.527E+02	(	1.805E+00	4.13E-01	1.00E+02 G
CO-57		2.8775E+02					2.72E+02	
			122.06	2.877E+02	(	1.657E+00	6.93E-01	1.00E+02 G
Ce-139		4.0726E+02					1.38E+02	
			165.85	4.073E+02	(	3.129E+00	8.87E-01	1.00E+02 G
Hg-203		9.5379E+02					4.66E+01	
			279.17	9.538E+02	(	1.235E+02	1.18E+01	1.00E+02 G
SN-113		5.7963E+02					1.15E+02	
			391.71	5.796E+02	(	5.803E+00	1.22E+00	1.00E+02 G
Sr-85		1.0126E+03					6.48E+01	
			513.99	1.013E+03	(	3.500E+01	3.69E+00	1.00E+02 G
CS-137		3.9253E+02					1.10E+04	
			661.66	3.925E+02	(	8.001E-01	4.09E-01	1.00E+02 G
Y-898		1.3872E+03					1.07E+02	
			898.02	1.387E+03	(	1.085E+01	1.13E+00	1.00E+02 G
Co-1173		6.9811E+02					1.92E+03	
			1173.23	6.981E+02	(	9.931E-01	3.73E-01	1.00E+02 G
Co-1332		7.0724E+02					1.92E+03	
			1332.51	7.072E+02	(	7.985E-01	3.77E-01	1.00E+02 G
Y-1836		1.5753E+03					1.07E+02	
			1836.01	1.575E+03	(	4.606E+00	9.23E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 20:34:43
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106002_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	5.4929E+02	5.6693E+02	3.8402E+00%	1.0594E+01%	1.169E+01
AM-241	3.8996E+02	3.9059E+02	1.5270E+00%	8.0316E+00%	2.752E+00
CD-109	3.1734E+02	5.5275E+02	8.2545E-01%	8.3070E+00%	1.805E+00
CO-57	1.1189E+02	2.8775E+02	1.3861E+00%	6.7312E+00%	1.657E+00
Ce-139	6.3043E+01	4.0726E+02	1.7738E+00%	6.4510E+00%	3.129E+00
Hg-203	3.8682E+00	9.5379E+02	2.3607E+01%	2.4377E+01%	1.235E+02
SN-113	6.2306E+01	5.7963E+02	2.4482E+00%	6.0064E+00%	5.803E+00
Sr-85	1.9319E+01	1.0126E+03	7.3783E+00%	9.2167E+00%	3.500E+01
CS-137	3.8346E+02	3.9253E+02	8.1816E-01%	5.8923E+00%	8.001E-01
Y-898	1.2482E+02	1.3872E+03	2.2502E+00%	5.9716E+00%	1.085E+01
Co-1173	6.1094E+02	6.9811E+02	7.4699E-01%	5.2775E+00%	9.931E-01
Co-1332	6.1894E+02	7.0724E+02	7.5312E-01%	5.3318E+00%	7.985E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 20:34:43
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140106002_EffVerif.An1

 Y-1836       1.4175E+02    1.5753E+03   1.8456E+00%   8.1337E+00% 4.606E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2041.4 keV)     3.397E+03  GPS/Source
 Total Decayed Activity (   25.1 to  2041.4 keV) 9.5116533E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/20/2013 20:37:24
Curtis & Tompkins HPS Lab       Spectrum name: 7_20130220001_Energy.An1

Sample description
     RICAL,S19585,Energy Calibration


Spectrum Filename: C:\User\Cal\Spectra\7_20130220001_Energy.An1

Acquisition information
       Start time:                 2/20/2013 20:10:12
       Live time:                600
       Real time:                627
       Dead time:                  4.29 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_QC.Clb
     HPGE07 S19585 7_20130220001_Energy


       Energy Calibration
            Created:               2/20/2013 20:33:31
            Zero offset:          -0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.662E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/20/2013 20:31:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    24.99keV )
       Stop channel:           16336 (  2041.76keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 2/20/2013 20:37:24
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0224

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.76	3368.	4.27	1.11	1.546E-02				
45.29	2237.	3.90	0.80	1.535E-02				
46.52	781.	11.30	0.80	1.533E-02				
121.79	79612.	0.41	0.89	1.391E-02	121.78	29.240	1.000E+00	QA122
244.67	17281.	1.04	1.02	1.159E-02	244.67	7.616	1.000E+00	Qa245
295.94	964.	8.38	1.02	1.033E-02				
324.98	296.	19.33	0.32	9.613E-03				
344.27	48288.	0.50	1.12	9.137E-03	344.30	27.000	1.000E+00	Qa344
367.70	1776.	5.38	1.15	8.909E-03				
411.11	3582.	2.82	1.18	8.486E-03				
443.94	4774.	1.98	1.09	8.166E-03				
488.77	642.	12.12	1.18	7.729E-03				
503.67	364.	16.82	0.88	7.584E-03				
564.02	661.	7.87	1.34	6.994E-03				
586.25	613.	11.45	1.16	6.779E-03				
674.68	228.	18.17	1.43	5.917E-03				
678.66	549.	8.15	1.44	5.879E-03				
688.80	1116.	9.08	1.20	5.780E-03				
719.26	401.	11.50	1.47	5.483E-03				
778.84	12973.	1.06	1.55	4.902E-03	778.90	12.990	1.041E+00	Qa779
810.28	471.	14.38	1.00	4.809E-03				
867.22	3994.	2.63	1.66	4.640E-03				
919.38	539.	13.38	1.23	4.485E-03				
925.89	344.	18.12	0.64	4.466E-03				
963.94	12453.	1.06	1.61	4.353E-03	964.00	14.580	1.002E+00	Qa964
1005.25	693.	10.20	1.14	4.249E-03				
1085.84	7739.	1.25	1.72	4.047E-03				

ORTEC g v - i (1087) Env32 G53W4.26 2/20/2013 20:37:24
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1090.01	1323.	3.98	1.72	4.037E-03				
1112.00	10592.	1.22	1.73	3.981E-03				
1212.91	1113.	5.57	1.68	3.728E-03				
1274.35	200.	16.66	0.43	3.574E-03				
1299.15	1148.	3.85	2.20	3.512E-03				
1408.06	13446.	0.90	1.87	3.239E-03	1408.08	21.210	1.000E+00	Qa1408
1457.63	353.	5.51	1.18	3.114E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.05	39.76	4431.	3368.	2.179E+05	8.53	1.110	-	s
362.26	45.28	2695.	2237.	1.457E+05	7.81	0.795	-	D
372.14	46.52	3502.	781.	5.093E+04	22.60	0.797	-	D
2366.48	295.94	1389.	964.	9.333E+04	16.75	1.024	-	
2598.69	324.98	876.	296.	3.079E+04	38.66	0.323	-	s
2940.28	367.70	1288.	1776.	1.994E+05	10.75	1.150	-	s
3287.46	411.11	1232.	3582.	4.221E+05	5.65	1.184	-	
3550.02	443.94	911.	4774.	5.847E+05	3.97	1.087	-	
3908.57	488.77	1042.	642.	8.312E+04	24.23	1.184	-	
4027.70	503.67	785.	364.	4.795E+04	33.64	0.880	-	s
4510.45	564.18	1021.	661.	9.448E+04	15.74	1.338	-	D
4688.23	586.25	940.	613.	9.049E+04	22.91	1.160	-	
5395.46	674.67	637.	258.	4.357E+04	39.68	0.136	-	s
5427.29	678.65	770.	543.	9.244E+04	23.74	0.899	-	s
5508.47	688.80	1271.	1116.	1.931E+05	18.16	1.200	-	
5751.76	719.22	1026.	457.	8.334E+04	34.18	0.836	-	s
6480.23	810.28	761.	471.	9.791E+04	28.75	1.000	-	s
6935.74	867.22	1027.	3994.	8.609E+05	5.27	1.660	-	
7352.98	919.38	684.	539.	1.201E+05	26.76	1.232	-	s
7405.07	925.89	590.	344.	7.703E+04	36.23	0.642	-	s
8040.02	1005.25	526.	693.	1.632E+05	20.40	1.144	-	s
8684.06	1085.74	912.	7784.	1.923E+06	2.99	1.699	-	
8717.46	1089.92	623.	1010.	2.501E+05	12.53	1.441	-	D
8894.16	1112.00	705.	10592.	2.660E+06	2.43	1.728	-	
9701.59	1212.91	364.	1113.	2.985E+05	11.14	1.678	-	s
10193.24	1274.35	128.	200.	5.593E+04	33.32	0.429	-	s
10391.70	1299.15	106.	1148.	3.270E+05	7.69	2.203	-	s
11660.01	1457.63	5.	353.	1.135E+05	11.02	1.185	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.Lib

ORTEC g v - i (1087) Env32 G53W4.26 2/20/2013 20:37:24
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220001_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.96	121.79	5052.	79612.	132.687	0.81	0.892
Qa-245	1956.48	244.67	2890.	17281.	28.802	2.08	1.024
Qa-344	2752.98	344.27	1624.	48288.	80.479	0.99	1.122
Qa-779	6228.75	778.84	946.	12973.	21.621	2.12	1.554
Qa-964	7709.56	963.94	667.	12422.	20.704	2.10	1.614
Qa-1408	11263.35	1408.07	165.	13408.	22.346	1.83	1.868s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		1.0000E+00				4.64E+03	
			121.78	1.000E+00	(	2.080E-03 4.07E-01 2.92E+01	G
Qa-245		1.0000E+00				4.64E+03	
			244.67	1.000E+00	(	7.248E-03 1.04E+00 7.62E+00	G
Qa-344		1.0000E+00				4.64E+03	
			344.30	1.000E+00	(	1.945E-03 4.95E-01 2.70E+01	G
Qa-779		1.0408E+00				4.64E+03	
			778.90	1.041E+00	(	5.751E-03 1.06E+00 1.30E+01	G
Qa-964		1.0000E+00				4.64E+03	
			964.00	1.000E+00	(	4.843E-03 1.05E+00 1.46E+01	G
Qa-1408		9.9712E-01				4.64E+03	
			1408.08	9.971E-01	@(	2.228E-03 9.14E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/20/2013 20:37:24
Curtis & Tompkins HPS Lab       Spectrum name: 7_20130220001_Energy.An1

  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi           uCi          uCi
_____________________________________________________________________________
QA-122       8.8173E-01    1.0000E+00   8.1355E-03    1.1445E-01  2.080E-03
Qa-245       8.8173E-01    1.0000E+00   2.0802E-02    1.1604E-01  7.248E-03
Qa-344       8.8173E-01    1.0000E+00   9.9078E-03    1.1459E-01  1.945E-03
Qa-779       9.1772E-01    1.0408E+00   2.2025E-02    1.2085E-01  5.751E-03
Qa-964       8.8173E-01    1.0000E+00   2.1006E-02    1.1608E-01  4.843E-03
Qa-1408#     8.7919E-01    9.9712E-01   1.8223E-02    1.1528E-01  2.228E-03

  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (  586.2 to  2041.8 keV)     5.324E+00  uCi
Total Decayed Activity (  586.2 to  2041.8 keV) 6.0379562E+00  uCi
```

ORTEC g v - i (1087) Env32 G53W4.26 2/20/2013 20:37:24
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220001_Energy.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 7_Soil 250ml TunaCan_02-20-2013.Clb
Energy Calibration Date: 1/6/2014 Time: 07:33:28
Efficiency Calibration Date: 2/21/2013 Time: 11:46:56

Calibration Description:
HPGE07 S21603 7_20130220002_EffCal

Energy Calibration Fit
Energy = -0.0102 +0.125052*Channel -6.43934e-009*Channel**2
FWHM (ch) = 6.2432 +0.001029*Channel -1.75584e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.02	121.78	121.79	-0.01%	0.90	0.90	-0.22%
1956.85	244.67	244.67	-0.00%	1.04	1.02	1.33%
2753.60	344.30	344.28	0.00%	1.11	1.12	-0.70%
6230.64	778.90	778.89	0.00%	1.46	1.50	-2.49%
7712.04	964.00	964.01	-0.00%	1.68	1.64	2.37%
11266.52	1408.08	1408.08	0.00%	1.94	1.95	-0.39%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9839 %
Coefficients:
-0.343951 -4.203033 0.485929 -0.062075 0.002900 -0.000060

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.6038E-003	1.6008E-003	0.18%
59.54	9.9934E-003	1.0057E-002	-0.63%
88.03	3.2047E-002	3.1120E-002	2.89%
122.06	4.4340E-002	4.4801E-002	-1.04%
165.85	4.7374E-002	4.8299E-002	-1.95%
279.17	3.9550E-002	3.9499E-002	0.13%
391.71	3.1861E-002	3.1553E-002	0.97%
513.99	2.6504E-002	2.6020E-002	1.83%
661.66	2.2272E-002	2.1747E-002	2.36%
898.02	1.7022E-002	1.7530E-002	-2.98%
1173.23	1.4213E-002	1.4469E-002	-1.81%
1332.51	1.2880E-002	1.3162E-002	-2.19%
1836.01	1.0445E-002	1.0175E-002	2.58%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	15094.00	641.50	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1187.50	426.30	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15909.00	574.30	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	363.55	311.20	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	544.93	435.40	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1084.50	883.90	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	947.66	606.50	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1166.10	1116.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	473.09	402.60	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1583.80	1484.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	748.72	748.50	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	748.77	748.70	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1583.70	1571.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/21/2013 11:53:06
Curtis & Tompkins HPS Lab       Spectrum name: 7_20130220002_EffCal.An1

Sample description
     RICAL |S21603| Efficiency Calibration


Spectrum Filename: C:\User\Cal\Spectra\7_20130220002_EffCal.An1

Acquisition information
       Start time:                 2/20/2013 20:39:38
       Live time:              10800
       Real time:              11086
       Dead time:                  2.58 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               2/21/2013 11:49:46
            Zero offset:           0.044 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.477E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      EfficiencyCalibration.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.06keV )
       Stop channel:           16336 (  2041.63keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 11:53:06
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0419

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.43	11063.	3.68	0.90	1.535E-03	46.54	4.250	1.512E+04	Pb210
59.44	46000.	1.14	0.83	9.975E-03	59.54	35.900	1.180E+03	AM241
70.70	3810.	7.60	0.85	1.898E-02				
72.89	7024.	4.12	0.85	2.068E-02				
82.45	2705.	11.54	0.86	2.757E-02				
88.03	184271.	0.39	0.85	3.112E-02	88.03	3.610	1.638E+04	CD109
122.11	130999.	0.44	0.88	4.481E-02	122.06	85.600	3.598E+02	CO57
136.53	17749.	2.41	0.93	4.718E-02				
165.91	170676.	0.35	0.93	4.830E-02	165.85	79.900	5.281E+02	Ce139
255.13	7034.	5.26	1.07	4.161E-02				
279.21	178033.	0.33	1.06	3.950E-02	279.17	81.500	1.085E+03	Hg203
352.11	1488.	11.72	1.13	3.396E-02				
391.72	153926.	0.33	1.17	3.155E-02	391.71	64.000	9.566E+02	SN113
510.13	2729.	5.99	1.28	2.616E-02				
514.02	185246.	0.25	1.28	2.602E-02	513.99	95.700	1.182E+03	Sr85
609.47	1152.	14.43	0.99	2.305E-02				
661.62	98762.	0.49	1.43	2.175E-02	661.66	85.100	4.957E+02	CS137
814.04	1767.	9.17	1.38	1.879E-02				
897.94	196393.	0.28	1.65	1.753E-02	898.02	93.700	1.537E+03	Y898
1173.19	112820.	0.38	1.84	1.447E-02	1173.23	99.970	7.354E+02	Co1173
1324.86	3221.	5.31	2.72	1.322E-02				
1332.50	102271.	0.38	2.00	1.316E-02	1332.51	99.990	7.327E+02	Co1332
1461.01	843.	19.05	0.20	1.226E-02				
1836.03	127574.	0.30	2.34	1.017E-02	1836.01	99.200	1.625E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 11:53:06
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
564.93	70.70	40080.	3706.	1.953E+05	19.60	0.829	-	
582.46	72.89	36586.	6813.	3.295E+05	10.02	0.845	-	
658.98	82.46	46750.	2973.	1.078E+05	26.28	0.982	-	
1091.41	136.53	42279.	17749.	3.762E+05	4.82	0.934	-	
2039.80	255.13	29468.	7034.	1.690E+05	10.51	1.073	-	
2816.88	352.29	17738.	1834.	5.401E+04	31.16	1.185	-	s
4079.36	510.11	11995.	2729.	-1.157E+04	11.98	1.280	-	D
4873.95	609.47	6978.	1152.	5.000E+04	28.87	0.992	-	s
6510.44	814.04	5562.	1767.	9.403E+04	18.34	1.379	-	
10598.00	1324.86	4269.	3221.	2.437E+05	10.62	2.717	-	sM
11687.71	1461.01	3774.	843.	6.871E+04	38.09	0.200	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyCalibration.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	370.93	46.43	41772.	11063.	1.024	7.36	0.900
AM-241	474.91	59.44	52859.	46000.	4.259	2.27	0.827
CD-109	703.53	88.03	69700.	184271.	17.062	0.77	0.851
CO-57	976.08	122.11	49532.	130999.	12.130	0.88	0.883
Ce-139	1326.35	165.91	41332.	170676.	15.803	0.69	0.932
Hg-203	2232.41	279.21	30656.	178033.	16.485	0.65	1.055
SN-113	3132.26	391.72	19279.	153926.	14.252	0.66	1.167
Sr-85	4110.23	513.99	21358.	185319.	17.159	0.62	1.293
CS-137	5291.08	661.62	17466.	98762.	9.145	0.97	1.428
Y-898	7181.77	897.94	12753.	196331.	18.179	0.56	1.646
Co-1173	9384.22	1173.19	7230.	112641.	10.430	0.74	1.836
Co-1332	10659.12	1332.50	5628.	102271.	9.470	0.75	2.001
Y-1836	14689.80	1836.03	2157.	127366.	11.793	0.61	2.339

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 11:53:06
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source	COMMENTS
Pb-210		1.5122E+04				8.12E+03	
			46.54	1.512E+04	(	6.509E+02 3.68E+00 4.25E+00	G
AM-241		1.1800E+03				1.58E+05	
			59.54	1.180E+03	(	1.374E+01 1.14E+00 3.59E+01	G
CD-109		1.6381E+04				4.63E+02	
			88.03	1.638E+04	(	5.468E+01 3.86E-01 3.61E+00	G
CO-57		3.5975E+02				2.72E+02	
			122.06	3.598E+02	(	1.424E+00 4.41E-01 8.56E+01	G
Ce-139		5.2810E+02				1.38E+02	
			165.85	5.281E+02	(	1.466E+00 3.46E-01 7.99E+01	G
Hg-203		1.0849E+03				4.66E+01	
			279.17	1.085E+03	(	2.486E+00 3.26E-01 8.15E+01	G
SN-113		9.5655E+02				1.15E+02	
			391.71	9.566E+02	(	2.010E+00 3.32E-01 6.40E+01	G
Sr-85		1.1821E+03				6.48E+01	
			513.99	1.182E+03	(	2.172E+00 3.08E-01 9.57E+01	G
CS-137		4.9571E+02				1.10E+04	
			661.66	4.957E+02	(	1.546E+00 4.85E-01 8.51E+01	G
Y-898		1.5368E+03				1.07E+02	
			898.02	1.537E+03	(	2.060E+00 2.80E-01 9.37E+01	G
Co-1173		7.3426E+02				1.92E+03	
			1173.23	7.343E+02	(	1.291E+00 3.70E-01 1.00E+02	G
Co-1332		7.3274E+02				1.92E+03	
			1332.51	7.327E+02	(	1.252E+00 3.75E-01 1.00E+02	G
Y-1836		1.6224E+03				1.07E+02	
			1836.01	1.622E+03	(	1.378E+00 3.03E-01 9.92E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 11:53:06
Curtis & Tompkins HPS Lab Spectrum name: 7_20130220002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	1.5057E+04	1.5122E+04	7.3570E+00%	1.2313E+01%	6.509E+02
AM-241	1.1797E+03	1.1800E+03	2.2730E+00%	8.2054E+00%	1.374E+01
CD-109	1.5187E+04	1.6381E+04	7.7121E-01%	8.2961E+00%	5.468E+01
CO-57	3.1629E+02	3.5975E+02	8.8244E-01%	6.6408E+00%	1.424E+00
Ce-139	4.0951E+02	5.2810E+02	6.9167E-01%	6.2369E+00%	1.466E+00
Hg-203	5.1208E+02	1.0849E+03	6.5257E-01%	5.9567E+00%	2.486E+00
SN-113	7.0578E+02	9.5655E+02	6.6493E-01%	5.1690E+00%	2.010E+00
Sr-85	6.8909E+02	1.1821E+03	6.1647E-01%	5.1093E+00%	2.172E+00
CS-137	4.9413E+02	4.9571E+02	9.7067E-01%	5.5048E+00%	1.546E+00
Y-898	1.1068E+03	1.5368E+03	5.5998E-01%	5.2700E+00%	2.060E+00
Co-1173	7.2103E+02	7.3426E+02	7.3930E-01%	5.1737E+00%	1.291E+00
Co-1332	7.1954E+02	7.3274E+02	7.5054E-01%	5.3042E+00%	1.252E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/21/2013 11:53:06
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20130220002_EffCal.An1

 Y-1836       1.1684E+03    1.6224E+03   6.0644E-01%   7.8506E+00% 1.378E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2041.6 keV)     3.827E+04  GPS/Source
 Total Decayed Activity (   25.1 to  2041.6 keV) 4.1915930E+04  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/21/2013 16:01:47
Curtis & Tompkins HPS Lab       Spectrum name: 7_20130221002_EffVerif.An1

Sample description
     RICV|S20633|Efficiency Verification


Spectrum Filename: C:\User\SPC\Det7\7_20130221002_EffVerif.An1

Acquisition information
       Start time:                 2/21/2013 12:59:09
       Live time:              10800
       Real time:              10942
       Dead time:                  1.30 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_Soil 250ml TunaCan_02-20-2013.Clb
     HPGE07 S21603 7_20130220002_EffCal


       Energy Calibration
            Created:               2/21/2013 12:07:04
            Zero offset:          -0.036 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.315E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 11:46:56
            Type:                  Polynomial
            Uncertainty:           0.984 %
            Coefficients:         -0.343951  -4.203033   0.485929
                                  -0.062075   0.002900  -0.000060

Library Files
       Main analysis library:      EfficiencyVerification.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    24.98keV )
       Stop channel:           16336 (  2041.76keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 16:01:47
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0530

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
30.66	5119.	3.54	1.11	0.000E+00				
46.34	11034.	2.80	0.80	1.477E-03	46.54	100.000	6.512E+02	Pb210
59.39	44403.	0.91	0.83	9.937E-03	59.54	100.000	4.092E+02	AM241
87.96	137807.	0.40	0.84	3.108E-02	88.03	100.000	5.832E+02	CD109
122.04	78523.	0.54	0.88	4.480E-02	122.06	100.000	2.956E+02	CO57
136.48	10434.	1.82	0.90	4.717E-02				
165.86	65537.	0.61	0.93	4.830E-02	165.85	100.000	4.108E+02	Ce139
238.50	1444.	13.23	0.66	4.312E-02				
255.02	2118.	8.99	1.01	4.162E-02				
279.19	11457.	2.64	1.07	3.950E-02	279.17	100.000	8.869E+02	Hg203
351.67	1216.	13.48	1.16	3.400E-02				
391.72	48006.	0.67	1.14	3.155E-02	391.71	100.000	5.806E+02	SN113
513.99	25361.	1.19	1.26	2.602E-02	513.99	100.000	1.115E+03	Sr85
583.28	800.	18.48	0.75	2.378E-02				
609.14	921.	14.80	1.17	2.306E-02				
661.69	87018.	0.37	1.38	2.175E-02	661.66	100.000	3.760E+02	CS137
897.99	56239.	0.58	1.64	1.753E-02	898.02	100.000	1.371E+03	Y898
1173.26	99024.	0.38	1.87	1.447E-02	1173.23	100.000	6.897E+02	Co1173
1325.10	667.	18.80	1.92	1.322E-02				
1332.58	90688.	0.38	1.98	1.316E-02	1332.51	100.000	6.944E+02	Co1332
1460.96	939.	12.44	1.41	1.226E-02				
1836.13	36979.	0.57	2.35	1.017E-02	1836.01	100.000	1.553E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 16:01:47
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221002_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
245.37	30.66	9576.	5119.	0.000E+00	7.09	1.111	-	s
1091.38	136.48	15492.	10558.	2.238E+05	4.99	0.874	-	
1907.11	238.50	10028.	1444.	3.350E+04	26.47	0.661	-	s
2039.18	255.02	9487.	2118.	5.087E+04	17.99	1.010	-	s
2812.01	351.67	6751.	1216.	3.577E+04	26.96	1.159	-	s
4664.26	583.28	4686.	800.	3.366E+04	36.96	0.747	-	s
4871.09	609.14	4205.	921.	3.995E+04	29.59	1.169	-	
10599.07	1325.10	2279.	667.	5.045E+04	37.59	1.920	-	sM
11686.38	1460.96	1569.	939.	7.656E+04	24.89	1.410	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	370.78	46.34	22907.	11034.	1.022	5.61	0.800
AM-241	475.07	59.39	28342.	44403.	4.111	1.82	0.831
CD-109	703.47	87.96	37548.	137807.	12.760	0.81	0.840
CO-57	975.96	122.04	23171.	78523.	7.271	1.08	0.883
Ce-139	1326.28	165.86	19163.	65537.	6.068	1.21	0.935
Hg-203	2232.46	279.19	14329.	11457.	1.061	5.29	1.075
SN-113	3132.24	391.72	9936.	48006.	4.445	1.33	1.145
Sr-85	4110.28	514.02	7950.	24595.	2.277	2.08	1.254
CS-137	5291.09	661.65	6985.	90199.	8.352	0.81	1.429
Y-898	7181.63	897.99	7081.	56239.	5.207	1.17	1.641
Co-1173	9384.04	1173.26	4805.	98916.	9.159	0.76	1.865
Co-1332	10658.96	1332.58	2820.	90688.	8.397	0.75	1.977
Y-1836	14689.56	1836.13	753.	36922.	3.419	1.15	2.354

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 16:01:47
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221002_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source	COMMENTS
Pb-210		6.5117E+02				8.12E+03	
			46.54	6.512E+02	(	2.081E+01 2.80E+00 1.00E+02	G
AM-241		4.0924E+02				1.58E+05	
			59.54	4.092E+02	(	3.615E+00 9.10E-01 1.00E+02	G
CD-109		5.8323E+02				4.63E+02	
			88.03	5.832E+02	(	1.911E+00 4.04E-01 1.00E+02	G
CO-57		2.9563E+02				2.72E+02	
			122.06	2.956E+02	(	1.335E+00 5.41E-01 1.00E+02	G
Ce-139		4.1077E+02				1.38E+02	
			165.85	4.108E+02	(	2.022E+00 6.06E-01 1.00E+02	G
Hg-203		8.8691E+02				4.66E+01	
			279.17	8.869E+02	(	2.159E+01 2.64E+00 1.00E+02	G
SN-113		5.8060E+02				1.15E+02	
			391.71	5.806E+02	(	2.809E+00 6.67E-01 1.00E+02	G
Sr-85		1.0812E+03				6.48E+01	
			513.99	1.081E+03	(	9.133E+00 1.04E+00 1.00E+02	G
CS-137		3.8979E+02				1.10E+04	
			661.66	3.898E+02	(	8.416E-01 4.06E-01 1.00E+02	G
Y-898		1.3707E+03				1.07E+02	
			898.02	1.371E+03	(	4.779E+00 5.84E-01 1.00E+02	G
Co-1173		6.8892E+02				1.92E+03	
			1173.23	6.889E+02	(	1.125E+00 3.82E-01 1.00E+02	G
Co-1332		6.9436E+02				1.92E+03	
			1332.51	6.944E+02	(	9.474E-01 3.75E-01 1.00E+02	G
Y-1836		1.5503E+03				1.07E+02	
			1836.01	1.550E+03	(	2.685E+00 5.73E-01 1.00E+02	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 16:01:47
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221002_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.3822E+02	6.5117E+02	5.6098E+00%	1.1356E+01%	2.081E+01
AM-241	4.0882E+02	4.0924E+02	1.8210E+00%	8.0918E+00%	3.615E+00
CD-109	4.1002E+02	5.8323E+02	8.0874E-01%	8.2996E+00%	1.911E+00
CO-57	1.6229E+02	2.9563E+02	1.0820E+00%	6.6702E+00%	1.335E+00
Ce-139	1.2564E+02	4.1077E+02	1.2112E+00%	6.3157E+00%	2.022E+00
Hg-203	2.6857E+01	8.8691E+02	5.2862E+00%	7.9373E+00%	2.159E+01
SN-113	1.4087E+02	5.8060E+02	1.3348E+00%	5.2970E+00%	2.809E+00
Sr-85	8.7522E+01	1.0812E+03	2.0754E+00%	5.4802E+00%	9.133E+00
CS-137	3.8405E+02	3.8979E+02	8.1230E-01%	5.4791E+00%	8.416E-01
Y-898	2.9706E+02	1.3707E+03	1.1683E+00%	5.3688E+00%	4.779E+00
Co-1173	6.3298E+02	6.8892E+02	7.6493E-01%	5.1774E+00%	1.125E+00
Co-1332	6.3798E+02	6.9436E+02	7.5044E-01%	5.3042E+00%	9.474E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/21/2013 16:01:47
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20130221002_EffVerif.An1

 Y-1836       3.3599E+02    1.5503E+03   1.1450E+00%   7.9104E+00% 2.685E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.8 keV)     4.288E+03  GPS/Source
 Total Decayed Activity (   25.0 to  2041.8 keV) 9.5927852E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 7_Soil 250ml TunaCan_02-20-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:13:44
Efficiency Calibration Date: 2/21/2013 Time: 11:46:56

Calibration Description:
HPGE07 S21603 7_20130220002_EffCal

Energy Calibration Fit
Energy = 0.0018 +0.125050*Channel -5.8167e-009*Channel**2
FWHM (ch) = 6.0510 +0.001094*Channel -1.81268e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.97	121.78	121.79	-0.01%	0.88	0.89	-0.79%
1956.74	244.67	244.67	0.00%	1.01	1.02	-0.80%
2753.51	344.30	344.28	0.00%	1.14	1.12	1.92%
6230.48	778.90	778.90	0.00%	1.52	1.52	-0.04%
7711.81	964.00	964.02	-0.00%	1.67	1.68	-0.60%
11266.01	1408.08	1408.07	0.00%	2.01	2.01	0.19%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9839 %
Coefficients:
-0.343951 -4.203033 0.485929 -0.062075 0.002900 -0.000060

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.6038E-003	1.6008E-003	0.18%
59.54	9.9934E-003	1.0057E-002	-0.63%
88.03	3.2047E-002	3.1120E-002	2.89%
122.06	4.4340E-002	4.4801E-002	-1.04%
165.85	4.7374E-002	4.8299E-002	-1.95%
279.17	3.9550E-002	3.9499E-002	0.13%
391.71	3.1861E-002	3.1553E-002	0.97%
513.99	2.6504E-002	2.6020E-002	1.83%
661.66	2.2272E-002	2.1747E-002	2.36%
898.02	1.7022E-002	1.7530E-002	-2.98%
1173.23	1.4213E-002	1.4469E-002	-1.81%
1332.51	1.2880E-002	1.3162E-002	-2.19%
1836.01	1.0445E-002	1.0175E-002	2.58%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	15094.00	641.50	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1187.50	426.30	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15909.00	574.30	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	363.55	311.20	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	544.93	435.40	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1084.50	883.90	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	947.66	606.50	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1166.10	1116.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	473.09	402.60	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1583.80	1484.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	748.72	748.50	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	748.77	748.70	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1583.70	1571.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/7/2013 12:05:45
Curtis & Tompkins HPS Lab       Spectrum name: 8_20130407001_Energy.An1

Sample description
     RICAL,S19585,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\8_20130407001_Energy.An1

Acquisition information
       Start time:                 4/7/2013 11:48:19
       Live time:                600
       Real time:                674
       Dead time:                 10.97 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_QC.Clb
     HPGE08 S19585 8_20130407001_Energy


       Energy Calibration
            Created:               4/7/2013 12:04:13
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.072E-10 keV/channel^2

       Efficiency Calibration
            Created:               4/7/2013 12:02:30
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.02keV )
       Stop channel:           16336 (  2042.12keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 12:05:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0267

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.94	1791.	5.08	0.80	1.462E-02				
45.34	1775.	4.54	0.81	1.453E-02				
46.94	443.	16.72	0.81	1.450E-02				
121.78	75226.	0.42	0.86	1.323E-02	121.78	29.240	1.000E+00	QA122
244.71	16518.	0.99	0.99	1.116E-02	244.67	7.616	1.000E+00	Qa245
295.93	894.	8.64	1.00	9.947E-03				
344.24	46228.	0.52	1.07	8.808E-03	344.30	27.000	1.000E+00	Qa344
367.61	1639.	5.75	1.18	8.595E-03				
411.09	3407.	2.53	1.14	8.200E-03				
443.94	4483.	2.11	1.13	7.901E-03				
488.78	643.	10.51	1.33	7.493E-03				
564.15	770.	12.18	1.07	6.808E-03				
586.32	514.	8.80	1.26	6.608E-03				
674.53	237.	17.54	1.32	5.803E-03				
678.61	483.	9.04	1.33	5.766E-03				
688.66	1046.	7.15	1.31	5.676E-03				
719.32	490.	16.39	1.56	5.397E-03				
778.86	12263.	1.15	1.41	4.856E-03	778.90	12.990	1.000E+00	Qa779
810.51	370.	11.05	1.43	4.735E-03				
867.37	3639.	2.96	1.40	4.519E-03				
919.39	349.	10.70	1.51	4.321E-03				
963.96	11766.	1.09	1.54	4.151E-03	964.00	14.580	1.000E+00	Qa964
1005.24	638.	6.63	1.16	4.052E-03				
1085.82	7388.	1.27	1.63	3.859E-03				
1089.76	1245.	4.03	1.63	3.850E-03				
1112.00	10192.	1.13	1.68	3.796E-03				
1212.89	989.	5.95	1.61	3.554E-03				

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 12:05:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1299.25	1094.	3.86	1.54	3.347E-03				
1408.05	12727.	0.92	1.85	3.087E-03	1408.08	21.210	1.000E+00	Qa1408

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.77	39.87	3797.	2254.	1.542E+05	11.46	1.195	-	s
362.46	45.28	2404.	1731.	1.192E+05	9.34	0.808	-	D
375.29	46.88	2517.	442.	3.050E+04	33.47	0.810	-	D
2366.95	295.93	1269.	894.	8.987E+04	17.29	1.002	-	
2940.39	367.61	1274.	1639.	1.907E+05	11.51	1.181	-	s
3288.17	411.09	889.	3407.	4.155E+05	5.05	1.139	-	
3550.94	443.94	931.	4483.	5.674E+05	4.22	1.125	-	
3909.68	488.78	853.	643.	8.578E+04	21.03	1.329	-	
4512.56	564.15	1382.	770.	1.130E+05	24.36	1.074	-	
4688.62	586.16	859.	605.	9.159E+04	22.72	1.301	-	s
5429.29	678.75	783.	512.	8.883E+04	25.51	0.996	-	s
5508.54	688.66	840.	1046.	1.842E+05	14.29	1.314	-	
5753.82	719.32	1027.	490.	9.075E+04	32.79	1.564	-	
6484.01	810.60	744.	434.	9.174E+04	30.71	0.955	-	s
6938.11	867.37	1140.	3639.	8.053E+05	5.92	1.399	-	
7354.73	919.45	610.	410.	9.499E+04	30.61	1.142	-	s
8041.02	1005.24	256.	638.	1.573E+05	13.26	1.158	-	s
8685.13	1085.76	874.	7408.	1.919E+06	3.09	1.535	-	
8716.60	1089.69	727.	978.	2.541E+05	14.53	1.369	-	D
8895.04	1112.00	467.	10192.	2.685E+06	2.27	1.683	-	
9702.16	1212.89	354.	989.	2.782E+05	11.91	1.608	-	
10393.02	1299.25	85.	1094.	3.268E+05	7.72	1.538	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.97	121.78	5058.	75226.	125.377	0.84	0.865
Qa-245	1957.25	244.71	2285.	16518.	27.530	1.97	0.989
Qa-344	2753.47	344.24	1993.	46228.	77.047	1.04	1.070
Qa-779	6230.09	778.86	1102.	12263.	20.438	2.29	1.409

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/7/2013 12:05:45
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20130407001_Energy.An1

 Nuclide  Channel   Energy  Background  Net area  Cnts/sec   Uncert   FWHM
 Qa-964   7710.86   963.96       648.     11766.    19.610     2.17   1.541
 Qa-1408 11263.50  1408.06       175.     12666.    21.110     1.88   1.852

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             uCi           keV     uCi           uCi            COMMENTS
 ____________________________________________________________________________

QA-122       1.0000E+00                                        4.64E+03
                            121.78 1.000E+00  (  2.203E-03 4.19E-01 2.92E+01 G

Qa-245       1.0000E+00                                        4.64E+03
                            244.67 1.000E+00  (  6.742E-03 9.87E-01 7.62E+00 G

Qa-344       1.0000E+00                                        4.64E+03
                            344.30 1.000E+00  (  2.250E-03 5.19E-01 2.70E+01 G

Qa-779       1.0000E+00                                        4.64E+03
                            778.90 1.000E+00  (  6.307E-03 1.15E+00 1.30E+01 G

Qa-964       1.0000E+00                                        4.64E+03
                            964.00 1.000E+00  (  5.041E-03 1.09E+00 1.46E+01 G

Qa-1408      9.9516E-01                                        4.64E+03
                           1408.08 9.952E-01  (  2.423E-03 9.38E-01 2.12E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
```

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 12:05:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407001_Energy.An1

to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.7574E-01	1.0000E+00	8.3865E-03	1.1447E-01	2.203E-03
Qa-245	8.7574E-01	1.0000E+00	1.9737E-02	1.1586E-01	6.742E-03
Qa-344	8.7574E-01	1.0000E+00	1.0382E-02	1.1464E-01	2.250E-03
Qa-779	8.7574E-01	1.0000E+00	2.2924E-02	1.1644E-01	6.307E-03
Qa-964	8.7574E-01	1.0000E+00	2.1703E-02	1.1621E-01	5.041E-03
Qa-1408	8.7150E-01	9.9516E-01	1.8673E-02	1.1514E-01	2.423E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (50.9 to 2042.1 keV) 5.250E+00 uCi
Total Decayed Activity (50.9 to 2042.1 keV) 5.9951825E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 8_Soil 250ml TunaCan_04-07-2013.Clb
Energy Calibration Date: 1/6/2014 Time: 07:47:05
Efficiency Calibration Date: 4/8/2013 Time: 11:06:59

Calibration Description:
HPGE08 S22147 8_20130407002_EffCal

Energy Calibration Fit
Energy = -0.0094 +0.125031*Channel -1.73782e-009*Channel**2
FWHM (ch) = 6.0128 +0.000945*Channel -1.2954e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.06	121.78	121.78	0.00%	0.86	0.87	-0.97%
1957.28	244.67	244.71	-0.01%	0.99	0.98	1.22%
2753.58	344.30	344.26	0.01%	1.07	1.06	0.05%
6230.19	778.90	778.89	0.00%	1.41	1.42	-0.88%
7711.13	964.00	964.02	-0.00%	1.57	1.57	0.56%
11263.61	1408.08	1408.07	0.00%	1.88	1.88	-0.03%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3437 %
Coefficients:
-0.359632 -4.215465 0.446712 -0.054338 0.002307 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.1480E-003	1.1459E-003	0.18%
59.54	7.8461E-003	7.8963E-003	-0.64%
88.03	2.8793E-002	2.7907E-002	3.07%
122.06	4.0568E-002	4.1250E-002	-1.68%
165.85	4.4022E-002	4.4468E-002	-1.01%
279.17	3.6126E-002	3.6350E-002	-0.62%
391.71	2.9368E-002	2.9198E-002	0.58%
513.99	2.4752E-002	2.4220E-002	2.15%
661.66	2.1181E-002	2.0350E-002	3.92%
898.02	1.5779E-002	1.6486E-002	-4.48%
1173.23	1.3373E-002	1.3640E-002	-2.00%
1332.51	1.2187E-002	1.2412E-002	-1.85%
1836.01	9.8414E-003	9.5788E-003	2.67%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14139.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1112.50	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	14903.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	340.54	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1016.00	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	887.81	568.20	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1093.00	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	443.24	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1483.50	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	701.41	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	701.37	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1482.90	1471.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/7/2013 15:54:54
Curtis & Tompkins HPS Lab       Spectrum name: 8_20130407002_EffCal.An1

Sample description
     RICAL |S22147| TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\8_20130407002_EffCal.An1

Acquisition information
       Start time:                 4/7/2013 12:44:57
       Live time:              10800
       Real time:              11390
       Dead time:                  5.18 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_12-29-2012.Clb
     HPGE08 S21306 8_20121228002_EffCal


       Energy Calibration
            Created:               4/7/2013 11:59:40
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.618E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 10:35:14
            Type:                  Polynomial
            Uncertainty:           1.208 %
            Coefficients:         -0.385856  -4.162519   0.423320
                                  -0.049895   0.001979  -0.000038

Library Files
       Main analysis library:      EfficiencyCalibration.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.06keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 15:54:54
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0491

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.45	7389.	3.78	0.80	1.216E-03	46.54	4.250	1.288E+04	Pb210
59.45	32540.	1.33	0.78	7.915E-03	59.54	35.900	1.052E+03	AM241
70.80	1630.	14.53	0.83	1.627E-02				
72.86	3034.	7.96	0.83	1.782E-02				
87.98	144430.	0.45	0.83	2.827E-02	88.03	3.610	1.512E+04	CD109
122.03	99817.	0.54	0.85	4.178E-02	122.06	85.600	3.302E+02	CO57
136.49	13709.	2.37	0.91	4.396E-02				
165.84	119437.	0.44	0.90	4.483E-02	165.85	79.900	5.012E+02	Ce139
238.70	1334.	17.19	0.69	3.983E-02				
255.17	4435.	5.55	1.04	3.846E-02				
279.21	77238.	0.54	1.03	3.653E-02	279.17	81.500	1.004E+03	Hg203
351.85	1324.	18.62	1.04	3.158E-02				
391.67	100719.	0.44	1.13	2.940E-02	391.71	64.000	8.845E+02	SN113
510.33	1796.	7.73	1.19	2.455E-02				
514.02	98244.	0.35	1.20	2.443E-02	513.99	95.700	1.088E+03	Sr85
609.33	975.	18.96	0.60	2.174E-02				
661.67	85762.	0.47	1.35	2.054E-02	661.66	85.100	4.571E+02	CS137
814.11	1182.	13.84	1.23	1.780E-02				
898.04	128722.	0.34	1.56	1.663E-02	898.02	93.700	1.430E+03	Y898
1173.26	97821.	0.38	1.75	1.371E-02	1173.23	99.970	6.840E+02	Co1173
1325.02	2252.	6.97	1.73	1.250E-02				
1332.60	89161.	0.40	1.86	1.245E-02	1332.51	99.990	6.867E+02	Co1332
1460.96	1054.	12.76	1.54	1.157E-02				
1836.32	83556.	0.38	2.16	9.514E-03	1836.01	99.200	1.532E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 15:54:54
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
582.53	72.83	26574.	2705.	1.518E+05	21.23	0.708	-	D
1091.65	136.49	25615.	13709.	3.118E+05	4.75	0.906	-	
1909.16	238.70	15546.	1334.	3.350E+04	34.39	0.690	-	s
2040.91	255.17	15579.	4435.	1.153E+05	11.09	1.044	-	
2814.22	351.85	13216.	1324.	4.193E+04	37.25	1.037	-	s
4081.87	510.31	8726.	1796.	-7.854E+03	15.45	1.193	-	D
4873.77	609.33	7067.	975.	4.486E+04	37.93	0.603	-	s
6511.88	814.11	5222.	1182.	6.639E+04	27.69	1.228	-	
10599.04	1325.02	3340.	2252.	1.801E+05	13.94	1.735	-	s
11686.69	1460.96	2466.	1054.	9.107E+04	25.51	1.542	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibration.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.52	46.45	22840.	7389.	0.684	7.57	0.802
AM-241	475.47	59.45	36650.	32540.	3.013	2.65	0.779
CD-109	703.71	87.98	56343.	144430.	13.373	0.90	0.829
CO-57	976.02	122.03	40752.	99817.	9.242	1.07	0.848
Ce-139	1326.44	165.84	33512.	119437.	11.059	0.89	0.903
Hg-203	2233.19	279.21	19566.	77238.	7.152	1.07	1.031
SN-113	3132.75	391.67	16268.	100719.	9.326	0.88	1.133
Sr-85	4111.25	514.00	13547.	99795.	9.240	0.84	1.252
CS-137	5292.46	661.67	11676.	85762.	7.941	0.94	1.351
Y-898	7183.28	898.04	8467.	128722.	11.919	0.68	1.561
Co-1173	9385.03	1173.27	5258.	97697.	9.046	0.76	1.746
Co-1332	10659.69	1332.60	4233.	89161.	8.256	0.79	1.857
Y-1836	14689.83	1836.32	1582.	83556.	7.737	0.76	2.164

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 15:54:54
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source	COMMENTS
Pb-210		1.2885E+04				8.12E+03	
			46.54	1.288E+04	(	6.140E+02 3.78E+00 4.25E+00	G
AM-241		1.0524E+03				1.58E+05	
			59.54	1.052E+03	(	1.443E+01 1.33E+00 3.59E+01	G
CD-109		1.5119E+04				4.63E+02	
			88.03	1.512E+04	(	5.790E+01 4.49E-01 3.61E+00	G
CO-57		3.3021E+02				2.72E+02	
			122.06	3.302E+02	(	1.556E+00 5.37E-01 8.56E+01	G
Ce-139		5.0120E+02				1.38E+02	
			165.85	5.012E+02	(	1.790E+00 4.43E-01 7.99E+01	G
Hg-203		1.0036E+03				4.66E+01	
			279.17	1.004E+03	(	4.235E+00 5.36E-01 8.15E+01	G
SN-113		8.8447E+02				1.15E+02	
			391.71	8.845E+02	(	2.610E+00 4.40E-01 6.40E+01	G
Sr-85		1.1049E+03				6.48E+01	
			513.99	1.105E+03	(	3.003E+00 4.20E-01 9.57E+01	G
CS-137		4.5706E+02				1.10E+04	
			661.66	4.571E+02	(	1.342E+00 4.71E-01 8.51E+01	G
Y-898		1.4297E+03				1.07E+02	
			898.02	1.430E+03	(	2.381E+00 3.38E-01 9.37E+01	G
Co-1173		6.8314E+02				1.92E+03	
			1173.23	6.831E+02	(	1.181E+00 3.82E-01 1.00E+02	G
Co-1332		6.8669E+02				1.92E+03	
			1332.51	6.867E+02	(	1.168E+00 3.97E-01 1.00E+02	G
Y-1836		1.5317E+03				1.07E+02	
			1836.01	1.532E+03	(	1.699E+00 3.78E-01 9.92E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 4/7/2013 15:54:54
Curtis & Tompkins HPS Lab Spectrum name: 8_20130407002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	1.2780E+04	1.2885E+04	7.5684E+00%	1.2440E+01%	6.140E+02
AM-241	1.0520E+03	1.0524E+03	2.6541E+00%	8.3190E+00%	1.443E+01
CD-109	1.3090E+04	1.5119E+04	8.9797E-01%	8.3088E+00%	5.790E+01
CO-57	2.5840E+02	3.3021E+02	1.0739E+00%	6.6689E+00%	1.556E+00
Ce-139	3.0878E+02	5.0120E+02	8.8654E-01%	6.2615E+00%	1.790E+00
Hg-203	2.4017E+02	1.0036E+03	1.0713E+00%	6.0170E+00%	4.235E+00
SN-113	4.9568E+02	8.8447E+02	8.8069E-01%	5.2012E+00%	2.610E+00
Sr-85	3.9529E+02	1.1049E+03	8.3995E-01%	5.1411E+00%	3.003E+00
CS-137	4.5430E+02	4.5706E+02	9.4101E-01%	5.4997E+00%	1.342E+00
Y-898	7.6510E+02	1.4297E+03	6.7518E-01%	5.2835E+00%	2.381E+00
Co-1173	6.5989E+02	6.8314E+02	7.6387E-01%	5.1773E+00%	1.181E+00
Co-1332	6.6332E+02	6.8669E+02	7.9486E-01%	5.3107E+00%	1.168E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/7/2013 15:54:54
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20130407002_EffCal.An1

 Y-1836       8.1965E+02    1.5317E+03   7.5578E-01%   7.8635E+00% 1.699E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2042.1 keV)     3.198E+04  GPS/Source
 Total Decayed Activity (   25.0 to  2042.1 keV) 3.7669051E+04  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins Hunters Point Lab

Sample Description: RICV
Detector: HPGE08 50-TP42229A
Spectrum: 8_20130408002_EffVerif

Source Date: 7/1/2012 09:00
Acquired: 4/8/2013 11:41:33
Report Date: 4/8/2013 14:58

Analyst: Philip Smith
Reviewer:
Review Date:

Efficiency: HPGE08 S22147 8_20130407002_EffCal
Library: EfficiencyVerification.lib

Nuclide	Activity GPS	Uncertainty %
Pb-210	6.396E+02	12.14
AM-241	4.180E+02	8.23
CD-109	5.868E+02	8.31
CO-57	3.020E+02	6.71
Ce-139	4.313E+02	6.38
Hg-203	9.480E+02	8.55
SN-113	5.973E+02	5.38
Sr-85	1.099E+03	6.06
CS-137	3.973E+02	5.49
Y-898	1.409E+03	5.44
Co-1173	6.992E+02	5.18
Co-1332	7.058E+02	5.31
Y-1836	1.570E+03	7.95
Total	9.804E+03	

Curtis & Tompkins HPS Lab Spectrum name: 8_20130408002_EffVerif.An1

Sample description
RICV |S20633| EFF VERIFICATION

Spectrum Filename: C:\User\SPC\Det8\8_20130408002_EffVerif.An1

Acquisition information
Start time: 4/8/2013 11:41:33
Live time: 10800
Real time: 11142
Dead time: 3.07 %
Detector ID: 8

Detector system
HPGE08 50-TP42229A

Calibration
Filename: 8_Soil 250ml TunaCan_04-07-2013.Clb
HPGE08 S22147 8_20130407002_EffCal

Energy Calibration
Created: 4/8/2013 11:25:28
Zero offset: 0.020 keV
Gain: 0.125 keV/channel
Quadratic: -1.209E-09 keV/channel^2

Efficiency Calibration
Created: 4/8/2013 11:06:59
Type: Polynomial
Uncertainty: 1.344 %
Coefficients: -0.359632 -4.215465 0.446712
-0.054338 0.002307 -0.000047

Library Files
Main analysis library: EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.26
Start channel: 200 (25.02keV)
Stop channel: 16336 (2042.08keV)
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00
Activity scaling factor: 1.0000E+00/(1.0000E+00* 1.0000E+00) =
1.0000E+00
Detection limit method: Critical level - ORTEC method
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00
Fraction Limit: 0.000%
Background width: average of five points.
Half lives decay limit: 12.000

Curtis & Tompkins HPS Lab Spectrum name: 8_20130408002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0464

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS	Nuc
46.44	7728.	3.54	0.84	1.095E-03	46.54	100.000	6.396E+02	Pb210
59.44	35601.	1.17	0.81	7.828E-03	59.54	100.000	4.180E+02	AM241
88.00	116075.	0.45	0.82	2.789E-02	88.03	100.000	5.868E+02	CD109
122.04	65680.	0.65	0.87	4.125E-02	122.06	100.000	3.020E+02	CO57
136.47	8879.	3.19	0.87	4.348E-02				
165.85	50261.	0.76	0.91	4.447E-02	165.85	100.000	4.313E+02	Ce139
238.63	1568.	10.34	0.99	3.963E-02				
255.23	1493.	12.55	1.00	3.826E-02				
279.21	5691.	3.08	1.08	3.635E-02	279.17	100.000	9.480E+02	Hg203
295.24	773.	14.34	1.02	3.514E-02				
351.87	1044.	14.13	0.53	3.138E-02				
391.68	34654.	0.82	1.13	2.920E-02	391.71	100.000	5.973E+02	SN113
510.35	964.	10.56	1.19	2.434E-02				
514.02	14642.	1.06	1.20	2.422E-02	513.99	100.000	1.130E+03	Sr85
582.99	739.	19.81	0.49	2.220E-02				
609.28	822.	17.72	0.70	2.154E-02				
661.66	85788.	0.43	1.35	2.035E-02	661.66	100.000	3.973E+02	CS137
898.08	38997.	0.57	1.52	1.649E-02	898.02	100.000	1.362E+03	Y898
1173.26	93202.	0.39	1.76	1.364E-02	1173.23	100.000	7.001E+02	Co1173
1332.59	85500.	0.38	1.85	1.241E-02	1332.51	100.000	7.058E+02	Co1332
1460.99	937.	9.64	1.80	1.156E-02				
1836.33	26202.	0.69	2.19	9.577E-03	1836.01	100.000	1.576E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1091.43	136.47	16245.	8879.	2.042E+05	6.39	0.874	-	
1908.55	238.63	7722.	1568.	3.956E+04	20.68	0.988	-	
2041.30	255.23	8848.	1493.	3.902E+04	25.10	1.002	-	
2361.45	295.25	5542.	726.	2.067E+04	37.42	0.583	-	s
2814.34	351.87	5597.	1044.	3.326E+04	28.26	0.527	-	s
4663.11	582.99	4399.	739.	3.327E+04	39.62	0.490	-	s
4873.38	609.28	4344.	822.	3.817E+04	35.45	0.700	-	s
11686.85	1460.99	962.	937.	8.103E+04	19.27	1.799	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.27	46.44	18587.	7728.	0.716	7.07	0.840
AM-241	475.27	59.44	28838.	35601.	3.296	2.34	0.812
CD-109	703.69	88.00	33233.	116075.	10.748	0.90	0.825
CO-57	976.00	122.04	23336.	65680.	6.081	1.30	0.866
Ce-139	1326.41	165.85	18026.	50261.	4.654	1.52	0.907
Hg-203	2233.15	279.21	6968.	5691.	0.527	6.17	1.082
SN-113	3132.78	391.68	8677.	34654.	3.209	1.65	1.134
Sr-85	4111.32	514.01	7434.	14244.	1.319	3.32	1.216
CS-137	5292.41	661.66	7254.	85788.	7.943	0.86	1.347
Y-898	7183.35	898.05	6256.	40337.	3.735	1.45	1.501
Co-1173	9385.04	1173.27	4196.	93092.	8.620	0.78	1.761
Co-1332	10659.66	1332.59	2406.	85500.	7.917	0.77	1.850
Y-1836	14689.84	1836.34	624.	26110.	2.418	1.39	2.193

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS	Peak Energy keV	Peak Activity GPS	Code	MDA Value GPS		COMMENTS
Pb-210		6.3957E+02					8.12E+03	
			46.54	6.396E+02	(	2.629E+01	3.54E+00	1.00E+02 G
AM-241		4.1797E+02					1.58E+05	
			59.54	4.180E+02	(	4.645E+00	1.17E+00	1.00E+02 G
CD-109		5.8684E+02					4.63E+02	
			88.03	5.868E+02	(	2.147E+00	4.50E-01	1.00E+02 G
CO-57		3.0195E+02					2.72E+02	
			122.06	3.020E+02	(	1.636E+00	6.50E-01	1.00E+02 G
Ce-139		4.3128E+02					1.38E+02	
			165.85	4.313E+02	(	2.684E+00	7.60E-01	1.00E+02 G
Hg-203		9.4803E+02					4.66E+01	
			279.17	9.480E+02	(	3.240E+01	3.08E+00	1.00E+02 G
SN-113		5.9730E+02					1.15E+02	
			391.71	5.973E+02	(	3.741E+00	8.24E-01	1.00E+02 G
Sr-85		1.0994E+03					6.48E+01	
			513.99	1.099E+03	(	1.550E+01	1.66E+00	1.00E+02 G
CS-137		3.9732E+02					1.10E+04	
			661.66	3.973E+02	(	9.191E-01	4.31E-01	1.00E+02 G
Y-898		1.4093E+03					1.07E+02	
			898.02	1.409E+03	(	6.439E+00	7.24E-01	1.00E+02 G
Co-1173		6.9924E+02					1.92E+03	
			1173.23	6.992E+02	(	1.134E+00	3.89E-01	1.00E+02 G
Co-1332		7.0577E+02					1.92E+03	
			1332.51	7.058E+02	(	9.433E-01	3.85E-01	1.00E+02 G
Y-1836		1.5701E+03					1.07E+02	
			1836.01	1.570E+03	(	3.499E+00	6.95E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS	Time Corrected Activity GPS	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.2441E+02	6.3957E+02	7.0709E+00%	1.2144E+01%	2.629E+01
AM-241	4.1746E+02	4.1797E+02	2.3436E+00%	8.2252E+00%	4.645E+00
CD-109	3.8512E+02	5.8684E+02	8.9907E-01%	8.3089E+00%	2.147E+00
CO-57	1.4743E+02	3.0195E+02	1.3004E+00%	6.7091E+00%	1.636E+00
Ce-139	1.0466E+02	4.3128E+02	1.5194E+00%	6.3819E+00%	2.684E+00
Hg-203	1.4497E+01	9.4803E+02	6.1652E+00%	8.5478E+00%	3.240E+01
SN-113	1.0990E+02	5.9730E+02	1.6477E+00%	5.3844E+00%	3.741E+00
Sr-85	5.4455E+01	1.0994E+03	3.3188E+00%	6.0613E+00%	1.550E+01
CS-137	3.9034E+02	3.9732E+02	8.6154E-01%	5.4866E+00%	9.191E-01
Y-898	2.2655E+02	1.4093E+03	1.4488E+00%	5.4368E+00%	6.439E+00
Co-1173	6.3192E+02	6.9924E+02	7.7841E-01%	5.1794E+00%	1.134E+00
Co-1332	6.3782E+02	7.0577E+02	7.6998E-01%	5.3070E+00%	9.433E-01

Y-1836	2.5239E+02	1.5701E+03	1.3895E+00%	7.9495E+00%	3.499E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2042.1 keV) 3.997E+03 GPS
Total Decayed Activity (25.0 to 2042.1 keV) 9.8040332E+03 GPS

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/8/2013 14:58:45
Curtis & Tompkins HPS Lab       Spectrum name: 8_20130408002_EffVerif.An1

Sample description
     RICV |S20633| EFF VERIFICATION


Spectrum Filename: C:\User\SPC\Det8\8_20130408002_EffVerif.An1

Acquisition information
       Start time:                 4/8/2013 11:41:33
       Live time:              10800
       Real time:              11142
       Dead time:                  3.07 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_Soil 250ml TunaCan_04-07-2013.Clb
     HPGE08 S22147 8_20130407002_EffCal


       Energy Calibration
            Created:               4/8/2013 11:25:28
            Zero offset:           0.020 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.209E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/8/2013 11:06:59
            Type:                  Polynomial
            Uncertainty:           1.344 %
            Coefficients:         -0.359632  -4.215465   0.446712
                                  -0.054338   0.002307  -0.000047

Library Files
       Main analysis library:      EfficiencyVerification.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.02keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 14:58:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0464

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS	Nuc
46.44	7728.	3.54	0.84	1.095E-03	46.54	100.000	6.396E+02	Pb210
59.44	35601.	1.17	0.81	7.828E-03	59.54	100.000	4.180E+02	AM241
88.00	116075.	0.45	0.82	2.789E-02	88.03	100.000	5.868E+02	CD109
122.04	65680.	0.65	0.87	4.125E-02	122.06	100.000	3.020E+02	CO57
136.47	8879.	3.19	0.87	4.348E-02				
165.85	50261.	0.76	0.91	4.447E-02	165.85	100.000	4.313E+02	Ce139
238.63	1568.	10.34	0.99	3.963E-02				
255.23	1493.	12.55	1.00	3.826E-02				
279.21	5691.	3.08	1.08	3.635E-02	279.17	100.000	9.480E+02	Hg203
295.24	773.	14.34	1.02	3.514E-02				
351.87	1044.	14.13	0.53	3.138E-02				
391.68	34654.	0.82	1.13	2.920E-02	391.71	100.000	5.973E+02	SN113
510.35	964.	10.56	1.19	2.434E-02				
514.02	14642.	1.06	1.20	2.422E-02	513.99	100.000	1.130E+03	Sr85
582.99	739.	19.81	0.49	2.220E-02				
609.28	822.	17.72	0.70	2.154E-02				
661.66	85788.	0.43	1.35	2.035E-02	661.66	100.000	3.973E+02	CS137
898.08	38997.	0.57	1.52	1.649E-02	898.02	100.000	1.362E+03	Y898
1173.26	93202.	0.39	1.76	1.364E-02	1173.23	100.000	7.001E+02	Co1173
1332.59	85500.	0.38	1.85	1.241E-02	1332.51	100.000	7.058E+02	Co1332
1460.99	937.	9.64	1.80	1.156E-02				
1836.33	26202.	0.69	2.19	9.577E-03	1836.01	100.000	1.576E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 14:58:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408002_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1091.43	136.47	16245.	8879.	2.042E+05	6.39	0.874	-	
1908.55	238.63	7722.	1568.	3.956E+04	20.68	0.988	-	
2041.30	255.23	8848.	1493.	3.902E+04	25.10	1.002	-	
2361.45	295.25	5542.	726.	2.067E+04	37.42	0.583	-	s
2814.34	351.87	5597.	1044.	3.326E+04	28.26	0.527	-	s
4663.11	582.99	4399.	739.	3.327E+04	39.62	0.490	-	s
4873.38	609.28	4344.	822.	3.817E+04	35.45	0.700	-	s
11686.85	1460.99	962.	937.	8.103E+04	19.27	1.799	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.27	46.44	18587.	7728.	0.716	7.07	0.840
AM-241	475.27	59.44	28838.	35601.	3.296	2.34	0.812
CD-109	703.69	88.00	33233.	116075.	10.748	0.90	0.825
CO-57	976.00	122.04	23336.	65680.	6.081	1.30	0.866
Ce-139	1326.41	165.85	18026.	50261.	4.654	1.52	0.907
Hg-203	2233.15	279.21	6968.	5691.	0.527	6.17	1.082
SN-113	3132.78	391.68	8677.	34654.	3.209	1.65	1.134
Sr-85	4111.32	514.01	7434.	14244.	1.319	3.32	1.216
CS-137	5292.41	661.66	7254.	85788.	7.943	0.86	1.347
Y-898	7183.35	898.05	6256.	40337.	3.735	1.45	1.501
Co-1173	9385.04	1173.27	4196.	93092.	8.620	0.78	1.761
Co-1332	10659.66	1332.59	2406.	85500.	7.917	0.77	1.850
Y-1836	14689.84	1836.34	624.	26110.	2.418	1.39	2.193

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 14:58:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408002_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS	Peak Energy keV	Peak Activity GPS	Code	MDA Value GPS		COMMENTS
Pb-210		6.3957E+02				8.12E+03		
			46.54	6.396E+02	(	2.629E+01	3.54E+00	1.00E+02 G
AM-241		4.1797E+02				1.58E+05		
			59.54	4.180E+02	(	4.645E+00	1.17E+00	1.00E+02 G
CD-109		5.8684E+02				4.63E+02		
			88.03	5.868E+02	(	2.147E+00	4.50E-01	1.00E+02 G
CO-57		3.0195E+02				2.72E+02		
			122.06	3.020E+02	(	1.636E+00	6.50E-01	1.00E+02 G
Ce-139		4.3128E+02				1.38E+02		
			165.85	4.313E+02	(	2.684E+00	7.60E-01	1.00E+02 G
Hg-203		9.4803E+02				4.66E+01		
			279.17	9.480E+02	(	3.240E+01	3.08E+00	1.00E+02 G
SN-113		5.9730E+02				1.15E+02		
			391.71	5.973E+02	(	3.741E+00	8.24E-01	1.00E+02 G
Sr-85		1.0994E+03				6.48E+01		
			513.99	1.099E+03	(	1.550E+01	1.66E+00	1.00E+02 G
CS-137		3.9732E+02				1.10E+04		
			661.66	3.973E+02	(	9.191E-01	4.31E-01	1.00E+02 G
Y-898		1.4093E+03				1.07E+02		
			898.02	1.409E+03	(	6.439E+00	7.24E-01	1.00E+02 G
Co-1173		6.9924E+02				1.92E+03		
			1173.23	6.992E+02	(	1.134E+00	3.89E-01	1.00E+02 G
Co-1332		7.0577E+02				1.92E+03		
			1332.51	7.058E+02	(	9.433E-01	3.85E-01	1.00E+02 G
Y-1836		1.5701E+03				1.07E+02		
			1836.01	1.570E+03	(	3.499E+00	6.95E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 14:58:45
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408002_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS	Time Corrected Activity GPS	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.2441E+02	6.3957E+02	7.0709E+00%	1.2144E+01%	2.629E+01
AM-241	4.1746E+02	4.1797E+02	2.3436E+00%	8.2252E+00%	4.645E+00
CD-109	3.8512E+02	5.8684E+02	8.9907E-01%	8.3089E+00%	2.147E+00
CO-57	1.4743E+02	3.0195E+02	1.3004E+00%	6.7091E+00%	1.636E+00
Ce-139	1.0466E+02	4.3128E+02	1.5194E+00%	6.3819E+00%	2.684E+00
Hg-203	1.4497E+01	9.4803E+02	6.1652E+00%	8.5478E+00%	3.240E+01
SN-113	1.0990E+02	5.9730E+02	1.6477E+00%	5.3844E+00%	3.741E+00
Sr-85	5.4455E+01	1.0994E+03	3.3188E+00%	6.0613E+00%	1.550E+01
CS-137	3.9034E+02	3.9732E+02	8.6154E-01%	5.4866E+00%	9.191E-01
Y-898	2.2655E+02	1.4093E+03	1.4488E+00%	5.4368E+00%	6.439E+00
Co-1173	6.3192E+02	6.9924E+02	7.7841E-01%	5.1794E+00%	1.134E+00
Co-1332	6.3782E+02	7.0577E+02	7.6998E-01%	5.3070E+00%	9.433E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/8/2013 14:58:45
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20130408002_EffVerif.An1

 Y-1836       2.5239E+02    1.5701E+03   1.3895E+00%   7.9495E+00% 3.499E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2042.1 keV)     3.997E+03  GPS
 Total Decayed Activity (   25.0 to  2042.1 keV) 9.8040332E+03  GPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 8_Soil 250ml TunaCan_04-07-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:40:12
Efficiency Calibration Date: 4/8/2013 Time: 11:06:59

Calibration Description:
HPGE08 S22147 8_20130407002_EffCal

Energy Calibration Fit
Energy = -0.0001 +0.125028*Channel -1.41986e-009*Channel**2
FWHM (ch) = 5.8562 +0.001118*Channel -3.00837e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.04	121.78	121.78	-0.00%	0.87	0.86	0.06%
1957.25	244.67	244.71	-0.01%	0.98	0.99	-1.01%
2753.48	344.30	344.25	0.01%	1.10	1.09	1.06%
7711.07	964.00	964.02	-0.00%	1.58	1.59	-0.23%
11263.49	1408.08	1408.07	0.00%	1.83	1.83	0.07%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3437 %
Coefficients:
-0.359632 -4.215465 0.446712 -0.054338 0.002307 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	1.1480E-003	1.1459E-003	0.18%
59.54	7.8461E-003	7.8963E-003	-0.64%
88.03	2.8793E-002	2.7907E-002	3.07%
122.06	4.0568E-002	4.1250E-002	-1.68%
165.85	4.4022E-002	4.4468E-002	-1.01%
279.17	3.6126E-002	3.6350E-002	-0.62%
391.71	2.9368E-002	2.9198E-002	0.58%
513.99	2.4752E-002	2.4220E-002	2.15%
661.66	2.1181E-002	2.0350E-002	3.92%
898.02	1.5779E-002	1.6486E-002	-4.48%
1173.23	1.3373E-002	1.3640E-002	-2.00%
1332.51	1.2187E-002	1.2412E-002	-1.85%
1836.01	9.8414E-003	9.5788E-003	2.67%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14139.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1112.50	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	14903.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	340.54	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1016.00	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	887.81	568.20	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1093.00	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	443.24	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1483.50	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	701.41	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	701.37	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1482.90	1471.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/29/2013 16:49:04
Curtis & Tompkins HPS Lab       Spectrum name: 9_20131229001_Energy.An1

Sample description
     RICAL,S19587,Energy Calibration


Spectrum Filename: C:\User\Cal\Spectra\9_20131229001_Energy.An1

Acquisition information
       Start time:                 12/29/2013 16:17:23
       Live time:               1200
       Real time:               1249
       Dead time:                  3.95 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_QC.Clb
     HPGE09 S19586 9_20121230001_Energy


       Energy Calibration
            Created:               12/27/2013 07:33:26
            Zero offset:           0.091 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -3.641E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 12:35:21
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.10keV )
       Stop channel:           16336 (  2042.11keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 12/29/2013 16:49:04
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 7 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0978

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
40.07	2938.	5.48	1.05	1.428E-02				
45.59	2282.	4.45	0.75	1.419E-02				
46.92	869.	11.45	0.75	1.417E-02				
121.90	142631.	0.30	0.86	1.293E-02	121.78	28.410	1.028E+00	QA122
244.66	31474.	0.69	1.00	1.090E-02	244.70	7.550	1.013E+00	Qa245
295.90	1772.	6.40	1.03	9.768E-03				
329.12	546.	16.18	0.99	9.032E-03				
344.15	88105.	0.37	1.08	8.699E-03	344.28	26.590	1.009E+00	Qa344
367.51	3280.	3.91	1.12	8.489E-03				
411.05	6474.	2.10	1.08	8.101E-03				
443.90	8517.	1.48	1.18	7.809E-03				
488.56	1172.	8.71	1.20	7.411E-03				
564.07	1099.	6.38	1.31	6.737E-03				
566.44	368.	17.70	1.31	6.716E-03				
586.17	1337.	8.04	1.18	6.542E-03				
656.63	374.	16.98	0.22	5.914E-03				
674.87	487.	11.55	1.41	5.752E-03				
678.76	995.	6.24	1.41	5.718E-03				
688.88	1794.	5.35	1.32	5.627E-03				
719.54	651.	8.98	1.45	5.353E-03				
723.42	286.	19.40	1.45	5.319E-03				
765.13	463.	12.20	1.49	4.948E-03				
779.05	23441.	0.85	1.46	4.824E-03	778.90	12.970	9.920E-01	Qa779
810.71	656.	9.02	1.52	4.704E-03				
867.51	7039.	1.96	1.56	4.484E-03				
919.67	946.	8.79	1.27	4.284E-03				
926.48	539.	9.24	1.61	4.258E-03				

ORTEC g v - i (1087) Env32 G53W4.26 12/29/2013 16:49:04
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
964.20	22735.	0.81	1.62	4.113E-03	964.08	14.500	1.009E+00	Qa964
1005.20	1230.	6.89	1.74	4.021E-03				
1086.08	14575.	0.89	1.72	3.838E-03				
1089.99	2475.	2.92	1.72	3.829E-03				
1112.21	19668.	0.87	1.69	3.779E-03	1112.08	13.410	1.028E+00	Qa1112
1213.30	1857.	4.43	1.74	3.551E-03				
1250.21	221.	13.97	1.82	3.467E-03				
1274.67	288.	13.45	0.62	3.412E-03				
1293.15	182.	11.90	1.85	3.371E-03				
1299.43	2030.	2.43	1.85	3.357E-03				
1408.27	24458.	0.68	1.97	3.111E-03	1408.01	20.850	9.984E-01	Qa1408
1457.87	620.	4.62	1.57	2.999E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
319.72	40.07	6375.	2938.	2.057E+05	10.95	1.047	-	s
363.82	45.61	4024.	2282.	1.608E+05	8.91	0.749	-	D
374.43	46.94	4517.	869.	6.133E+04	22.90	0.751	-	D
2365.48	295.90	2637.	1772.	1.814E+05	12.79	1.026	-	
2631.14	329.12	2012.	546.	6.041E+04	32.35	0.994	-	
2938.16	367.51	2390.	3280.	3.863E+05	7.82	1.121	-	s
3286.35	411.05	2266.	6474.	7.991E+05	4.20	1.080	-	
3549.13	443.90	1676.	8517.	1.091E+06	2.96	1.185	-	
3906.31	488.56	1888.	1172.	1.582E+05	17.41	1.202	-	
4510.21	564.22	1892.	1114.	1.653E+05	12.57	1.308	-	D
4529.20	566.60	1541.	391.	5.822E+04	30.15	1.310	-	D
4687.02	586.17	1926.	1337.	2.043E+05	16.08	1.180	-	s
5250.60	656.63	1042.	374.	6.316E+04	33.96	0.216	-	s
5395.79	674.79	1188.	501.	8.710E+04	28.93	0.421	-	s
5426.93	678.68	1525.	1057.	1.849E+05	17.47	1.043	-	s
5508.56	688.88	1543.	1794.	3.189E+05	10.69	1.322	-	
5754.10	719.58	1506.	688.	1.285E+05	25.61	0.729	-	s
6117.69	765.04	1290.	462.	9.344E+04	33.16	0.362	-	s
6481.40	810.51	1759.	778.	1.654E+05	27.16	1.110	-	s
6937.40	867.51	1929.	7039.	1.570E+06	3.92	1.559	-	
7354.62	919.67	1048.	946.	2.208E+05	17.59	1.265	-	s
7407.93	926.33	1168.	622.	1.461E+05	28.30	0.916	-	s
8038.88	1005.20	889.	1230.	3.059E+05	13.79	1.744	-	
8685.40	1086.02	1847.	14115.	3.677E+06	2.32	1.681	-	
8716.71	1089.93	1485.	1762.	4.602E+05	11.64	1.557	-	sD
9703.68	1213.30	666.	1857.	5.231E+05	8.87	1.740	-	
9999.03	1250.42	366.	221.	6.375E+04	27.93	1.822	-	D
10194.70	1274.67	216.	288.	8.434E+04	26.90	0.624	-	s
10341.95	1293.07	132.	195.	5.785E+04	30.90	0.422	-	s

ORTEC g v - i (1087) Env32 G53W4.26 12/29/2013 16:49:04
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229001_Energy.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
10392.19	1299.35	156.	2118.	6.310E+05	5.25	1.535	-
11660.55	1457.87	23.	620.	2.067E+05	9.24	1.569	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.00	121.90	9295.	142631.	118.859	0.61	0.861
Qa-245	1955.68	244.66	3856.	31474.	26.228	1.38	1.000
Qa-344	2751.35	344.15	3513.	88105.	73.421	0.75	1.081
Qa-779	6229.80	779.05	2213.	23441.	19.534	1.69	1.461
Qa-964	7710.89	964.20	1419.	22735.	18.946	1.61	1.620
Qa-1112	8894.96	1112.21	1110.	19668.	16.390	1.73	1.689
Qa-1408	11263.62	1408.27	337.	24458.	20.382	1.36	1.966

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Code	MDA Value µCi	COMMENTS
QA-122		1.0280E+00				4.94E+03	
			121.78	1.028E+00	(	3.258E-03 3.03E-01 2.84E+01	G
Qa-245		1.0126E+00				4.94E+03	
			244.70	1.013E+00	(	9.397E-03 6.91E-01 7.55E+00	G
Qa-344		1.0090E+00				4.94E+03	
			344.28	1.009E+00	(	3.194E-03 3.74E-01 2.66E+01	G
Qa-779		9.9198E-01				4.94E+03	
			778.90	9.920E-01	(	9.393E-03 8.47E-01 1.30E+01	G
Qa-964		1.0094E+00				4.94E+03	
			964.08	1.009E+00	(	7.914E-03 8.05E-01 1.45E+01	G

```
      ORTEC g v - i (1087) Env32  G53W4.26  12/29/2013 16:49:04
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20131229001_Energy.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Qa-1112      1.0277E+00                                      4.94E+03
                          1112.08 1.028E+00  (  8.254E-03 8.66E-01 1.34E+01 G

Qa-1408      9.9844E-01                                      4.94E+03
                          1408.01 9.984E-01  (  3.601E-03 6.82E-01 2.09E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction
```

ORTEC g v - i (1087) Env32 G53W4.26 12/29/2013 16:49:04
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229001_Energy.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.7427E-01	1.0280E+00	6.2376E-03	1.1753E-01	3.258E-03
Qa-245	8.6114E-01	1.0126E+00	1.3992E-02	1.1644E-01	9.397E-03
Qa-344	8.5814E-01	1.0090E+00	7.5565E-03	1.1544E-01	3.194E-03
Qa-779	8.4363E-01	9.9198E-01	1.6795E-02	1.1449E-01	9.393E-03
Qa-964	8.5848E-01	1.0094E+00	1.6258E-02	1.1638E-01	7.914E-03
Qa-1112	8.7401E-01	1.0277E+00	1.7794E-02	1.1867E-01	8.254E-03
Qa-1408	8.4913E-01	9.9844E-01	1.3627E-02	1.1480E-01	3.601E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1274.6 to 2042.1 keV) 6.019E+00 µCi
Total Decayed Activity (1274.6 to 2042.1 keV) 7.0771713E+00 µCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 9_Soil 250ml TunaCan_12-29-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:26:14
Efficiency Calibration Date: 12/30/2013 Time: 12:17:54

Calibration Description:
HPGE09 S23325 9_20131229002_EffCal

Energy Calibration Fit
Energy = 0.0949 +0.125077*Channel -5.67454e-009*Channel**2
FWHM (ch) = 6.0944 +0.000986*Channel -1.06572e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.79	121.78	121.89	-0.09%	0.88	0.88	-0.66%
1955.38	244.67	244.65	0.01%	0.99	1.00	-1.07%
2750.98	344.30	344.13	0.05%	1.12	1.09	2.21%
6229.21	778.90	779.00	-0.01%	1.47	1.48	-0.71%
11262.57	1408.08	1408.06	0.00%	1.98	1.98	0.11%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9396 %
Coefficients:
-0.405508 -4.148311 0.423719 -0.051216 0.002101 -0.000043

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	9.6799E-004	9.6656E-004	0.15%
59.54	7.1400E-003	7.1767E-003	-0.51%
88.03	2.7754E-002	2.7086E-002	2.41%
122.06	4.0400E-002	4.0745E-002	-0.85%
165.85	4.3400E-002	4.4228E-002	-1.91%
279.17	3.6871E-002	3.6468E-002	1.09%
391.71	2.9633E-002	2.9420E-002	0.72%
661.66	2.1148E-002	2.0523E-002	2.95%
898.02	1.6152E-002	1.6551E-002	-2.47%
1173.23	1.3311E-002	1.3584E-002	-2.05%
1332.51	1.2247E-002	1.2294E-002	-0.39%
1836.01	9.4555E-003	9.3078E-003	1.56%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 13:02:24
Curtis & Tompkins HPS Lab       Spectrum name: 9_20131229002_EffCal.An1

Sample description
     RICAL,S23325,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\9_20131229002_EffCal.An1

Acquisition information
       Start time:                 12/29/2013 17:07:07
       Live time:              10800
       Real time:              10956
       Dead time:                  1.42 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               12/30/2013 12:20:37
            Zero offset:          -0.017 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -7.396E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      EfficiencyCalibration.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2041.37keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 13:02:24
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0514

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
30.85	5925.	2.56	0.76	0.000E+00				
32.58	2271.	7.82	0.76	0.000E+00				
46.59	6133.	4.37	0.77	9.778E-04	46.54	4.250	1.404E+04	Pb210
59.57	32137.	1.13	0.79	7.198E-03	59.54	35.900	1.156E+03	AM241
88.02	127358.	0.43	0.81	2.708E-02	88.03	3.610	1.583E+04	CD109
122.07	82773.	0.49	0.85	4.075E-02	122.06	85.600	3.490E+02	CO57
136.47	10866.	2.75	0.85	4.307E-02				
165.87	79373.	0.50	0.91	4.423E-02	165.85	79.900	5.185E+02	Ce139
238.37	1251.	19.69	0.65	3.968E-02				
254.99	2884.	8.12	1.08	3.835E-02				
279.00	23949.	1.33	1.01	3.648E-02	279.17	81.500	1.107E+03	Hg203
351.55	1198.	17.36	1.11	3.161E-02				
391.50	63353.	0.56	1.13	2.943E-02	391.71	64.000	9.285E+02	SN113
513.92	42190.	0.82	1.20	2.445E-02	513.99	95.700	1.160E+03	Sr85
609.35	990.	16.87	0.99	2.173E-02				
661.66	85960.	0.44	1.35	2.052E-02	661.66	85.100	4.610E+02	CS137
813.94	926.	16.31	1.16	1.775E-02				
898.03	76526.	0.48	1.54	1.655E-02	898.02	93.700	1.486E+03	Y898
1173.21	94915.	0.39	1.77	1.358E-02	1173.23	99.970	6.908E+02	Co1173
1332.54	85083.	0.36	1.87	1.229E-02	1332.51	99.990	6.841E+02	Co1332
1460.91	693.	10.03	1.41	1.140E-02				
1835.83	49300.	0.50	2.21	9.309E-03	1836.01	99.200	1.607E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 13:02:24
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.81	30.85	10674.	5662.	0.000E+00	7.14	1.193	-	s
260.61	32.58	14623.	2271.	0.000E+00	15.63	0.764	-	lD
1091.23	136.47	19572.	10866.	2.523E+05	5.50	0.853	-	
1906.08	238.37	14499.	1251.	3.153E+04	39.38	0.651	-	s
2038.98	254.99	12657.	2884.	7.520E+04	16.23	1.077	-	
2811.16	351.55	9345.	1198.	3.790E+04	34.72	1.106	-	s
4873.14	609.35	5601.	990.	4.555E+04	33.74	0.994	-	s
6509.81	813.94	4293.	926.	5.218E+04	32.62	1.157	-	s
11687.72	1460.91	938.	693.	6.075E+04	20.05	1.409	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibration.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	372.50	46.58	20088.	6222.	0.576	8.89	0.769
AM-241	476.42	59.57	25032.	32137.	2.976	2.26	0.793
CD-109	703.88	88.02	37846.	127358.	11.792	0.86	0.807
CO-57	976.09	122.07	21479.	82773.	7.664	0.98	0.853
Ce-139	1326.30	165.87	18093.	79373.	7.349	0.99	0.913
Hg-203	2231.00	279.01	14608.	23794.	2.203	2.64	1.010
SN-113	3130.62	391.50	11153.	63353.	5.866	1.12	1.128
Sr-85	4109.75	513.92	11896.	42190.	3.907	1.64	1.204
CS-137	5291.60	661.66	8846.	85960.	7.959	0.89	1.354
Y-898	7182.67	898.03	7742.	76526.	7.086	0.96	1.543
Co-1173	9384.83	1173.21	4805.	94849.	8.782	0.78	1.768
Co-1332	10659.53	1332.47	3570.	87350.	8.088	0.80	1.861
Y-1836	14689.86	1835.84	1348.	48964.	4.534	1.02	2.211

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 13:02:24
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210		1.4242E+04				8.12E+03	
			46.54	1.424E+04	(	1.518E+03 4.45E+00 4.25E+00	G
AM-241		1.1559E+03				1.58E+05	
			59.54	1.156E+03	(	2.662E+01 1.13E+00 3.59E+01	G
CD-109		1.5825E+04				4.63E+02	
			88.03	1.583E+04	(	1.130E+02 4.28E-01 3.61E+00	G
CO-57		3.4895E+02				2.72E+02	
			122.06	3.490E+02	(	2.891E+00 4.90E-01 8.56E+01	G
Ce-139		5.1847E+02				1.38E+02	
			165.85	5.185E+02	(	4.112E+00 4.97E-01 7.99E+01	G
Hg-203		1.0994E+03				4.66E+01	
			279.17	1.099E+03	(	2.615E+01 1.32E+00 8.15E+01	G
SN-113		9.2851E+02				1.15E+02	
			391.71	9.285E+02	(	7.253E+00 5.62E-01 6.40E+01	G
Sr-85		1.1604E+03				6.48E+01	
			513.99	1.160E+03	(	1.405E+01 8.19E-01 9.57E+01	G
CS-137		4.6096E+02				1.10E+04	
			661.66	4.610E+02	(	2.365E+00 4.43E-01 8.51E+01	G
Y-898		1.4856E+03				1.07E+02	
			898.02	1.486E+03	(	8.012E+00 4.79E-01 9.37E+01	G
Co-1173		6.9034E+02				1.92E+03	
			1173.23	6.903E+02	(	2.371E+00 3.90E-01 1.00E+02	G
Co-1332		7.0234E+02				1.92E+03	
			1332.51	7.023E+02	(	2.261E+00 3.98E-01 1.00E+02	G
Y-1836		1.5966E+03				1.07E+02	
			1836.01	1.597E+03	(	5.668E+00 5.09E-01 9.92E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 13:02:24
Curtis & Tompkins HPS Lab Spectrum name: 9_20131229002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	1.4023E+04	1.4242E+04	8.8929E+00%	1.3288E+01%	1.518E+03
AM-241	1.1549E+03	1.1559E+03	2.2633E+00%	8.2035E+00%	2.662E+01
CD-109	1.2060E+04	1.5825E+04	8.5677E-01%	8.3102E+00%	1.130E+02
CO-57	2.1975E+02	3.4895E+02	9.7967E-01%	6.6594E+00%	2.891E+00
Ce-139	2.0797E+02	5.1847E+02	9.9318E-01%	6.2813E+00%	4.112E+00
Hg-203	7.4126E+01	1.0994E+03	2.6353E+00%	6.6234E+00%	2.615E+01
SN-113	3.1154E+02	9.2851E+02	1.1247E+00%	5.5989E+00%	7.253E+00
Sr-85	1.6700E+02	1.1604E+03	1.6388E+00%	5.7613E+00%	1.405E+01
CS-137	4.5571E+02	4.6096E+02	8.8668E-01%	5.9022E+00%	2.365E+00
Y-898	4.5690E+02	1.4856E+03	9.5878E-01%	5.6138E+00%	8.012E+00
Co-1173	6.4670E+02	6.9034E+02	7.7948E-01%	5.2822E+00%	2.371E+00
Co-1332	6.5794E+02	7.0234E+02	7.9615E-01%	5.3381E+00%	2.261E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 13:02:24
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20131229002_EffCal.An1

 Y-1836       4.9102E+02    1.5966E+03   1.0174E+00%   7.9866E+00% 5.668E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.4 keV)     3.093E+04  Bq
 Total Decayed Activity (   25.0 to  2041.4 keV) 4.0214742E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins Hunters Point Lab

Sample Description: Eff Verification - Source ID:S22147
Detector: HPGE09 50-TP42232A
Spectrum: 9_20131230002_EffVerif
Source Date: 1/1/2013 09:00
Acquired: 12/30/2013 16:17:25
Report Date: 12/30/2013 21:35

Analyst: Philip Smith
Reviewer:
Review Date:

Efficiency: HPGE09 S23325 9_20131229002_EffCal
Library: EfficiencyVerification.lib

Nuclide	Activity GPS/Source	Uncertainty %
Pb-210	5.643E+02	12.98
AM-241	3.787E+02	8.25
CD-109	5.408E+02	8.32
CO-57	2.893E+02	6.73
Ce-139	4.056E+02	6.50
Hg-203	1.044E+03	17.42
SN-113	5.722E+02	6.02
Sr-85	1.058E+03	7.84
CS-137	3.928E+02	5.90
Y-898	1.371E+03	6.01
Co-1173	6.948E+02	5.28
Co-1332	7.018E+02	5.33
Y-1836	1.575E+03	8.16
Total	9.587E+03	

Curtis & Tompkins HPS Lab Spectrum name: 9_20131230002_EffVerif.An1

Sample description
Eff Verification - Source ID:S22147

Spectrum Filename: C:\User\SPC\Det9\9_20131230002_EffVerif.An1

Acquisition information
Start time: 12/30/2013 16:17:25
Live time: 10800
Real time: 10905
Dead time: 0.96 %
Detector ID: 9

Detector system
HPGE09 50-TP42232A

Calibration
Filename: 9_Soil 250ml TunaCan_12-29-2013.Clb
HPGE09 S23325 9_20131229002_EffCal

Energy Calibration
Created: 12/30/2013 16:14:21
Zero offset: 0.147 keV
Gain: 0.125 keV/channel
Quadratic: -2.910E-09 keV/channel^2

Efficiency Calibration
Created: 12/30/2013 12:17:54
Type: Polynomial
Uncertainty: 0.940 %
Coefficients: -0.405508 -4.148311 0.423719
-0.051216 0.002101 -0.000043

Library Files
Main analysis library: EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.26
Start channel: 200 (25.15keV)
Stop channel: 16336 (2041.86keV)
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00
Activity scaling factor: 1.0000E+00/(1.0000E+00* 1.0000E+00) =
1.0000E+00
Detection limit method: Critical level - ORTEC method
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00
Fraction Limit: 0.000%
Background width: average of five points.
Half lives decay limit: 12.000

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1094

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.76	5711.	4.21	0.72	1.021E-03	46.54	100.000	5.643E+02	Pb210
59.71	29305.	1.21	0.79	7.288E-03	59.54	100.000	3.787E+02	AM241
88.16	91796.	0.49	0.82	2.716E-02	88.03	100.000	5.408E+02	CD109
122.18	50401.	0.68	0.87	4.077E-02	122.06	100.000	2.893E+02	CO57
136.60	6706.	3.24	0.87	4.309E-02				
165.97	31078.	0.98	0.91	4.423E-02	165.85	100.000	4.056E+02	Ce139
238.64	1169.	10.44	0.98	3.966E-02				
255.17	840.	19.55	1.01	3.833E-02				
279.10	1851.	8.16	1.05	3.647E-02	279.17	100.000	1.044E+03	Hg203
295.01	776.	17.98	1.00	3.530E-02				
351.90	1008.	10.47	1.09	3.158E-02				
391.54	20389.	1.24	1.12	2.943E-02	391.71	100.000	5.721E+02	SN113
510.39	738.	13.05	1.23	2.456E-02				
513.97	5904.	2.00	1.23	2.445E-02	513.99	100.000	1.087E+03	Sr85
609.40	831.	10.21	1.31	2.173E-02				
661.70	85087.	0.42	1.36	2.052E-02	661.66	100.000	3.928E+02	CS137
898.10	23080.	1.18	1.50	1.655E-02	898.02	100.000	1.371E+03	Y898
1173.30	89433.	0.40	1.76	1.358E-02	1173.23	100.000	6.948E+02	Co1173
1332.61	81754.	0.38	1.86	1.229E-02	1332.51	100.000	7.018E+02	Co1332
1460.89	951.	8.33	1.29	1.140E-02				
1836.24	14926.	0.98	2.23	9.307E-03	1836.01	100.000	1.576E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1091.37	136.60	10651.	6706.	1.556E+05	6.48	0.874	-	
1907.59	238.64	7987.	1216.	3.067E+04	28.84	0.444	-	s
2039.82	255.17	7052.	840.	2.190E+04	39.09	1.014	-	s
2358.45	295.01	5332.	776.	2.197E+04	35.96	1.000	-	
2813.74	351.93	5701.	1115.	3.531E+04	28.07	0.901	-	
4872.99	609.35	2901.	920.	4.234E+04	24.33	1.051	-	
11686.26	1460.89	665.	951.	8.341E+04	16.65	1.292	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	372.80	46.76	14490.	5711.	0.529	8.42	0.720
AM-241	476.40	59.71	21287.	29305.	2.713	2.41	0.788
CD-109	703.92	88.16	24684.	91796.	8.500	0.98	0.817
CO-57	976.06	122.18	15761.	50401.	4.667	1.36	0.872
Ce-139	1326.32	165.97	12738.	31078.	2.878	1.95	0.909
Hg-203	2231.21	279.10	5827.	1851.	0.171	16.32	1.045
SN-113	3130.61	391.54	7857.	20389.	1.888	2.49	1.124
Sr-85	4109.90	513.96	4617.	5744.	0.532	5.57	1.251
CS-137	5291.76	661.70	6000.	85087.	7.878	0.84	1.356
Y-898	7183.07	898.10	6559.	23080.	2.137	2.35	1.498
Co-1173	9385.04	1173.30	3993.	89433.	8.281	0.79	1.764
Co-1332	10659.73	1332.61	1778.	81754.	7.570	0.76	1.865
Y-1836	14690.19	1836.24	571.	14915.	1.381	1.96	2.226

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source		COMMENTS
Pb-210		5.6434E+02					8.12E+03	
			46.54	5.643E+02	(	2.771E+01	4.21E+00	1.00E+02 G
AM-241		3.7869E+02					1.58E+05	
			59.54	3.787E+02	(	4.393E+00	1.21E+00	1.00E+02 G
CD-109		5.4084E+02					4.63E+02	
			88.03	5.408E+02	(	2.157E+00	4.88E-01	1.00E+02 G
CO-57		2.8929E+02					2.72E+02	
			122.06	2.893E+02	(	1.679E+00	6.82E-01	1.00E+02 G
Ce-139		4.0564E+02					1.38E+02	
			165.85	4.056E+02	(	3.432E+00	9.77E-01	1.00E+02 G
Hg-203		1.0437E+03					4.66E+01	
			279.17	1.044E+03	(	1.003E+02	8.16E+00	1.00E+02 G
SN-113		5.7215E+02					1.15E+02	
			391.71	5.721E+02	(	5.795E+00	1.24E+00	1.00E+02 G
Sr-85		1.0576E+03					6.48E+01	
			513.99	1.058E+03	(	2.915E+01	2.79E+00	1.00E+02 G
CS-137		3.9278E+02					1.10E+04	
			661.66	3.928E+02	(	8.331E-01	4.19E-01	1.00E+02 G
Y-898		1.3706E+03					1.07E+02	
			898.02	1.371E+03	(	1.121E+01	1.18E+00	1.00E+02 G
Co-1173		6.9479E+02					1.92E+03	
			1173.23	6.948E+02	(	1.144E+00	3.97E-01	1.00E+02 G
Co-1332		7.0180E+02					1.92E+03	
			1332.51	7.018E+02	(	8.433E-01	3.82E-01	1.00E+02 G
Y-1836		1.5750E+03					1.07E+02	
			1836.01	1.575E+03	(	5.881E+00	9.79E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	5.4711E+02	5.6434E+02	8.4245E+00%	1.2979E+01%	2.771E+01
AM-241	3.7809E+02	3.7869E+02	2.4139E+00%	8.2463E+00%	4.393E+00
CD-109	3.1380E+02	5.4084E+02	9.7535E-01%	8.3232E+00%	2.157E+00
CO-57	1.1454E+02	2.8929E+02	1.3641E+00%	6.7267E+00%	1.679E+00
Ce-139	6.5063E+01	4.0564E+02	1.9543E+00%	6.5029E+00%	3.432E+00
Hg-203	4.7008E+00	1.0437E+03	1.6321E+01%	1.7416E+01%	1.003E+02
SN-113	6.4170E+01	5.7215E+02	2.4890E+00%	6.0231E+00%	5.795E+00
Sr-85	2.1759E+01	1.0576E+03	5.5703E+00%	7.8445E+00%	2.915E+01
CS-137	3.8387E+02	3.9278E+02	8.3795E-01%	5.8951E+00%	8.331E-01
Y-898	1.2912E+02	1.3706E+03	2.3507E+00%	6.0101E+00%	1.121E+01
Co-1173	6.0959E+02	6.9479E+02	7.9436E-01%	5.2844E+00%	1.144E+00
Co-1332	6.1573E+02	7.0180E+02	7.6416E-01%	5.3334E+00%	8.433E-01

Y-1836	1.4837E+02	1.5750E+03	1.9576E+00%	8.1598E+00%	5.881E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.2 to 2041.9 keV) 3.396E+03 GPS/Source
Total Decayed Activity (25.2 to 2041.9 keV) 9.5872715E+03 GPS/Source

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 21:28:01
Curtis & Tompkins HPS Lab       Spectrum name: 9_20131230002_EffVerif.An1

Sample description
     Eff Verification - Source ID:S22147


Spectrum Filename: C:\User\SPC\Det9\9_20131230002_EffVerif.An1

Acquisition information
       Start time:                 12/30/2013 16:17:25
       Live time:              10800
       Real time:              10905
       Dead time:                  0.96 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_Soil 250ml TunaCan_12-29-2013.Clb
     HPGE09 S23325 9_20131229002_EffCal


       Energy Calibration
            Created:               12/30/2013 16:14:21
            Zero offset:           0.147 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -2.910E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 12:17:54
            Type:                  Polynomial
            Uncertainty:           0.940 %
            Coefficients:         -0.405508  -4.148311   0.423719
                                  -0.051216   0.002101  -0.000043

Library Files
       Main analysis library:      EfficiencyVerification.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.86keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 21:28:01
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1094

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.76	5711.	4.21	0.72	1.021E-03	46.54	100.000	5.643E+02	Pb210
59.71	29305.	1.21	0.79	7.288E-03	59.54	100.000	3.787E+02	AM241
88.16	91796.	0.49	0.82	2.716E-02	88.03	100.000	5.408E+02	CD109
122.18	50401.	0.68	0.87	4.077E-02	122.06	100.000	2.893E+02	CO57
136.60	6706.	3.24	0.87	4.309E-02				
165.97	31078.	0.98	0.91	4.423E-02	165.85	100.000	4.056E+02	Ce139
238.64	1169.	10.44	0.98	3.966E-02				
255.17	840.	19.55	1.01	3.833E-02				
279.10	1851.	8.16	1.05	3.647E-02	279.17	100.000	1.044E+03	Hg203
295.01	776.	17.98	1.00	3.530E-02				
351.90	1008.	10.47	1.09	3.158E-02				
391.54	20389.	1.24	1.12	2.943E-02	391.71	100.000	5.721E+02	SN113
510.39	738.	13.05	1.23	2.456E-02				
513.97	5904.	2.00	1.23	2.445E-02	513.99	100.000	1.087E+03	Sr85
609.40	831.	10.21	1.31	2.173E-02				
661.70	85087.	0.42	1.36	2.052E-02	661.66	100.000	3.928E+02	CS137
898.10	23080.	1.18	1.50	1.655E-02	898.02	100.000	1.371E+03	Y898
1173.30	89433.	0.40	1.76	1.358E-02	1173.23	100.000	6.948E+02	Co1173
1332.61	81754.	0.38	1.86	1.229E-02	1332.51	100.000	7.018E+02	Co1332
1460.89	951.	8.33	1.29	1.140E-02				
1836.24	14926.	0.98	2.23	9.307E-03	1836.01	100.000	1.576E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 21:28:01
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230002_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1091.37	136.60	10651.	6706.	1.556E+05	6.48	0.874	-	
1907.59	238.64	7987.	1216.	3.067E+04	28.84	0.444	-	s
2039.82	255.17	7052.	840.	2.190E+04	39.09	1.014	-	s
2358.45	295.01	5332.	776.	2.197E+04	35.96	1.000	-	
2813.74	351.93	5701.	1115.	3.531E+04	28.07	0.901	-	
4872.99	609.35	2901.	920.	4.234E+04	24.33	1.051	-	
11686.26	1460.89	665.	951.	8.341E+04	16.65	1.292	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	372.80	46.76	14490.	5711.	0.529	8.42	0.720
AM-241	476.40	59.71	21287.	29305.	2.713	2.41	0.788
CD-109	703.92	88.16	24684.	91796.	8.500	0.98	0.817
CO-57	976.06	122.18	15761.	50401.	4.667	1.36	0.872
Ce-139	1326.32	165.97	12738.	31078.	2.878	1.95	0.909
Hg-203	2231.21	279.10	5827.	1851.	0.171	16.32	1.045
SN-113	3130.61	391.54	7857.	20389.	1.888	2.49	1.124
Sr-85	4109.90	513.96	4617.	5744.	0.532	5.57	1.251
CS-137	5291.76	661.70	6000.	85087.	7.878	0.84	1.356
Y-898	7183.07	898.10	6559.	23080.	2.137	2.35	1.498
Co-1173	9385.04	1173.30	3993.	89433.	8.281	0.79	1.764
Co-1332	10659.73	1332.61	1778.	81754.	7.570	0.76	1.865
Y-1836	14690.19	1836.24	571.	14915.	1.381	1.96	2.226

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 21:28:01
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230002_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source	COMMENTS
Pb-210		5.6434E+02				8.12E+03	
			46.54	5.643E+02	(	5.570E+01 4.21E+00 1.00E+02	G
AM-241		3.7869E+02				1.58E+05	
			59.54	3.787E+02	(	8.821E+00 1.21E+00 1.00E+02	G
CD-109		5.4084E+02				4.63E+02	
			88.03	5.408E+02	(	4.330E+00 4.88E-01 1.00E+02	G
CO-57		2.8929E+02				2.72E+02	
			122.06	2.893E+02	(	3.373E+00 6.82E-01 1.00E+02	G
Ce-139		4.0564E+02				1.38E+02	
			165.85	4.056E+02	(	6.900E+00 9.77E-01 1.00E+02	G
Hg-203		1.0437E+03				4.66E+01	
			279.17	1.044E+03	(	2.020E+02 8.16E+00 1.00E+02	G
SN-113		5.7215E+02				1.15E+02	
			391.71	5.721E+02	(	1.167E+01 1.24E+00 1.00E+02	G
Sr-85		1.0576E+03				6.48E+01	
			513.99	1.058E+03	(	5.880E+01 2.79E+00 1.00E+02	G
CS-137		3.9278E+02				1.10E+04	
			661.66	3.928E+02	(	1.679E+00 4.19E-01 1.00E+02	G
Y-898		1.3706E+03				1.07E+02	
			898.02	1.371E+03	(	2.257E+01 1.18E+00 1.00E+02	G
Co-1173		6.9479E+02				1.92E+03	
			1173.23	6.948E+02	(	2.309E+00 3.97E-01 1.00E+02	G
Co-1332		7.0180E+02				1.92E+03	
			1332.51	7.018E+02	(	1.710E+00 3.82E-01 1.00E+02	G
Y-1836		1.5750E+03				1.07E+02	
			1836.01	1.575E+03	(	1.205E+01 9.79E-01 1.00E+02	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 21:28:01
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230002_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	5.4711E+02	5.6434E+02	8.4245E+00%	1.2979E+01%	5.570E+01
AM-241	3.7809E+02	3.7869E+02	2.4139E+00%	8.2463E+00%	8.821E+00
CD-109	3.1380E+02	5.4084E+02	9.7535E-01%	8.3232E+00%	4.330E+00
CO-57	1.1454E+02	2.8929E+02	1.3641E+00%	6.7267E+00%	3.373E+00
Ce-139	6.5063E+01	4.0564E+02	1.9543E+00%	6.5029E+00%	6.900E+00
Hg-203	4.7008E+00	1.0437E+03	1.6321E+01%	1.7416E+01%	2.020E+02
SN-113	6.4170E+01	5.7215E+02	2.4890E+00%	6.0231E+00%	1.167E+01
Sr-85	2.1759E+01	1.0576E+03	5.5703E+00%	7.8445E+00%	5.880E+01
CS-137	3.8387E+02	3.9278E+02	8.3795E-01%	5.8951E+00%	1.679E+00
Y-898	1.2912E+02	1.3706E+03	2.3507E+00%	6.0101E+00%	2.257E+01
Co-1173	6.0959E+02	6.9479E+02	7.9436E-01%	5.2844E+00%	2.309E+00
Co-1332	6.1573E+02	7.0180E+02	7.6416E-01%	5.3334E+00%	1.710E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 21:28:01
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20131230002_EffVerif.An1

 Y-1836       1.4837E+02    1.5750E+03   1.9576E+00%   8.1598E+00% 1.205E+01
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.2 to  2041.9 keV)     3.396E+03  GPS/Source
 Total Decayed Activity (   25.2 to  2041.9 keV) 9.5872715E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 9_Soil 250ml TunaCan_12-29-2013.Clb
Energy Calibration Date: 1/10/2014 Time: 06:14:13
Efficiency Calibration Date: 12/30/2013 Time: 12:17:54

Calibration Description:
HPGE09 S23325 9_20131229002_EffCal

Energy Calibration Fit
Energy = 0.1501 +0.125042*Channel -3.16821e-009*Channel**2
FWHM (ch) = 6.1535 +0.001002*Channel -1.94678e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.76	121.78	121.91	-0.11%	0.88	0.89	-1.52%
1955.41	244.67	244.65	0.01%	1.02	1.00	1.38%
2750.96	344.30	344.11	0.05%	1.10	1.10	-0.01%
6229.35	778.90	778.95	-0.01%	1.48	1.45	1.60%
7710.29	964.00	964.07	-0.01%	1.56	1.59	-2.02%
11262.61	1408.08	1408.04	0.00%	1.88	1.87	0.38%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9396 %
Coefficients:
-0.405508 -4.148311 0.423719 -0.051216 0.002101 -0.000043

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	9.6799E-004	9.6656E-004	0.15%
59.54	7.1400E-003	7.1767E-003	-0.51%
88.03	2.7754E-002	2.7086E-002	2.41%
122.06	4.0400E-002	4.0745E-002	-0.85%
165.85	4.3400E-002	4.4228E-002	-1.91%
279.17	3.6871E-002	3.6468E-002	1.09%
391.71	2.9633E-002	2.9420E-002	0.72%
661.66	2.1148E-002	2.0523E-002	2.95%
898.02	1.6152E-002	1.6551E-002	-2.47%
1173.23	1.3311E-002	1.3584E-002	-2.05%
1332.51	1.2247E-002	1.2294E-002	-0.39%
1836.01	9.4555E-003	9.3078E-003	1.56%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 15:44:50
Curtis & Tompkins HPS Lab       Spectrum name: 10_20131230001_Energy.An1

Sample description
     RICAL,S19587,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\10_20131230001_Energy.An1

Acquisition information
       Start time:                 12/30/2013 14:59:59
       Live time:               1200
       Real time:               1245
       Dead time:                  3.64 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_QC.Clb
     HPGE10 S19587 10_20131230001_Energy


       Energy Calibration
            Created:               12/30/2013 15:43:50
            Zero offset:          -0.007 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -7.511E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 15:43:50
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.43keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 15:44:50
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0503

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
40.02	700.	19.78	0.94	1.321E-02				
45.82	1307.	10.92	0.68	1.313E-02				
121.87	129207.	0.33	0.90	1.204E-02	121.78	28.410	1.000E+00	QA122
244.65	29353.	0.77	1.02	1.030E-02	244.70	7.550	1.000E+00	Qa245
295.81	1760.	8.00	1.00	9.218E-03				
344.18	81206.	0.36	1.11	8.196E-03	344.28	26.590	9.873E-01	Qa344
367.57	2668.	5.03	1.09	7.988E-03				
411.00	6064.	2.33	1.10	7.606E-03				
443.87	8044.	1.73	1.21	7.316E-03				
488.65	1012.	9.18	1.25	6.922E-03				
503.50	460.	17.33	1.20	6.791E-03				
563.98	1075.	6.33	1.29	6.257E-03				
566.46	337.	17.32	1.30	6.236E-03				
586.22	1256.	8.34	1.43	6.063E-03				
674.68	395.	13.97	1.38	5.285E-03				
678.68	879.	6.80	1.39	5.250E-03				
688.63	1817.	6.38	1.37	5.161E-03				
719.36	664.	12.12	1.21	4.891E-03				
778.95	21382.	0.95	1.46	4.366E-03	778.90	12.970	1.000E+00	Qa779
810.52	730.	10.46	1.02	4.275E-03				
867.41	6629.	2.57	1.60	4.110E-03				
919.30	756.	11.78	1.71	3.959E-03				
964.05	20963.	0.81	1.63	3.829E-03	964.08	14.500	1.000E+00	Qa964
1005.17	1044.	8.03	1.53	3.737E-03				
1085.87	13128.	0.94	1.69	3.557E-03				
1089.87	2230.	3.04	1.70	3.548E-03				
1112.04	17575.	0.94	1.63	3.499E-03				

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 15:44:50
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1212.91	1909.	4.25	1.52	3.273E-03				
1274.49	288.	11.99	0.31	3.136E-03				
1299.18	1823.	3.34	1.87	3.081E-03				
1407.99	22339.	0.72	1.91	2.838E-03	1408.01	20.850	1.000E+00	Qa1408
1457.55	539.	4.49	1.44	2.727E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide		
319.97	40.02	5272.	700.	5.296E+04	39.57	0.941	-		
366.36	45.82	5146.	1307.	9.956E+04	21.83	0.678	PB-210	s	
2365.17	295.81	3542.	1760.	1.909E+05	16.00	0.999	PB-214		
2939.06	367.57	2640.	2668.	3.340E+05	10.05	1.092	-		
3286.42	411.00	2320.	6064.	7.973E+05	4.66	1.103	AC-228		
3549.30	443.87	2090.	8044.	1.099E+06	3.46	1.210	RA-223		
3907.40	488.65	1656.	1012.	1.462E+05	18.36	1.253	PB-214		
4026.15	503.50	1442.	460.	6.781E+04	34.67	1.199	-	s	
4509.92	564.15	1782.	1075.	1.719E+05	12.67	1.293	-		D
4529.74	566.63	1532.	337.	5.401E+04	34.63	1.295	-		D
4687.80	586.22	1869.	1256.	2.072E+05	16.68	1.426	-		
5394.86	674.61	1221.	371.	7.012E+04	39.58	0.245	-	s	
5426.93	678.62	1417.	940.	1.790E+05	18.55	1.059	-	s	
5507.00	688.63	1907.	1817.	3.520E+05	12.77	1.373	-	s	
5752.86	719.36	1319.	664.	1.357E+05	24.23	1.211	-		
6482.15	810.52	1109.	730.	1.708E+05	20.91	1.016	-	s	
6937.36	867.41	2701.	6629.	1.613E+06	5.14	1.598	-		
7352.55	919.30	1215.	756.	1.909E+05	23.56	1.711	-		
8039.63	1005.17	882.	1044.	2.794E+05	16.07	1.531	-		
8684.98	1085.82	1562.	13023.	3.661E+06	2.35	1.768	-		
8716.96	1089.81	1079.	1792.	5.049E+05	9.61	1.524	-		D
8894.83	1112.04	1272.	17575.	5.023E+06	1.89	1.626	-		
9702.14	1212.91	614.	1909.	5.832E+05	8.49	1.521	-		
10195.02	1274.49	167.	288.	9.178E+04	23.98	0.309	-	s	
10392.62	1299.18	230.	1823.	5.916E+05	6.69	1.873	-	s	
11660.36	1457.55	6.	539.	1.975E+05	8.99	1.440	-	s	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 15:44:50
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230001_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.37	121.87	9586.	129207.	107.673	0.65	0.898
Qa-245	1956.13	244.65	4684.	29353.	24.461	1.54	1.020
Qa-344	2751.89	344.17	3172.	82254.	68.545	0.77	1.117
Qa-779	6229.55	778.95	2564.	21382.	17.819	1.90	1.465
Qa-964	7710.58	964.05	1226.	20963.	17.469	1.63	1.629
Qa-1408	11263.67	1407.99	462.	22217.	18.514	1.47	1.910

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Peak Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	3.552E-03 3.27E-01 2.84E+01	G
Qa-245		1.0000E+00				4.94E+03	
			244.70	1.000E+00	(	1.096E-02 7.69E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	3.224E-03 3.83E-01 2.66E+01	G
Qa-779		1.0000E+00				4.94E+03	
			778.90	1.000E+00	(	1.116E-02 9.51E-01 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	7.914E-03 8.13E-01 1.45E+01	G
Qa-1408		9.9456E-01				4.94E+03	
			1408.01	9.946E-01	(	4.605E-03 7.34E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 15:44:50
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230001_Energy.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.5034E-01	1.0000E+00	6.5324E-03	1.1435E-01	3.552E-03
Qa-245	8.5034E-01	1.0000E+00	1.5372E-02	1.1519E-01	1.096E-02
Qa-344	8.5034E-01	1.0000E+00	7.6654E-03	1.1442E-01	3.224E-03
Qa-779	8.5034E-01	1.0000E+00	1.9027E-02	1.1574E-01	1.116E-02
Qa-964	8.5034E-01	1.0000E+00	1.6263E-02	1.1532E-01	7.914E-03
Qa-1408	8.4571E-01	9.9456E-01	1.4591E-02	1.1448E-01	4.605E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (586.1 to 2041.4 keV) 5.097E+00 µCi
Total Decayed Activity (586.1 to 2041.4 keV) 5.9945755E+00 µCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 15:44:50
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230001_Energy.An1

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 10_Soil 250ml TunaCan_12-30-2013.Clb
Energy Calibration Date: 1/8/2014 Time: 07:52:53
Efficiency Calibration Date: 12/30/2013 Time: 19:08:15

Calibration Description:
HPGE10 S23325 10_20131230002_EffCal

Energy Calibration Fit
Energy = 0.0222 +0.125067*Channel -5.21964e-009*Channel**2
FWHM (ch) = 6.3648 +0.000906*Channel -1.18817e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.38	121.78	121.88	-0.08%	0.90	0.90	-0.54%
1956.12	244.67	244.65	0.01%	1.00	1.01	-0.72%
2751.90	344.30	344.16	0.04%	1.12	1.10	1.70%
6229.58	778.90	778.94	-0.00%	1.43	1.44	-0.72%
7710.63	964.00	964.06	-0.01%	1.58	1.58	0.14%
11263.46	1408.08	1408.05	0.00%	1.88	1.88	0.07%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9077 %
Coefficients:
-0.405663 -4.247105 0.428613 -0.050516 0.001891 -0.000039

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.9104E-004	3.9052E-004	0.13%
59.54	4.3412E-003	4.3611E-003	-0.46%
88.03	2.2760E-002	2.2293E-002	2.05%
122.06	3.6359E-002	3.6522E-002	-0.45%
165.85	3.9843E-002	4.0637E-002	-1.99%
279.17	3.3898E-002	3.3619E-002	0.82%
391.71	2.7263E-002	2.7019E-002	0.89%
661.66	1.9310E-002	1.8746E-002	2.92%
898.02	1.4720E-002	1.5083E-002	-2.46%
1173.23	1.2257E-002	1.2360E-002	-0.84%
1332.51	1.0979E-002	1.1180E-002	-1.83%
1836.01	8.6118E-003	8.4538E-003	1.83%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 19:12:54
Curtis & Tompkins HPS Lab       Spectrum name: 10_20131230002_EffCal.An1

Sample description
     RICAL,S23325,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\10_20131230002_EffCal.An1

Acquisition information
       Start time:                 12/30/2013 15:49:51
       Live time:              10800
       Real time:              10944
       Dead time:                  1.32 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               12/30/2013 19:10:34
            Zero offset:          -0.121 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -8.845E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      EfficiencyCalibration.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    24.90keV )
       Stop channel:           16336 (  2041.23keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 19:12:54
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2013 09:00:00
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0535

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
46.63	2513.	7.87	0.82	4.013E-04	46.54	4.250	1.424E+04	Pb210
59.52	19137.	1.68	0.80	4.351E-03	59.54	35.900	1.133E+03	AM241
88.03	104292.	0.50	0.87	2.229E-02	88.03	3.610	1.577E+04	CD109
122.03	74314.	0.58	0.87	3.652E-02	122.06	85.600	3.504E+02	CO57
136.45	9803.	1.97	0.90	3.910E-02				
165.82	72522.	0.62	0.93	4.064E-02	165.85	79.900	5.180E+02	Ce139
238.58	1410.	10.88	1.00	3.661E-02				
254.96	2505.	8.86	1.05	3.538E-02				
279.03	21586.	1.52	1.06	3.363E-02	279.17	81.500	1.097E+03	Hg203
351.57	1090.	14.64	1.03	2.906E-02				
391.53	57954.	0.61	1.17	2.703E-02	391.71	64.000	9.302E+02	SN113
513.89	37858.	0.87	1.26	2.238E-02	513.99	95.700	1.149E+03	Sr85
609.08	1068.	14.41	1.14	1.987E-02				
661.65	78486.	0.45	1.40	1.875E-02	661.66	85.100	4.608E+02	CS137
814.29	873.	19.14	1.28	1.618E-02				
898.04	69314.	0.54	1.57	1.508E-02	898.02	93.700	1.486E+03	Y898
1173.21	87368.	0.40	1.78	1.236E-02	1173.23	99.970	6.991E+02	Co1173
1332.49	79682.	0.43	1.89	1.118E-02	1332.51	99.990	7.048E+02	Co1332
1460.80	659.	8.22	1.99	1.036E-02				
1835.83	44435.	0.54	2.20	8.455E-03	1836.01	99.200	1.605E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
1091.75	136.45	14278.	9909.	2.534E+05	4.82	0.905	-

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 19:12:54
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230002_EffCal.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
1908.26	238.51	11082.	1387.	3.788E+04	22.13	0.996	PB-212	D
2039.25	254.96	11682.	2505.	7.080E+04	17.72	1.045	TH-227	
2811.69	351.57	6773.	1090.	3.750E+04	29.28	1.029	PB-214	
4871.20	609.08	4918.	1068.	5.377E+04	28.81	1.140	BI-214	
6512.80	814.29	4747.	873.	5.395E+04	38.29	1.279	-	
11687.21	1460.80	1082.	622.	5.997E+04	25.22	0.929	K-40	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibration.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	373.70	46.63	12618.	2513.	0.233	15.74	0.818
AM-241	476.74	59.52	20988.	19137.	1.772	3.36	0.802
CD-109	704.61	88.03	35143.	104292.	9.657	1.00	0.868
CO-57	976.49	122.03	25420.	74314.	6.881	1.17	0.874
Ce-139	1326.52	165.82	24291.	72522.	6.715	1.24	0.934
Hg-203	2231.70	279.03	15520.	21586.	1.999	3.03	1.056
SN-113	3131.28	391.53	11540.	57954.	5.366	1.23	1.168
Sr-85	4109.95	513.91	8673.	37052.	3.431	1.55	1.252
CS-137	5291.72	661.65	7574.	78486.	7.267	0.90	1.397
Y-898	7182.88	898.04	8410.	69314.	6.418	1.07	1.569
Co-1173	9385.01	1173.21	4452.	87109.	8.066	0.81	1.779
Co-1332	10659.97	1332.49	3784.	79545.	7.365	0.86	1.885
Y-1836	14690.61	1835.84	1350.	44234.	4.096	1.08	2.197

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Peak Code	MDA Value Bq	COMMENTS
Pb-210		1.4240E+04					8.12E+03
			46.54	1.424E+04	(	2.981E+03	7.87E+00 4.25E+00 G
AM-241		1.1327E+03					1.58E+05
			59.54	1.133E+03	(	4.012E+01	1.68E+00 3.59E+01 G

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 19:12:54
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230002_EffCal.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CD-109	1.5768E+04					4.63E+02	
		88.03	1.577E+04	(	1.325E+02	4.98E-01	3.61E+00 G
CO-57	3.5036E+02					2.72E+02	
		122.06	3.504E+02	(	3.516E+00	5.85E-01	8.56E+01 G
Ce-139	5.1805E+02					1.38E+02	
		165.85	5.180E+02	(	5.207E+00	6.19E-01	7.99E+01 G
Hg-203	1.0972E+03					4.66E+01	
		279.17	1.097E+03	(	2.965E+01	1.52E+00	8.15E+01 G
SN-113	9.3015E+02					1.15E+02	
		391.71	9.302E+02	(	8.078E+00	6.13E-01	6.40E+01 G
Sr-85	1.1243E+03					6.48E+01	
		513.99	1.124E+03	(	1.325E+01	7.74E-01	9.57E+01 G
CS-137	4.6083E+02					1.10E+04	
		661.66	4.608E+02	(	2.397E+00	4.50E-01	8.51E+01 G
Y-898	1.4857E+03					1.07E+02	
		898.02	1.486E+03	(	9.218E+00	5.36E-01	9.37E+01 G
Co-1173	6.9703E+02					1.92E+03	
		1173.23	6.970E+02	(	2.510E+00	4.03E-01	1.00E+02 G
Co-1332	7.0358E+02					1.92E+03	
		1332.51	7.036E+02	(	2.559E+00	4.28E-01	1.00E+02 G
Y-1836	1.5978E+03					1.07E+02	
		1836.01	1.598E+03	(	6.283E+00	5.41E-01	9.92E+01 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting Bq	2 Sigma Total Bq	MDA
Pb-210	1.4020E+04	1.4240E+04	2.2410E+03	2.6456E+03	2.981E+03
AM-241	1.1318E+03	1.1327E+03	3.8007E+01	9.7063E+01	4.012E+01
CD-109	1.1999E+04	1.5768E+04	1.5697E+02	1.3128E+03	1.325E+02
CO-57	2.2010E+02	3.5036E+02	4.0961E+00	2.3439E+01	3.516E+00
Ce-139	2.0682E+02	5.1805E+02	6.4093E+00	3.2764E+01	5.207E+00
Hg-203	7.2945E+01	1.0972E+03	3.3245E+01	7.4500E+01	2.965E+01
SN-113	3.1032E+02	9.3015E+02	1.1396E+01	5.2274E+01	8.078E+00
Sr-85	1.6018E+02	1.1243E+03	1.7395E+01	6.4490E+01	1.325E+01
CS-137	4.5556E+02	4.6083E+02	4.1465E+00	2.7208E+01	2.397E+00
Y-898	4.5413E+02	1.4857E+03	1.5941E+01	8.3712E+01	9.218E+00
Co-1173	6.5274E+02	6.9703E+02	5.6165E+00	3.6846E+01	2.510E+00
Co-1332	6.5888E+02	7.0358E+02	6.0217E+00	3.7622E+01	2.559E+00
Y-1836	4.8839E+02	1.5978E+03	1.7278E+01	1.2774E+02	6.283E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (241.5 to 2041.2 keV) 3.083E+04 Bq
Total Decayed Activity (241.5 to 2041.2 keV) 4.0105891E+04 Bq

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 19:12:54
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230002_EffCal.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/31/2013 01:08:37
Curtis & Tompkins HPS Lab       Spectrum name: 10_20131230003_EffVerif.An1

Sample description
     Eff Verification - Source ID:S22147


Spectrum Filename: C:\User\SPC\Det10\10_20131230003_EffVerif.An1

Acquisition information
       Start time:                 12/30/2013 22:06:52
       Live time:              10800
       Real time:              10898
       Dead time:                  0.90 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_Soil 250ml TunaCan_12-30-2013.Clb
     HPGE10 S23325 10_20131230002_EffCal


       Energy Calibration
            Created:               12/30/2013 22:04:03
            Zero offset:          -0.026 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.749E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 19:08:15
            Type:                  Polynomial
            Uncertainty:           0.908 %
            Coefficients:         -0.405663  -4.247105   0.428613
                                  -0.050516   0.001891  -0.000039

Library Files
       Main analysis library:      EfficiencyVerification.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    24.99keV )
       Stop channel:           16336 (  2041.42keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 12/31/2013 01:08:37
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230003_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0604

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
30.62	1438.	7.90	0.77	0.000E+00				
46.68	2307.	9.20	0.73	4.068E-04	46.54	100.000	5.643E+02	Pb210
59.65	18444.	1.57	0.83	4.414E-03	59.54	100.000	3.922E+02	AM241
85.28	1739.	10.68	0.87	2.059E-02				
88.14	77448.	0.41	0.87	2.235E-02	88.03	100.000	5.546E+02	CD109
122.11	44881.	0.77	0.88	3.653E-02	122.06	100.000	2.876E+02	CO57
136.51	6169.	3.35	0.88	3.911E-02				
165.89	28151.	1.04	0.92	4.064E-02	165.85	100.000	4.004E+02	Ce139
238.54	1261.	14.06	0.95	3.661E-02				
255.13	940.	17.74	0.59	3.537E-02				
279.20	1711.	10.13	1.20	3.362E-02	279.17	100.000	1.050E+03	Hg203
351.93	998.	12.94	0.94	2.904E-02				
391.60	19011.	1.32	1.17	2.702E-02	391.71	100.000	5.817E+02	SN113
510.77	871.	10.83	1.24	2.248E-02				
513.96	5482.	2.09	1.25	2.238E-02	513.99	100.000	1.105E+03	Sr85
583.13	564.	15.01	1.31	2.048E-02				
609.37	741.	17.40	1.20	1.986E-02				
661.69	77553.	0.43	1.38	1.875E-02	661.66	100.000	3.920E+02	CS137
898.07	20934.	1.14	1.48	1.508E-02	898.02	100.000	1.366E+03	Y898
1173.27	81619.	0.41	1.76	1.236E-02	1173.23	100.000	6.969E+02	Co1173
1332.57	74224.	0.41	1.85	1.118E-02	1332.51	100.000	7.007E+02	Co1332
1460.95	805.	10.24	1.33	1.036E-02				
1836.03	13416.	0.98	2.31	8.454E-03	1836.01	100.000	1.562E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 12/31/2013 01:08:37
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230003_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
245.01	30.62	4411.	1438.	0.000E+00	15.80	0.773	- s
682.06	85.26	16354.	1739.	2.208E+04	21.35	0.866	- lD
1091.70	136.51	9879.	6169.	1.577E+05	6.70	0.877	-
1907.53	238.54	7932.	1261.	3.443E+04	28.12	0.953	- s
2040.26	255.13	7073.	940.	2.658E+04	35.48	0.587	- s
2814.37	351.93	4488.	998.	3.438E+04	25.89	0.940	-
4664.48	583.24	3450.	846.	4.128E+04	31.21	1.652	- s
4873.44	609.37	3528.	741.	3.731E+04	34.79	1.197	- s
11688.03	1460.95	723.	805.	7.770E+04	20.49	1.326	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	373.40	46.68	11885.	2307.	0.214	18.41	0.731
AM-241	477.11	59.65	15533.	18444.	1.708	3.14	0.827
CD-109	704.78	88.12	19812.	76290.	7.064	1.04	0.855
CO-57	976.56	122.11	16391.	44881.	4.156	1.55	0.878
Ce-139	1326.66	165.90	12056.	27944.	2.587	2.07	0.920
Hg-203	2232.68	279.20	6907.	1711.	0.158	20.25	1.197s
SN-113	3131.59	391.60	7713.	19011.	1.760	2.64	1.165
Sr-85	4110.52	513.99	5318.	5123.	0.474	7.01	1.217D
CS-137	5291.96	661.69	5044.	77553.	7.181	0.85	1.379
Y-898	7183.28	898.09	4909.	20751.	1.921	2.18	1.479
Co-1173	9385.41	1173.28	3441.	81594.	7.555	0.81	1.755
Co-1332	10660.35	1332.57	2116.	74161.	6.867	0.83	1.853
Y-1836	14691.21	1836.04	517.	13313.	1.233	2.02	2.307

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 12/31/2013 01:08:37
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230003_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source		COMMENTS
Pb-210		5.6433E+02					8.12E+03	
			46.54	5.643E+02	(	6.212E+01	9.20E+00	1.00E+02 G
AM-241		3.9222E+02					1.58E+05	
			59.54	3.922E+02	(	6.175E+00	1.57E+00	1.00E+02 G
CD-109		5.4633E+02					4.63E+02	
			88.03	5.463E+02	(	2.349E+00	5.20E-01	1.00E+02 G
CO-57		2.8757E+02					2.72E+02	
			122.06	2.876E+02	(	1.911E+00	7.73E-01	1.00E+02 G
Ce-139		3.9745E+02					1.38E+02	
			165.85	3.974E+02	(	3.639E+00	1.03E+00	1.00E+02 G
Hg-203		1.0501E+03					4.66E+01	
			279.17	1.050E+03	*(	1.188E+02	1.01E+01	1.00E+02 G
SN-113		5.8174E+02					1.15E+02	
			391.71	5.817E+02	(	6.261E+00	1.32E+00	1.00E+02 G
Sr-85		1.0329E+03					6.48E+01	
			513.99	1.033E+03	(	3.426E+01	3.50E+00	1.00E+02 G
CS-137		3.9196E+02					1.10E+04	
			661.66	3.920E+02	(	8.363E-01	4.27E-01	1.00E+02 G
Y-898		1.3545E+03					1.07E+02	
			898.02	1.354E+03	(	1.066E+01	1.09E+00	1.00E+02 G
Co-1173		6.9672E+02					1.92E+03	
			1173.23	6.967E+02	(	1.167E+00	4.07E-01	1.00E+02 G
Co-1332		7.0014E+02					1.92E+03	
			1332.51	7.001E+02	(	1.012E+00	4.13E-01	1.00E+02 G
Y-1836		1.5504E+03					1.07E+02	
			1836.01	1.550E+03	(	6.167E+00	1.01E+00	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 12/31/2013 01:08:37
Curtis & Tompkins HPS Lab Spectrum name: 10_20131230003_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	5.4709E+02	5.6433E+02	1.8406E+01%	2.0887E+01%	6.212E+01
AM-241	3.9159E+02	3.9222E+02	3.1368E+00%	8.4862E+00%	6.175E+00
CD-109	3.1687E+02	5.4633E+02	1.0405E+00%	8.3311E+00%	2.349E+00
CO-57	1.1379E+02	2.8757E+02	1.5455E+00%	6.7658E+00%	1.911E+00
Ce-139	6.3671E+01	3.9745E+02	2.0670E+00%	6.5377E+00%	3.639E+00
Hg-203 #	4.7129E+00	1.0501E+03	2.0254E+01%	2.1145E+01%	1.188E+02
SN-113	6.5150E+01	5.8174E+02	2.6400E+00%	6.0870E+00%	6.261E+00
Sr-85	2.1196E+01	1.0329E+03	7.0097E+00%	8.9243E+00%	3.426E+01
CS-137	3.8307E+02	3.9196E+02	8.5466E-01%	5.8975E+00%	8.363E-01
Y-898	1.2739E+02	1.3545E+03	2.1805E+00%	5.9456E+00%	1.066E+01
Co-1173	6.1123E+02	6.9672E+02	8.1480E-01%	5.2875E+00%	1.167E+00
Co-1332	6.1422E+02	7.0014E+02	8.2518E-01%	5.3425E+00%	1.012E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/31/2013 01:08:37
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20131230003_EffVerif.An1

 Y-1836       1.4582E+02    1.5504E+03   2.0192E+00%   8.1748E+00% 6.167E+00

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.4 keV)     3.406E+03  GPS/Source
 Total Decayed Activity (   25.0 to  2041.4 keV) 9.5463926E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 10_Soil 250ml TunaCan_12-30-2013.Clb
Energy Calibration Date: 1/10/2014 Time: 06:53:23
Efficiency Calibration Date: 12/30/2013 Time: 19:08:15

Calibration Description:
HPGE10 S23325 10_20131230002_EffCal

Energy Calibration Fit
Energy = 0.0309 +0.125067*Channel -5.40063e-009*Channel**2
FWHM (ch) = 6.6891 +0.000706*Channel +8.51382e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
974.30	121.78	121.88	-0.08%	0.91	0.92	-1.74%
1956.06	244.67	244.65	0.01%	1.02	1.01	0.98%
2751.85	344.30	344.16	0.04%	1.10	1.09	1.01%
6229.60	778.90	778.94	-0.01%	1.44	1.43	0.84%
7710.59	964.00	964.05	-0.01%	1.56	1.58	-1.56%
11263.58	1408.08	1408.05	0.00%	1.97	1.96	0.34%

Efficiency Calibration Fit
Polynomial Uncertainty = 0.9077 %
Coefficients:
-0.405663 -4.247105 0.428613 -0.050516 0.001891 -0.000039

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.9104E-004	3.9052E-004	0.13%
59.54	4.3412E-003	4.3611E-003	-0.46%
88.03	2.2760E-002	2.2293E-002	2.05%
122.06	3.6359E-002	3.6522E-002	-0.45%
165.85	3.9843E-002	4.0637E-002	-1.99%
279.17	3.3898E-002	3.3619E-002	0.82%
391.71	2.7263E-002	2.7019E-002	0.89%
661.66	1.9310E-002	1.8746E-002	2.92%
898.02	1.4720E-002	1.5083E-002	-2.46%
1173.23	1.2257E-002	1.2360E-002	-0.84%
1332.51	1.0979E-002	1.1180E-002	-1.83%
1836.01	8.6118E-003	8.4538E-003	1.83%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 14:17:14
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140102001_Energy.An1

Sample description
     RICAL,S19586,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\11_20140102001_Energy.An1

Acquisition information
       Start time:                 1/2/2014 16:24:33
       Live time:               1200
       Real time:               1294
       Dead time:                  7.26 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_QC.Clb
     HPGE11 S19586 11_20140102001_Energy


       Energy Calibration
            Created:               2/21/2013 21:50:50
            Zero offset:           0.103 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -9.497E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 21:48:39
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.12keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:17:14
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1028

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
39.96	9556.	2.07	1.07	1.180E-02				
45.44	4998.	2.48	0.74	1.174E-02				
46.77	1499.	7.46	0.74	1.173E-02				
121.94	118482.	0.34	0.84	1.095E-02	121.78	28.410	1.009E+00	QA122
244.57	26961.	0.68	0.97	9.690E-03	244.70	7.550	9.767E-01	Qa245
295.84	1488.	7.78	1.05	8.704E-03				
344.03	77630.	0.40	1.10	7.776E-03	344.28	26.590	9.954E-01	Qa344
367.45	2709.	3.92	1.06	7.588E-03				
410.91	5911.	2.35	1.12	7.245E-03				
443.76	7512.	1.63	1.20	6.986E-03				
488.55	1097.	8.16	1.10	6.632E-03				
563.90	1026.	6.49	1.31	6.037E-03				
566.49	373.	17.04	1.31	6.017E-03				
586.22	1041.	8.32	1.48	5.861E-03				
674.57	408.	13.17	1.42	5.163E-03				
678.70	961.	6.19	1.42	5.130E-03				
688.58	1697.	6.67	1.45	5.052E-03				
719.46	624.	12.49	0.90	4.808E-03				
764.68	566.	17.53	1.12	4.451E-03				
778.92	21114.	0.87	1.52	4.339E-03	778.90	12.970	9.941E-01	Qa779
810.43	522.	12.47	0.78	4.254E-03				
867.35	6557.	2.27	1.61	4.099E-03				
919.32	793.	11.28	0.93	3.959E-03				
926.32	439.	18.89	0.85	3.940E-03				
964.01	20396.	0.84	1.66	3.838E-03	964.08	14.500	9.713E-01	Qa964
1005.05	1162.	5.88	1.47	3.745E-03				
1085.86	13138.	0.95	1.77	3.563E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:17:14
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1089.87	2280.	3.23	1.77	3.554E-03				
1112.01	17438.	0.95	1.81	3.504E-03				
1212.96	1626.	3.17	1.86	3.276E-03				
1249.47	536.	10.97	1.20	3.193E-03				
1299.15	1848.	2.87	1.80	3.081E-03				
1408.00	22172.	0.70	2.01	2.836E-03	1408.01	20.850	9.937E-01	Qa1408
1457.52	584.	4.69	1.50	2.724E-03				
1528.56	436.	5.11	0.71	2.564E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Channel	Peak Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.58	39.96	8030.	9556.	8.100E+05	4.15	1.072	-	s
362.40	45.42	5158.	4998.	4.256E+05	4.95	0.736	Pb-210	D
373.06	46.75	5500.	1499.	1.278E+05	14.92	0.737	Am-241	D
2364.38	295.84	2765.	1488.	1.709E+05	15.55	1.050	Pb-214	
2937.02	367.45	1861.	2709.	3.570E+05	7.84	1.056	-	s
3284.53	410.91	2299.	5911.	8.158E+05	4.69	1.121	-	
3547.30	443.76	1666.	7512.	1.075E+06	3.26	1.204	-	
3905.51	488.55	1505.	1097.	1.654E+05	16.32	1.105	-	
4508.18	563.84	1708.	1026.	1.700E+05	12.99	1.311	Cs-134	D
4528.88	566.42	1832.	373.	6.197E+04	34.08	1.313	-	D
4686.69	586.22	1505.	1041.	1.777E+05	16.65	1.477	-	
5393.70	674.60	1238.	441.	8.550E+04	34.76	0.726	-	s
5426.79	678.73	1274.	999.	1.947E+05	16.59	1.186	-	
5505.54	688.58	1850.	1697.	3.359E+05	13.33	1.455	-	
5752.62	719.46	1267.	624.	1.297E+05	24.98	0.895	-	s
6114.39	764.68	1626.	566.	1.271E+05	35.06	1.120	Pa-234m	s
6480.41	810.43	951.	522.	1.227E+05	24.93	0.779	-	s
6935.87	867.35	2196.	6557.	1.599E+06	4.54	1.607	-	
7351.74	919.32	1145.	793.	2.004E+05	22.56	0.929	-	s
7407.77	926.32	1093.	439.	1.115E+05	37.78	0.854	-	s
8037.81	1005.05	585.	1162.	3.103E+05	11.76	1.471	Eu-154	
8683.99	1085.79	1716.	12698.	3.564E+06	2.41	1.716	-	
8716.15	1089.80	1331.	1569.	4.414E+05	11.75	1.229	-	sD
8893.88	1112.01	1155.	17438.	4.977E+06	1.90	1.814	Eu-152	
9701.58	1212.91	737.	1810.	5.525E+05	10.20	1.973	-	
9994.28	1249.47	348.	536.	1.679E+05	21.93	1.203	-	s
10391.96	1299.15	148.	1848.	5.999E+05	5.74	1.798	-	
11660.00	1457.52	17.	584.	2.143E+05	9.38	1.496	-	s
12228.85	1528.56	7.	436.	1.699E+05	10.23	0.707	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:17:14
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102001_Energy.An1

This section based on library: QCDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.94	121.94	8884.	118482.	98.735	0.68	0.843
Qa-245	1954.34	244.56	4582.	27248.	22.706	1.61	0.974
Qa-344	2749.74	344.03	3542.	77630.	64.691	0.80	1.101
Qa-779	6228.35	778.92	1960.	21114.	17.595	1.75	1.518
Qa-964	7709.38	964.01	1210.	20354.	16.962	1.68	1.663
Qa-1408	11263.49	1408.00	218.	22172.	18.477	1.41	2.010

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Code	MDA Value µCi			COMMENTS
QA-122		1.0088E+00						4.94E+03	
			121.78	1.009E+00	(	3.763E-03	3.38E-01	2.84E+01	G
Qa-245		9.8707E-01						4.94E+03	
			244.70	9.871E-01	(	1.152E-02	8.03E-01	7.55E+00	G
Qa-344		9.9542E-01						4.94E+03	
			344.28	9.954E-01	(	3.591E-03	4.01E-01	2.66E+01	G
Qa-779		9.9414E-01						4.94E+03	
			778.90	9.941E-01	(	9.841E-03	8.74E-01	1.30E+01	G
Qa-964		9.6931E-01						4.94E+03	
			964.08	9.693E-01	(	7.847E-03	8.39E-01	1.45E+01	G
Qa-1408		9.9371E-01						4.94E+03	
			1408.01	9.937E-01	(	3.202E-03	7.03E-01	2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:17:14
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102001_Energy.An1

% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.5742E-01	1.0088E+00	6.8162E-03	1.1537E-01	3.763E-03
Qa-245	8.3898E-01	9.8707E-01	1.5851E-02	1.1380E-01	1.152E-02
Qa-344	8.4609E-01	9.9542E-01	7.9917E-03	1.1392E-01	3.591E-03
Qa-779	8.4500E-01	9.9414E-01	1.7377E-02	1.1482E-01	9.841E-03
Qa-964	8.2389E-01	9.6931E-01	1.6271E-02	1.1185E-01	7.847E-03
Qa-1408	8.4463E-01	9.9371E-01	1.3967E-02	1.1430E-01	3.202E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (579.4 to 2041.3 keV) 5.056E+00 µCi
Total Decayed Activity (579.4 to 2041.3 keV) 5.9484110E+00 µCi

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:17:14
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102001_Energy.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 11_Soil 250ml TunaCan_01-02-2014.Clb
Energy Calibration Date: 1/7/2014 Time: 07:07:34
Efficiency Calibration Date: 1/3/2014 Time: 14:18:33

Calibration Description:
HPGE11 S23325 11_20140102002_EffCal

Energy Calibration Fit
Energy = 0.1174 +0.125120*Channel -1.07184e-008*Channel**2
FWHM (ch) = 5.7600 +0.001075*Channel -1.52036e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.93	121.78	121.97	-0.15%	0.85	0.85	-0.10%
1954.24	244.67	244.59	0.03%	0.99	0.98	1.40%
2749.70	344.30	344.08	0.06%	1.07	1.08	-0.89%
6228.30	778.90	778.99	-0.01%	1.45	1.48	-2.65%
7709.30	964.00	964.07	-0.01%	1.69	1.64	2.55%
11263.36	1408.08	1408.03	0.00%	1.98	1.99	-0.42%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0987 %
Coefficients:
-0.389026 -4.316173 0.421471 -0.052531 0.002317 -0.000045

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.1698E-003	2.1663E-003	0.16%
59.54	9.2183E-003	9.2714E-003	-0.58%
88.03	2.5586E-002	2.4875E-002	2.78%
122.06	3.4140E-002	3.4560E-002	-1.23%
165.85	3.6166E-002	3.6856E-002	-1.91%
279.17	3.0944E-002	3.0501E-002	1.43%
391.71	2.4890E-002	2.4766E-002	0.50%
661.66	1.8028E-002	1.7443E-002	3.24%
898.02	1.3678E-002	1.4148E-002	-3.44%
1173.23	1.1583E-002	1.1677E-002	-0.81%
1332.51	1.0506E-002	1.0600E-002	-0.90%
1836.01	8.2242E-003	8.0984E-003	1.53%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 14:24:47
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140102002_EffCal.An1

Sample description
     RICAL,S23325,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\11_20140102002_EffCal.An1

Acquisition information
       Start time:                 1/2/2014 17:15:09
       Live time:              10800
       Real time:              11075
       Dead time:                  2.48 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/3/2014 14:22:18
            Zero offset:           0.046 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.133E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      EfficiencyCalibration.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.07keV )
       Stop channel:           16336 (  2041.08keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:24:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0757

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
30.88	5329.	2.71	0.75	0.000E+00				
32.16	2952.	5.86	0.75	0.000E+00				
46.52	13797.	2.31	0.78	2.159E-03	46.54	4.250	1.410E+04	Pb210
59.49	40636.	1.00	0.78	9.241E-03	59.54	35.900	1.131E+03	AM241
72.81	1097.	17.44	0.80	1.722E-02				
88.06	114587.	0.46	0.81	2.489E-02	88.03	3.610	1.560E+04	CD109
122.17	69236.	0.59	0.85	3.458E-02	122.06	85.600	3.477E+02	CO57
136.61	9130.	2.71	0.90	3.618E-02				
165.96	64822.	0.58	0.88	3.685E-02	165.85	79.900	5.185E+02	Ce139
238.49	1064.	13.40	0.97	3.310E-02				
254.95	1960.	9.67	0.76	3.203E-02				
278.99	18937.	1.53	1.02	3.051E-02	279.17	81.500	1.110E+03	Hg203
351.51	1126.	13.45	1.12	2.655E-02				
391.48	51944.	0.60	1.12	2.477E-02	391.71	64.000	9.265E+02	SN113
513.86	34260.	0.86	1.28	2.068E-02	513.99	95.700	1.162E+03	Sr85
609.13	838.	19.79	1.44	1.845E-02				
661.65	73259.	0.48	1.40	1.744E-02	661.66	85.100	4.623E+02	CS137
898.07	62935.	0.43	1.60	1.415E-02	898.02	93.700	1.467E+03	Y898
1173.24	82475.	0.41	1.84	1.168E-02	1173.23	99.970	6.993E+02	Co1173
1324.92	1148.	11.53	1.16	1.065E-02				
1332.52	74825.	0.41	1.99	1.060E-02	1332.51	99.990	6.988E+02	Co1332
1461.11	686.	11.73	0.83	9.853E-03				
1835.78	41724.	0.52	2.36	8.099E-03	1836.01	99.200	1.605E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:24:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.44	30.88	7726.	5329.	0.000E+00	5.41	0.750	-	D
256.66	32.16	13505.	2952.	0.000E+00	11.73	0.751	-	D
581.81	72.84	16748.	1160.	6.733E+04	38.47	0.773	-	
1091.56	136.61	14521.	9130.	2.523E+05	5.43	0.897	-	
1905.29	238.41	10304.	1164.	3.517E+04	33.60	1.053	PB-212	
2037.59	254.95	9425.	1960.	6.120E+04	19.33	0.763	TH-227	s
2809.61	351.51	6058.	1126.	4.241E+04	26.90	1.117	PB-214	s
4869.88	609.13	5223.	838.	4.541E+04	39.58	1.442	BI-214	
10598.51	1324.92	2184.	1148.	1.078E+05	23.07	1.159	-	sM
11689.10	1461.11	1015.	686.	6.960E+04	23.46	0.829	K-40	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyCalibration.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.43	46.52	22524.	13797.	1.277	4.62	0.778
AM-241	475.10	59.49	28387.	40636.	3.763	2.00	0.784
CD-109	703.44	88.06	31848.	116709.	10.806	0.86	0.810
CO-57	976.11	122.17	22797.	69236.	6.411	1.19	0.847
Ce-139	1326.12	165.96	17558.	64822.	6.002	1.16	0.880
Hg-203	2229.78	278.99	12759.	18937.	1.753	3.06	1.025
SN-113	3129.23	391.48	8594.	51944.	4.810	1.19	1.117
Sr-85	4108.05	513.88	7137.	33676.	3.118	1.56	1.278
CS-137	5290.03	661.65	7453.	73259.	6.783	0.96	1.401
Y-898	7181.30	898.03	6579.	63963.	5.922	1.05	1.595
Co-1173	9384.11	1173.24	3973.	82475.	7.637	0.83	1.839
Co-1332	10659.36	1332.52	2378.	74825.	6.928	0.83	1.986
Y-1836	14690.61	1835.78	567.	41724.	3.863	1.04	2.364

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:24:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210		1.4097E+04				8.12E+03	
			46.54	1.410E+04	(	7.174E+02 2.31E+00 4.25E+00	G
AM-241		1.1314E+03				1.58E+05	
			59.54	1.131E+03	(	2.193E+01 1.00E+00 3.59E+01	G
CD-109		1.5886E+04				4.63E+02	
			88.03	1.589E+04	(	1.136E+02 4.32E-01 3.61E+00	G
CO-57		3.4765E+02				2.72E+02	
			122.06	3.477E+02	(	3.547E+00 5.95E-01 8.56E+01	G
Ce-139		5.1847E+02				1.38E+02	
			165.85	5.185E+02	(	4.960E+00 5.81E-01 7.99E+01	G
Hg-203		1.1103E+03				4.66E+01	
			279.17	1.110E+03	(	3.102E+01 1.53E+00 8.15E+01	G
SN-113		9.2647E+02				1.15E+02	
			391.71	9.265E+02	(	7.753E+00 5.96E-01 6.40E+01	G
Sr-85		1.1426E+03				6.48E+01	
			513.99	1.143E+03	(	1.345E+01 7.78E-01 9.57E+01	G
CS-137		4.6234E+02				1.10E+04	
			661.66	4.623E+02	(	2.556E+00 4.81E-01 8.51E+01	G
Y-898		1.4910E+03				1.07E+02	
			898.02	1.491E+03	(	8.874E+00 5.25E-01 9.37E+01	G
Co-1173		6.9931E+02				1.92E+03	
			1173.23	6.993E+02	(	2.514E+00 4.15E-01 1.00E+02	G
Co-1332		6.9877E+02				1.92E+03	
			1332.51	6.988E+02	(	2.147E+00 4.14E-01 1.00E+02	G
Y-1836		1.6049E+03				1.07E+02	
			1836.01	1.605E+03	(	4.372E+00 5.19E-01 9.92E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 14:24:47
Curtis & Tompkins HPS Lab Spectrum name: 11_20140102002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting Bq	2 Sigma Total Bq	MDA
Pb-210	1.3875E+04	1.4097E+04	6.5149E+02	1.5368E+03	7.174E+02
AM-241	1.1305E+03	1.1314E+03	2.2655E+01	9.2042E+01	2.193E+01
CD-109	1.2034E+04	1.5886E+04	1.3711E+02	1.3203E+03	1.136E+02
CO-57	2.1670E+02	3.4765E+02	4.1351E+00	2.3270E+01	3.547E+00
Ce-139	2.0382E+02	5.1847E+02	6.0296E+00	3.2717E+01	4.960E+00
Hg-203	7.0535E+01	1.1103E+03	3.3989E+01	7.5547E+01	3.102E+01
SN-113	3.0345E+02	9.2647E+02	1.1039E+01	5.2000E+01	7.753E+00
Sr-85	1.5755E+02	1.1426E+03	1.7780E+01	6.5568E+01	1.345E+01
CS-137	4.5697E+02	4.6234E+02	4.4436E+00	2.7342E+01	2.556E+00
Y-898	4.4676E+02	1.4910E+03	1.5647E+01	8.3943E+01	8.874E+00
Co-1173	6.5416E+02	6.9931E+02	5.8016E+00	3.6992E+01	2.514E+00
Co-1332	6.5366E+02	6.9877E+02	5.7867E+00	3.7335E+01	2.147E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 14:24:47
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140102002_EffCal.An1

 Y-1836       4.8089E+02    1.6049E+03   1.6657E+01    1.2822E+02  4.372E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   37.3 to  2041.1 keV)     3.068E+04  Bq
 Total Decayed Activity (   37.3 to  2041.1 keV) 4.0116000E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 18:32:39
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140103003_EffVerif.An1

Sample description
     RICV|S22147|Efficiency Verification


Spectrum Filename: C:\User\SPC\Det11\11_20140103003_EffVerif.An1

Acquisition information
       Start time:                 1/3/2014 15:29:27
       Live time:              10800
       Real time:              10985
       Dead time:                  1.68 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_Soil 250ml TunaCan_01-02-2014.Clb
     HPGE11 S23325 11_20140102002_EffCal


       Energy Calibration
            Created:               1/3/2014 15:27:04
            Zero offset:           0.072 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.292E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 14:18:33
            Type:                  Polynomial
            Uncertainty:           1.099 %
            Coefficients:         -0.389026  -4.316173   0.421471
                                  -0.052531   0.002317  -0.000045

Library Files
       Main analysis library:      EfficiencyVerification.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.10keV )
       Stop channel:           16336 (  2041.11keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 18:32:39
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103003_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0894

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.49	13083.	1.99	0.78	2.142E-03	46.54	100.000	5.770E+02	Pb210
59.52	38931.	0.86	0.79	9.257E-03	59.54	100.000	3.894E+02	AM241
88.09	85216.	0.50	0.80	2.490E-02	88.03	100.000	5.500E+02	CD109
122.21	41253.	0.77	0.85	3.458E-02	122.06	100.000	2.820E+02	CO57
136.68	5329.	3.85	0.86	3.619E-02				
165.99	25010.	1.09	0.90	3.685E-02	165.85	100.000	3.996E+02	Ce139
238.54	916.	17.16	0.63	3.309E-02				
255.02	771.	14.40	0.98	3.202E-02				
279.11	1243.	8.69	1.01	3.050E-02	279.17	100.000	8.890E+02	Hg203
351.68	1026.	15.53	0.92	2.654E-02				
391.54	16867.	1.27	1.15	2.477E-02	391.71	100.000	5.759E+02	SN113
510.58	674.	13.59	1.25	2.077E-02				
513.97	4926.	2.22	1.25	2.068E-02	513.99	100.000	1.118E+03	Sr85
609.36	878.	13.85	1.19	1.844E-02				
661.74	71736.	0.45	1.39	1.744E-02	661.66	100.000	3.897E+02	CS137
898.12	19368.	1.20	1.55	1.415E-02	898.02	100.000	1.381E+03	Y898
1173.32	77829.	0.40	1.86	1.168E-02	1173.23	100.000	7.044E+02	Co1173
1332.60	70827.	0.41	2.02	1.060E-02	1332.51	100.000	7.061E+02	Co1332
1460.78	788.	9.72	2.13	9.855E-03				
1835.76	12697.	0.97	2.34	8.099E-03	1836.01	100.000	1.581E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
1091.66	136.68	9682.	5329.	1.473E+05	7.70	0.860	-

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 18:32:39
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103003_EffVerif.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
1905.78	238.54	6800.	916.	2.768E+04	34.33	0.632	-	s
2037.44	255.01	4690.	668.	2.086E+04	36.35	0.253	-	s
2810.24	351.68	5539.	1026.	3.867E+04	31.05	0.920	-	
4870.80	609.36	3024.	878.	4.761E+04	27.70	1.190	-	
11685.57	1460.78	619.	788.	7.994E+04	19.44	2.133	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	370.89	46.49	14834.	13083.	1.211	3.99	0.783
AM-241	475.00	59.52	18516.	38931.	3.605	1.73	0.795
CD-109	703.31	88.09	22018.	85216.	7.890	1.00	0.800
CO-57	976.01	122.21	13642.	41253.	3.820	1.53	0.849
Ce-139	1325.92	165.99	10829.	25010.	2.316	2.17	0.897
Hg-203	2230.59	279.17	5182.	1237.	0.115	17.42	1.008D
SN-113	3128.97	391.54	5808.	16867.	1.562	2.54	1.149
Sr-85	4108.09	513.99	4182.	4654.	0.431	6.58	1.276D
CS-137	5289.79	661.74	5011.	71736.	6.642	0.91	1.385
Y-898	7181.00	898.12	4346.	19293.	1.786	2.24	1.554
Co-1173	9383.68	1173.32	2574.	77550.	7.181	0.80	1.857
Co-1332	10658.98	1332.60	1477.	70827.	6.558	0.82	2.015
Y-1836	14689.97	1835.76	255.	12697.	1.176	1.94	2.338

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Peak Code	Peak MDA Value GPS/Source	COMMENTS
Pb-210		5.7702E+02				8.12E+03	
			46.54	5.770E+02	(	1.252E+01 1.99E+00 1.00E+02	G
AM-241		3.8943E+02				1.58E+05	
			59.54	3.894E+02	(	3.171E+00 8.63E-01 1.00E+02	G

```
      ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 18:32:39
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140103003_EffVerif.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

CD-109       5.4995E+02                                        4.63E+02
                             88.03 5.500E+02  (  2.231E+00 5.01E-01 1.00E+02 G

CO-57        2.8199E+02                                        2.72E+02
                            122.06 2.820E+02  (  1.860E+00 7.66E-01 1.00E+02 G

Ce-139       3.9963E+02                                        1.38E+02
                            165.85 3.996E+02  (  3.874E+00 1.09E+00 1.00E+02 G

Hg-203       8.8418E+02                                        4.66E+01
                            279.17 8.842E+02  (  1.199E+02 8.71E+00 1.00E+02 G

SN-113       5.7586E+02                                        1.15E+02
                            391.71 5.759E+02  (  6.062E+00 1.27E+00 1.00E+02 G

Sr-85        1.0566E+03                                        6.48E+01
                            513.99 1.057E+03  (  3.421E+01 3.29E+00 1.00E+02 G

CS-137       3.8972E+02                                        1.10E+04
                            661.66 3.897E+02  (  8.961E-01 4.53E-01 1.00E+02 G

Y-898        1.3754E+03                                        1.07E+02
                            898.02 1.375E+03  (  1.095E+01 1.12E+00 1.00E+02 G

Co-1173      7.0186E+02                                        1.92E+03
                           1173.23 7.019E+02  (  1.070E+00 4.01E-01 1.00E+02 G

Co-1332      7.0615E+02                                        1.92E+03
                           1332.51 7.061E+02  (  8.929E-01 4.11E-01 1.00E+02 G

Y-1836       1.5813E+03                                        1.07E+02
                           1836.01 1.581E+03  (  4.634E+00 9.68E-01 1.00E+02 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
```

library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	5.5921E+02	5.7702E+02	3.9854E+00%	1.0647E+01%	1.252E+01
AM-241	3.8880E+02	3.8943E+02	1.7269E+00%	8.0720E+00%	3.171E+00
CD-109	3.1720E+02	5.4995E+02	1.0015E+00%	8.3264E+00%	2.231E+00
CO-57	1.1052E+02	2.8199E+02	1.5325E+00%	6.7629E+00%	1.860E+00
Ce-139	6.2832E+01	3.9963E+02	2.1715E+00%	6.5715E+00%	3.874E+00
Hg-203	3.7543E+00	8.8418E+02	1.7418E+01%	1.8448E+01%	1.199E+02
SN-113	6.3062E+01	5.7586E+02	2.5406E+00%	6.0446E+00%	6.062E+00
Sr-85	2.0835E+01	1.0566E+03	6.5849E+00%	8.5947E+00%	3.421E+01
CS-137	3.8079E+02	3.8972E+02	9.0690E-01%	5.9053E+00%	8.961E-01
Y-898	1.2627E+02	1.3754E+03	2.2396E+00%	5.9675E+00%	1.095E+01
Co-1173	6.1491E+02	7.0186E+02	8.0262E-01%	5.2857E+00%	1.070E+00
Co-1332	6.1867E+02	7.0615E+02	8.2117E-01%	5.3418E+00%	8.929E-01
Y-1836	1.4517E+02	1.5813E+03	1.9369E+00%	8.1549E+00%	4.634E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (284.6 to 2041.1 keV) 3.412E+03 GPS/Source
Total Decayed Activity (284.6 to 2041.1 keV) 9.4691035E+03 GPS/Source

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 18:32:39
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103003_EffVerif.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 11_Soil 250ml TunaCan_01-02-2014.Clb
Energy Calibration Date: 1/8/2014 Time: 07:30:05
Efficiency Calibration Date: 1/3/2014 Time: 14:18:33

Calibration Description:
HPGE11 S23325 11_20140102002_EffCal

Energy Calibration Fit
Energy = 0.1247 +0.125122*Channel -1.05437e-008*Channel**2
FWHM (ch) = 5.9057 +0.000996*Channel -7.52245e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.85	121.78	121.97	-0.15%	0.85	0.86	-1.26%
1954.16	244.67	244.59	0.03%	0.97	0.98	-1.00%
2749.58	344.30	344.08	0.06%	1.10	1.07	2.78%
6228.10	778.90	778.99	-0.01%	1.47	1.48	-0.30%
7709.06	964.00	964.07	-0.01%	1.63	1.64	-0.66%
11262.97	1408.08	1408.03	0.00%	2.02	2.02	0.24%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0987 %
Coefficients:
-0.389026 -4.316173 0.421471 -0.052531 0.002317 -0.000045

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.1698E-003	2.1663E-003	0.16%
59.54	9.2183E-003	9.2714E-003	-0.58%
88.03	2.5586E-002	2.4875E-002	2.78%
122.06	3.4140E-002	3.4560E-002	-1.23%
165.85	3.6166E-002	3.6856E-002	-1.91%
279.17	3.0944E-002	3.0501E-002	1.43%
391.71	2.4890E-002	2.4766E-002	0.50%
661.66	1.8028E-002	1.7443E-002	3.24%
898.02	1.3678E-002	1.4148E-002	-3.44%
1173.23	1.1583E-002	1.1677E-002	-0.81%
1332.51	1.0506E-002	1.0600E-002	-0.90%
1836.01	8.2242E-003	8.0984E-003	1.53%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 16:41:54
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103001_Energy.An1

Sample description
     RICAL,S19586,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\12_20140103001_Energy.An1

Acquisition information
       Start time:                 1/3/2014 16:03:18
       Live time:               1200
       Real time:               1250
       Dead time:                  4.04 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_QC.Clb
     HPGE12 S19586 12_20140103001_Energy


       Energy Calibration
            Created:               12/30/2012 16:03:40
            Zero offset:           0.126 keV
            Gain:                  0.125 keV/channel
            Quadratic:             4.164E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 16:03:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.12keV )
       Stop channel:           16336 (  2042.40keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0303

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
30.75	612.	12.50	0.58	1.178E-02				
40.00	2316.	7.17	1.14	1.169E-02				
45.48	1870.	5.63	0.80	1.164E-02				
46.84	654.	14.73	0.80	1.163E-02				
121.82	118954.	0.34	0.90	1.090E-02	121.78	28.410	1.018E+00	QA122
244.67	27593.	0.77	1.02	9.701E-03	244.70	7.550	9.985E-01	Qa245
295.92	1645.	6.73	1.00	8.641E-03				
329.56	527.	18.57	1.06	7.945E-03				
344.29	77333.	0.40	1.12	7.640E-03	344.28	26.590	1.009E+00	Qa344
367.75	2829.	4.02	0.90	7.453E-03				
411.20	5655.	1.98	1.14	7.107E-03				
444.08	7628.	1.66	1.16	6.845E-03				
488.75	991.	7.78	1.12	6.490E-03				
503.43	483.	16.18	0.73	6.373E-03				
564.13	1028.	6.40	1.31	5.889E-03				
566.33	335.	19.02	1.31	5.871E-03				
586.32	1010.	9.72	1.08	5.713E-03				
656.11	374.	19.34	0.50	5.157E-03				
674.65	441.	11.89	1.41	5.009E-03				
678.61	875.	6.72	1.41	4.978E-03				
688.73	1688.	7.29	1.27	4.898E-03				
719.27	650.	8.98	1.45	4.656E-03				
778.87	20649.	0.96	1.47	4.180E-03	778.90	12.970	1.009E+00	Qa779
810.47	589.	13.76	1.16	4.088E-03				
867.32	6276.	2.31	1.55	3.923E-03				
919.54	795.	9.74	1.36	3.771E-03				
925.77	497.	14.44	0.70	3.753E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
964.00	19905.	0.84	1.68	3.642E-03	964.08	14.500	9.990E-01	Qa964
1005.16	1080.	6.95	1.43	3.546E-03				
1085.87	12921.	0.92	1.75	3.359E-03				
1089.84	2194.	3.08	1.75	3.350E-03				
1112.04	16926.	0.93	1.68	3.298E-03				
1212.96	1769.	4.97	1.53	3.063E-03				
1249.38	381.	13.65	0.67	2.979E-03				
1299.19	1849.	2.87	1.53	2.863E-03				
1408.07	21025.	0.72	1.93	2.610E-03	1408.01	20.850	1.024E+00	Qa1408
1457.68	571.	4.18	1.44	2.495E-03				
1528.79	410.	4.94	0.45	2.330E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
245.08	30.75	2097.	612.	5.194E+04	25.00	0.585	-	s
319.11	40.00	6823.	2316.	1.981E+05	14.34	1.141	-	s
362.98	45.50	4609.	1870.	1.606E+05	11.26	0.798	PB-210	D
373.86	46.86	4314.	654.	5.627E+04	29.46	0.799	TH-227	D
2367.12	295.92	2592.	1645.	1.904E+05	13.46	1.004	PB-214	s
2636.31	329.56	2262.	527.	6.633E+04	37.14	1.058	TH-227	s
2941.90	367.75	2020.	2829.	3.796E+05	8.04	0.898	-	s
3289.55	411.20	1597.	5655.	7.957E+05	3.96	1.136	AC-228	
3552.70	444.08	1708.	7628.	1.114E+06	3.32	1.164	RA-223	
3910.10	488.75	1267.	991.	1.527E+05	15.55	1.119	PB-214	
4027.58	503.43	1341.	483.	7.582E+04	32.37	0.732	-	s
4513.18	564.25	1649.	1028.	1.745E+05	12.80	1.307	-	D
4530.78	566.45	1864.	335.	5.707E+04	38.05	1.309	-	D
4690.77	586.32	1724.	1010.	1.768E+05	19.43	1.081	-	
5249.10	656.11	1155.	374.	7.248E+04	38.68	0.496	-	s
5398.08	674.73	1191.	481.	9.596E+04	31.14	1.250	-	
5429.73	678.69	1460.	885.	1.778E+05	20.45	1.415	-	s
5510.12	688.73	2068.	1688.	3.446E+05	14.57	1.270	-	
5753.26	719.13	1452.	706.	1.516E+05	25.28	1.268	-	s
6484.03	810.47	1221.	589.	1.441E+05	27.51	1.160	-	s
6938.78	867.32	2068.	6276.	1.600E+06	4.61	1.555	-	
7356.49	919.54	898.	795.	2.109E+05	19.48	1.359	-	
7406.36	925.77	877.	497.	1.324E+05	28.88	0.704	-	s
8041.45	1005.16	713.	1080.	3.046E+05	13.91	1.429	-	s
8686.62	1085.82	1309.	12358.	3.679E+06	2.34	1.665	-	
8718.40	1089.80	1138.	1720.	5.136E+05	10.60	1.561	-	D
8896.33	1112.04	979.	16926.	5.132E+06	1.87	1.677	-	
9703.48	1212.96	685.	1769.	5.774E+05	9.94	1.531	-	
9994.77	1249.38	336.	381.	1.278E+05	27.30	0.669	-	s
10393.19	1299.19	142.	1849.	6.460E+05	5.75	1.529	-	

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103001_Energy.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
11660.65	1457.68	0.	571.	2.289E+05	8.37	1.438	-	s
12229.30	1528.79	0.	410.	1.760E+05	9.88	0.447	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.89	121.82	9627.	118954.	99.129	0.69	0.898
Qa-245	1956.99	244.67	4155.	27593.	22.994	1.55	1.017
Qa-344	2754.21	344.29	3413.	77333.	64.444	0.81	1.124
Qa-779	6231.22	778.87	2332.	20649.	17.207	1.91	1.466
Qa-964	7712.20	964.00	1045.	19773.	16.477	1.64	1.681
Qa-1408	11263.90	1408.07	216.	21025.	17.521	1.44	1.932

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Code	MDA Value µCi	COMMENTS
QA-122		1.0183E+00				4.94E+03	
			121.78	1.018E+00	(	3.937E-03	3.45E-01 2.84E+01 G
Qa-245		9.9849E-01				4.94E+03	
			244.70	9.985E-01	(	1.097E-02	7.73E-01 7.55E+00 G
Qa-344		1.0089E+00				4.94E+03	
			344.28	1.009E+00	(	3.587E-03	4.03E-01 2.66E+01 G
Qa-779		1.0094E+00				4.94E+03	
			778.90	1.009E+00	(	1.113E-02	9.57E-01 1.30E+01 G
Qa-964		9.9237E-01				4.94E+03	
			964.08	9.924E-01	(	7.697E-03	8.19E-01 1.45E+01 G

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103001_Energy.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Qa-1408	1.0239E+00					4.94E+03	
		1408.01	1.024E+00	(	3.467E-03	7.21E-01	2.09E+01 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.6540E-01	1.0183E+00	7.0185E-03	1.1646E-01	3.937E-03
Qa-245	8.4857E-01	9.9849E-01	1.5430E-02	1.1503E-01	1.097E-02
Qa-344	8.5738E-01	1.0089E+00	8.1313E-03	1.1546E-01	3.587E-03
Qa-779	8.5782E-01	1.0094E+00	1.9325E-02	1.1684E-01	1.113E-02

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 16:41:54
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103001_Energy.An1

 Qa-964       8.4337E-01    9.9237E-01   1.6264E-02    1.1445E-01  7.697E-03
 Qa-1408      8.7013E-01    1.0239E+00   1.4761E-02    1.1781E-01  3.467E-03
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  586.2 to  2042.4 keV)     5.143E+00  µCi
 Total Decayed Activity (  586.2 to  2042.4 keV) 6.0512171E+00  µCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 12_Soil 250ml TunaCan_01-03-2014.Clb
Energy Calibration Date: 1/8/2014 Time: 07:54:39
Efficiency Calibration Date: 1/3/2014 Time: 19:51:11

Calibration Description:
HPGE12 S23325 12_20140103002_EffCal

Energy Calibration Fit
Energy = 0.0939 +0.124966*Channel +3.48228e-009*Channel**2
FWHM (ch) = 6.2423 +0.000966*Channel -1.76989e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.89	121.78	121.80	-0.02%	0.89	0.90	-0.28%
1956.90	244.67	244.65	0.01%	1.01	1.01	0.63%
2754.11	344.30	344.29	0.00%	1.09	1.10	-0.66%
6230.97	778.90	778.89	0.00%	1.46	1.45	1.21%
7711.91	964.00	964.03	-0.00%	1.56	1.58	-1.12%
11263.37	1408.08	1408.07	0.00%	1.86	1.86	0.16%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0370 %
Coefficients:
-0.383371 -4.365972 0.460548 -0.057677 0.002462 -0.000050

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	7.0564E-004	7.0481E-004	0.12%
59.54	5.4777E-003	5.4997E-003	-0.40%
88.03	2.2152E-002	2.1771E-002	1.72%
122.06	3.4027E-002	3.4034E-002	-0.02%
165.85	3.6904E-002	3.7803E-002	-2.44%
279.17	3.2090E-002	3.1481E-002	1.90%
391.71	2.5170E-002	2.5287E-002	-0.47%
661.66	1.8058E-002	1.7473E-002	3.24%
898.02	1.3711E-002	1.4043E-002	-2.43%
1173.23	1.1371E-002	1.1521E-002	-1.32%
1332.51	1.0346E-002	1.0434E-002	-0.85%
1836.01	8.0582E-003	7.9410E-003	1.45%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 19:58:30
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103002_EffCal.An1

Sample description
     RICAL,S23325,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\12_20140103002_EffCal.An1

Acquisition information
       Start time:                 1/3/2014 16:45:23
       Live time:              10800
       Real time:              10964
       Dead time:                  1.49 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_Soil 250ml TunaCan_01-03-2014.Clb
     HPGE12 S23325 12_20140103002_EffCal


       Energy Calibration
            Created:               1/3/2014 19:56:47
            Zero offset:           0.028 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.230E-10 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 19:51:11
            Type:                  Polynomial
            Uncertainty:           1.037 %
            Coefficients:         -0.383371  -4.365972   0.460548
                                  -0.057677   0.002462  -0.000050

Library Files
       Main analysis library:      EfficiencyCalibration.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.02keV )
       Stop channel:           16336 (  2041.82keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 19:58:30
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0433

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
46.50	4676.	5.55	0.74	6.927E-04	46.54	4.250	1.469E+04	Pb210
59.47	24147.	1.44	0.81	5.463E-03	59.54	35.900	1.133E+03	AM241
87.99	100895.	0.50	0.85	2.175E-02	88.03	3.610	1.571E+04	CD109
122.01	68835.	0.65	0.88	3.402E-02	122.06	85.600	3.519E+02	CO57
136.43	9187.	2.54	0.92	3.634E-02				
165.81	65819.	0.54	0.93	3.780E-02	165.85	79.900	5.158E+02	Ce139
238.39	1415.	14.66	0.36	3.425E-02				
255.10	2239.	8.95	1.00	3.310E-02				
279.13	19354.	1.60	1.07	3.148E-02	279.17	81.500	1.116E+03	Hg203
351.82	1110.	14.73	1.00	2.720E-02				
391.74	52219.	0.64	1.16	2.529E-02	391.71	64.000	9.175E+02	SN113
510.71	1056.	10.64	1.24	2.100E-02				
514.10	33939.	0.62	1.25	2.090E-02	513.99	95.700	1.151E+03	Sr85
609.25	781.	15.86	1.27	1.853E-02				
661.67	73378.	0.51	1.36	1.747E-02	661.66	85.100	4.623E+02	CS137
814.02	705.	16.25	1.19	1.507E-02				
897.96	62856.	0.54	1.56	1.404E-02	898.02	93.700	1.486E+03	Y898
1173.17	80895.	0.42	1.76	1.152E-02	1173.23	99.970	6.955E+02	Co1173
1332.42	73664.	0.41	1.84	1.043E-02	1332.51	99.990	6.991E+02	Co1332
1460.86	817.	15.29	1.67	9.687E-03				
1835.98	40431.	0.54	2.17	7.941E-03	1836.01	99.200	1.596E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 19:58:30
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
1091.34	136.43	13664.	9187.	2.528E+05	5.07	0.915	-	
1907.15	238.39	11248.	1415.	4.130E+04	29.32	0.355	PB-212	s
2040.84	255.10	10238.	2239.	6.762E+04	17.90	1.004	TH-227	
2814.71	351.82	6742.	1110.	4.079E+04	29.47	1.001	PB-214	
4086.00	510.69	5781.	1056.	1.697E+04	21.28	1.245	TL-208	lD
4874.41	609.25	3729.	781.	4.213E+04	31.72	1.269	BI-214	s
6512.79	814.02	2891.	705.	4.679E+04	32.50	1.195	-	
11688.02	1460.86	1702.	817.	8.437E+04	30.59	1.673	K-40	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibration.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.87	46.50	18406.	4676.	0.433	11.09	0.738
AM-241	475.59	59.47	23693.	24147.	2.236	2.88	0.812
CD-109	703.81	87.99	33365.	100895.	9.342	1.00	0.853
CO-57	975.97	122.01	26957.	68835.	6.374	1.30	0.881
Ce-139	1326.44	165.81	15666.	65819.	6.094	1.08	0.933
Hg-203	2233.12	279.13	14155.	19354.	1.792	3.20	1.073
SN-113	3134.14	391.74	10138.	52219.	4.835	1.27	1.162
Sr-85	4113.02	514.09	9420.	33298.	3.083	1.81	1.264
CS-137	5293.85	661.67	8794.	73378.	6.794	1.02	1.364
Y-898	7184.42	897.97	6721.	62794.	5.814	1.07	1.556
Co-1173	9386.30	1173.17	4039.	80820.	7.483	0.84	1.757
Co-1332	10660.36	1332.42	2264.	73664.	6.821	0.82	1.836
Y-1836	14689.22	1835.98	783.	40411.	3.742	1.09	2.170

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 19:58:30
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210		1.4687E+04				8.12E+03	
			46.54	1.469E+04	(	1.994E+03 5.55E+00 4.25E+00 G	
AM-241		1.1333E+03				1.58E+05	
			59.54	1.133E+03	(	3.379E+01 1.44E+00 3.59E+01 G	
CD-109		1.5715E+04				4.63E+02	
			88.03	1.571E+04	(	1.330E+02 5.00E-01 3.61E+00 G	
CO-57		3.5186E+02				2.72E+02	
			122.06	3.519E+02	(	3.925E+00 6.51E-01 8.56E+01 G	
Ce-139		5.1579E+02				1.38E+02	
			165.85	5.158E+02	(	4.592E+00 5.41E-01 7.99E+01 G	
Hg-203		1.1156E+03				4.66E+01	
			279.17	1.116E+03	(	3.211E+01 1.60E+00 8.15E+01 G	
SN-113		9.1754E+02				1.15E+02	
			391.71	9.175E+02	(	8.292E+00 6.35E-01 6.40E+01 G	
Sr-85		1.1296E+03				6.48E+01	
			513.99	1.130E+03	(	1.543E+01 9.05E-01 9.57E+01 G	
CS-137		4.6232E+02				1.10E+04	
			661.66	4.623E+02	(	2.770E+00 5.09E-01 8.51E+01 G	
Y-898		1.4840E+03				1.07E+02	
			898.02	1.484E+03	(	9.093E+00 5.36E-01 9.37E+01 G	
Co-1173		6.9484E+02				1.92E+03	
			1173.23	6.948E+02	(	2.570E+00 4.18E-01 1.00E+02 G	
Co-1332		6.9911E+02				1.92E+03	
			1332.51	6.991E+02	(	2.130E+00 4.10E-01 1.00E+02 G	
Y-1836		1.5953E+03				1.07E+02	
			1836.01	1.595E+03	(	5.255E+00 5.44E-01 9.92E+01 G	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 19:58:30
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting Bq	2 Sigma Total Bq	MDA
Pb-210	1.4455E+04	1.4687E+04	1.6290E+03	2.1809E+03	1.994E+03
AM-241	1.1324E+03	1.1333E+03	3.2692E+01	9.5156E+01	3.379E+01
CD-109	1.1887E+04	1.5715E+04	1.5711E+02	1.3084E+03	1.330E+02
CO-57	2.1878E+02	3.5186E+02	4.5825E+00	2.3625E+01	3.925E+00
Ce-139	2.0177E+02	5.1579E+02	5.5836E+00	3.2475E+01	4.592E+00
Hg-203	6.9846E+01	1.1156E+03	3.5680E+01	7.6606E+01	3.211E+01
SN-113	2.9876E+02	9.1754E+02	1.1656E+01	5.1657E+01	8.292E+00
Sr-85	1.5413E+02	1.1296E+03	2.0440E+01	6.5655E+01	1.543E+01
CS-137	4.5692E+02	4.6232E+02	4.7037E+00	2.7385E+01	2.770E+00
Y-898	4.4185E+02	1.4840E+03	1.5903E+01	8.3613E+01	9.093E+00
Co-1173	6.4975E+02	6.9484E+02	5.8041E+00	3.6762E+01	2.570E+00
Co-1332	6.5374E+02	6.9911E+02	5.7362E+00	3.7345E+01	2.130E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 19:58:30
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103002_EffCal.An1

 Y-1836       4.7500E+02    1.5953E+03   1.7342E+01    1.2756E+02  5.255E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.8 keV)     3.109E+04  Bq
 Total Decayed Activity (   25.0 to  2041.8 keV) 4.0501047E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 10:41:59
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103004_EffVerif.An1

Sample description
     RICV|S22147|Efficiency Verification


Spectrum Filename: C:\User\SPC\Det12\12_20140103004_EffVerif.An1

Acquisition information
       Start time:                 1/3/2014 21:40:19
       Live time:              10800
       Real time:              10916
       Dead time:                  1.06 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_Soil 250ml TunaCan_01-03-2014.Clb
     HPGE12 S23325 12_20140103002_EffCal


       Energy Calibration
            Created:               1/3/2014 20:28:37
            Zero offset:           0.088 keV
            Gain:                  0.125 keV/channel
            Quadratic:             2.596E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/3/2014 19:51:11
            Type:                  Polynomial
            Uncertainty:           1.037 %
            Coefficients:         -0.383371  -4.365972   0.460548
                                  -0.057677   0.002462  -0.000050

Library Files
       Main analysis library:      EfficiencyVerification.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.08keV )
       Stop channel:           16336 (  2042.25keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 10:41:59
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103004_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0442

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
31.05	5597.	3.31	1.48	0.000E+00				
46.53	4342.	5.49	0.90	7.033E-04	46.54	100.000	5.886E+02	Pb210
59.53	22238.	1.51	0.83	5.493E-03	59.54	100.000	3.750E+02	AM241
88.04	71992.	0.61	0.86	2.178E-02	88.03	100.000	5.311E+02	CD109
122.06	40722.	0.88	0.87	3.403E-02	122.06	100.000	2.829E+02	CO57
136.50	5572.	2.67	0.90	3.635E-02				
165.85	25434.	1.05	0.92	3.780E-02	165.85	100.000	3.967E+02	Ce139
238.60	1248.	11.84	0.63	3.424E-02				
254.91	957.	18.10	1.03	3.312E-02				
279.14	1230.	11.67	1.07	3.148E-02	279.17	100.000	8.553E+02	Hg203
351.78	1069.	13.22	0.92	2.720E-02				
391.78	17368.	1.42	1.13	2.528E-02	391.71	100.000	5.816E+02	SN113
510.63	668.	13.74	1.27	2.100E-02				
514.14	4977.	2.21	1.27	2.090E-02	513.99	100.000	1.121E+03	Sr85
609.49	806.	15.14	0.59	1.852E-02				
661.72	72095.	0.47	1.35	1.747E-02	661.66	100.000	3.910E+02	CS137
898.05	19245.	1.26	1.51	1.404E-02	898.02	100.000	1.384E+03	Y898
1173.29	76373.	0.43	1.75	1.152E-02	1173.23	100.000	7.007E+02	Co1173
1332.57	69570.	0.41	1.86	1.043E-02	1332.51	100.000	7.047E+02	Co1332
1460.84	742.	10.81	1.14	9.687E-03				
1836.30	12266.	0.98	2.21	7.940E-03	1836.01	100.000	1.561E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 10:41:59
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103004_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
247.79	31.05	8000.	5597.	0.000E+00	6.63	1.475	-	s
1091.53	136.50	10593.	5759.	1.584E+05	7.62	0.963	-	
1908.52	238.60	6240.	1248.	3.645E+04	23.68	0.635	-	s
2039.02	254.91	7263.	957.	2.890E+04	36.20	1.030	-	s
2814.12	351.78	4846.	1069.	3.930E+04	26.44	0.919	-	
4875.98	609.49	3126.	806.	4.349E+04	30.28	0.587	-	s
11686.16	1460.84	640.	742.	7.661E+04	21.62	1.145	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerification.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	371.65	46.53	14205.	4342.	0.402	10.99	0.904s
AM-241	475.62	59.53	19667.	22238.	2.059	3.02	0.826
CD-109	703.81	88.04	24796.	71992.	6.666	1.22	0.860
CO-57	975.97	122.06	17596.	40722.	3.771	1.76	0.872
Ce-139	1326.43	165.85	10778.	25434.	2.355	2.11	0.925
Hg-203	2232.92	279.14	5535.	1230.	0.114	23.34	1.069
SN-113	3134.12	391.78	7355.	17368.	1.608	2.84	1.132
Sr-85	4111.92	513.99	4417.	4511.	0.418	6.99	1.188D
CS-137	5293.83	661.72	4871.	71934.	6.661	0.89	1.347
Y-898	7184.44	898.05	5299.	19245.	1.782	2.51	1.506
Co-1173	9386.22	1173.29	3200.	76337.	7.068	0.84	1.747
Co-1332	10660.22	1332.57	1401.	69487.	6.434	0.82	1.860
Y-1836	14689.01	1836.30	250.	12266.	1.136	1.96	2.212

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 10:41:59
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103004_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source		COMMENTS
Pb-210		5.8864E+02					8.12E+03	
			46.54	5.886E+02	*(	3.764E+01	5.49E+00	1.00E+02 G
AM-241		3.7500E+02					1.58E+05	
			59.54	3.750E+02	(	5.510E+00	1.51E+00	1.00E+02 G
CD-109		5.3106E+02					4.63E+02	
			88.03	5.311E+02	(	2.707E+00	6.11E-01	1.00E+02 G
CO-57		2.8285E+02					2.72E+02	
			122.06	2.829E+02	(	2.147E+00	8.81E-01	1.00E+02 G
Ce-139		3.9675E+02					1.38E+02	
			165.85	3.967E+02	(	3.773E+00	1.05E+00	1.00E+02 G
Hg-203		8.5526E+02					4.66E+01	
			279.17	8.553E+02	(	1.205E+02	1.17E+01	1.00E+02 G
SN-113		5.8163E+02					1.15E+02	
			391.71	5.816E+02	(	6.692E+00	1.42E+00	1.00E+02 G
Sr-85		1.0161E+03					6.48E+01	
			513.99	1.016E+03	(	3.488E+01	3.49E+00	1.00E+02 G
CS-137		3.9013E+02					1.10E+04	
			661.66	3.901E+02	(	8.819E-01	4.45E-01	1.00E+02 G
Y-898		1.3845E+03					1.07E+02	
			898.02	1.384E+03	(	1.220E+01	1.26E+00	1.00E+02 G
Co-1173		7.0035E+02					1.92E+03	
			1173.23	7.003E+02	(	1.209E+00	4.22E-01	1.00E+02 G
Co-1332		7.0387E+02					1.92E+03	
			1332.51	7.039E+02	(	8.835E-01	4.11E-01	1.00E+02 G
Y-1836		1.5606E+03					1.07E+02	
			1836.01	1.561E+03	(	4.683E+00	9.80E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 10:41:59
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103004_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210 #	5.7045E+02	5.8864E+02	1.0987E+01%	1.4771E+01%	3.764E+01
AM-241	3.7440E+02	3.7500E+02	3.0193E+00%	8.4434E+00%	5.510E+00
CD-109	3.0618E+02	5.3106E+02	1.2220E+00%	8.3557E+00%	2.707E+00
CO-57	1.1079E+02	2.8285E+02	1.7619E+00%	6.8186E+00%	2.147E+00
Ce-139	6.2297E+01	3.9675E+02	2.1067E+00%	6.5503E+00%	3.773E+00
Hg-203	3.6176E+00	8.5526E+02	2.3339E+01%	2.4117E+01%	1.205E+02
SN-113	6.3595E+01	5.8163E+02	2.8385E+00%	6.1758E+00%	6.692E+00
Sr-85	1.9982E+01	1.0161E+03	6.9866E+00%	8.9061E+00%	3.488E+01
CS-137	3.8119E+02	3.9013E+02	8.9065E-01%	5.9028E+00%	8.819E-01
Y-898	1.2689E+02	1.3845E+03	2.5127E+00%	6.0753E+00%	1.220E+01
Co-1173	6.1353E+02	7.0035E+02	8.4431E-01%	5.2922E+00%	1.209E+00
Co-1332	6.1661E+02	7.0387E+02	8.2259E-01%	5.3421E+00%	8.835E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 10:41:59
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103004_EffVerif.An1

 Y-1836       1.4303E+02    1.5606E+03   1.9608E+00%   8.1606E+00% 4.683E+00

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2042.3 keV)     3.393E+03  GPS/Source
 Total Decayed Activity (   25.1 to  2042.3 keV) 9.3667275E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Calibration Data from file: 12_Soil 250ml TunaCan_01-03-2014.Clb
Energy Calibration Date: 1/10/2014 Time: 06:54:40
Efficiency Calibration Date: 1/3/2014 Time: 19:51:11

Calibration Description:
HPGE12 S23325 12_20140103002_EffCal

Energy Calibration Fit
Energy = 0.0765 +0.124974*Channel +3.35111e-009*Channel**2
FWHM (ch) = 6.3851 +0.000923*Channel -1.36064e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
973.92	121.78	121.79	-0.01%	0.90	0.91	-0.74%
1956.94	244.67	244.66	0.01%	1.01	1.02	-0.98%
2754.11	344.30	344.29	0.00%	1.13	1.10	2.26%
6230.92	778.90	778.91	-0.00%	1.44	1.45	-0.78%
11262.96	1408.08	1408.08	0.00%	1.88	1.88	0.12%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.0370 %
Coefficients:
-0.383371 -4.365972 0.460548 -0.057677 0.002462 -0.000050

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	7.0564E-004	7.0481E-004	0.12%
59.54	5.4777E-003	5.4997E-003	-0.40%
88.03	2.2152E-002	2.1771E-002	1.72%
122.06	3.4027E-002	3.4034E-002	-0.02%
165.85	3.6904E-002	3.7803E-002	-2.44%
279.17	3.2090E-002	3.1481E-002	1.90%
391.71	2.5170E-002	2.5287E-002	-0.47%
661.66	1.8058E-002	1.7473E-002	3.24%
898.02	1.3711E-002	1.4043E-002	-2.43%
1173.23	1.1371E-002	1.1521E-002	-1.32%
1332.51	1.0346E-002	1.0434E-002	-0.85%
1836.01	8.0582E-003	7.9410E-003	1.45%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14221.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1137.90	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15446.00	557.60	4.70%	7/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	351.99	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1095.50	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	922.19	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	447.36	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1522.90	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	705.01	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	705.07	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1522.20	1510.00	4.00%	7/1/2013 09:00:00

Continuing Calibration Verification Raw Data

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE06
Seqnum : 1554009668001
Cal : 06-JAN-2014 17:29:29,04-JAN-2014 11:46:48

Run Name : QUALITY CONTROL CHEC
File : 6_20140106_001
Caldate : 06-JAN-2014, 04-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 06-JAN-2014 17:08
Dead Time : 4.43 %

Standards: S19584

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9905	uCi	.0057764	974.25	972.00 - 976.00	121.92	121.58 - 121.98	0.89	0.77 - 0.95	-0.95	5	
QA-779	1.000	1.018	uCi	.017302					1.53	1.40 - 1.71	1.78	5	
QA-1408	1.000	0.9897	uCi	.0127	11263.89	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	2.03	1.85 - 2.26	-1.03	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 17:29:47
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140106001_QCAsLeft.An1

Sample description
     RCCV,S19584,Quality control Check (QC Source #3)


Spectrum Filename: C:\User\SPC\Det6\6_20140106001_QCAsLeft.An1

Acquisition information
       Start time:                 1/6/2014 17:08:04
       Live time:               1200
       Real time:               1256
       Dead time:                  4.43 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_QC.Clb
     HPGE06 S19584 6_20140104001_Energy


       Energy Calibration
            Created:               1/6/2014 17:29:29
            Zero offset:           0.063 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -8.017E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/4/2014 11:46:48
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.08keV )
       Stop channel:           16336 (  2041.37keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 17:29:47
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0734

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.95	11348.	2.08	1.14	1.628E-02				
45.48	6449.	2.04	0.81	1.616E-02				
46.83	2086.	5.96	0.81	1.613E-02				
75.00	671.	16.50	0.54	1.548E-02				
121.92	155704.	0.29	0.89	1.440E-02	121.78	29.240	9.905E-01	QA122
244.56	32741.	0.73	0.99	1.159E-02	244.67	7.616	9.943E-01	Qa245
295.81	1871.	7.12	1.03	1.041E-02				
329.21	610.	17.21	0.95	9.643E-03				
344.18	92688.	0.35	1.11	9.299E-03	344.30	27.000	9.894E-01	Qa344
367.62	3146.	4.73	1.20	9.067E-03				
411.07	6990.	2.01	1.18	8.639E-03				
443.94	9238.	1.66	1.23	8.315E-03				
488.55	1182.	7.94	1.29	7.876E-03				
503.44	489.	15.95	1.20	7.729E-03				
564.02	1181.	5.93	1.30	7.131E-03				
586.31	1192.	9.78	1.14	6.913E-03				
656.66	355.	19.21	0.50	6.220E-03				
674.73	365.	16.36	1.41	6.042E-03				
678.72	1040.	6.18	1.41	6.002E-03				
688.58	2068.	5.91	1.39	5.905E-03				
719.33	755.	8.19	1.45	5.602E-03				
723.71	328.	17.94	1.45	5.558E-03				
764.95	483.	12.00	1.49	5.153E-03				
778.93	24747.	0.85	1.53	5.015E-03	778.90	12.990	1.018E+00	Qa779
810.33	936.	8.81	1.19	4.897E-03				
841.73	338.	18.72	0.44	4.778E-03				
867.40	7456.	2.15	1.61	4.681E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 17:29:47
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
919.33	808.	10.71	1.45	4.484E-03				
926.39	469.	10.83	1.63	4.458E-03				
964.03	23944.	0.81	1.66	4.315E-03	964.00	14.580	1.020E+00	Qa964
1005.27	1402.	7.51	1.43	4.222E-03				
1085.93	15109.	0.88	1.76	4.039E-03				
1089.87	2610.	2.99	1.77	4.030E-03				
1112.07	20370.	0.86	1.68	3.979E-03				
1123.10	333.	17.23	0.57	3.954E-03				
1212.93	2051.	3.72	1.81	3.750E-03				
1250.09	346.	18.40	0.31	3.666E-03				
1292.63	158.	15.27	1.93	3.569E-03				
1299.25	2037.	2.43	1.94	3.554E-03				
1408.03	25916.	0.64	2.03	3.307E-03	1408.08	21.210	9.900E-01	Qa1408
1457.60	669.	4.09	1.29	3.194E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.90	39.95	10309.	11348.	6.969E+05	4.16	1.137	-	s
363.03	45.48	5490.	6431.	3.981E+05	4.10	0.805	-	D
373.83	46.83	6797.	1982.	1.229E+05	12.59	0.807	-	D
599.06	75.00	3738.	671.	4.335E+04	33.00	0.536	-	s
2364.69	295.81	3245.	1871.	1.797E+05	14.25	1.026	-	
2631.76	329.21	2480.	610.	6.326E+04	34.43	0.950	-	
2938.89	367.62	3010.	3146.	3.469E+05	9.45	1.196	-	s
3286.46	411.07	2277.	6990.	8.091E+05	4.02	1.183	-	
3549.30	443.94	2385.	9238.	1.111E+06	3.32	1.232	-	
3906.12	488.55	1660.	1182.	1.501E+05	15.88	1.290	-	
4025.24	503.44	1398.	489.	6.327E+04	31.89	1.196	-	
4509.78	564.17	1862.	1181.	1.656E+05	11.86	1.304	-	D
4688.09	586.31	2254.	1192.	1.725E+05	19.55	1.140	-	
5250.85	656.66	1161.	355.	5.708E+04	38.42	0.500	-	s
5427.18	678.70	1642.	1073.	1.788E+05	17.63	1.466	-	
5506.19	688.58	2040.	2068.	3.503E+05	11.81	1.394	-	
5752.73	719.40	1554.	827.	1.476E+05	22.02	1.300	-	
6117.38	764.98	1417.	552.	1.071E+05	30.78	0.650	-	s
6480.24	810.33	1197.	936.	1.911E+05	17.63	1.186	-	s
6731.47	841.73	991.	338.	7.076E+04	37.43	0.443	-	s
6936.86	867.40	2438.	7456.	1.593E+06	4.30	1.612	-	
7352.41	919.33	1170.	808.	1.801E+05	21.41	1.449	-	s
7409.29	926.44	1377.	548.	1.229E+05	35.31	1.167	-	s
8040.11	1005.27	1125.	1402.	3.321E+05	15.01	1.431	-	s
8685.62	1085.85	1269.	15109.	3.741E+06	1.76	1.764	-	D
8717.15	1089.79	1738.	2610.	6.476E+05	5.98	1.767	-	D
8894.85	1112.07	1246.	20370.	5.119E+06	1.71	1.677	-	

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 17:29:47
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106001_QCAsLeft.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
8983.13	1123.10	592.	333.	8.422E+04	34.47	0.567	-	s
9702.08	1212.93	549.	2051.	5.470E+05	7.45	1.810	-	
9999.58	1250.09	494.	346.	9.439E+04	36.79	0.308	-	s
10392.07	1299.12	208.	2121.	5.968E+05	5.72	1.759	-	
11660.77	1457.60	8.	669.	2.093E+05	8.18	1.287	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.25	121.92	10088.	155704.	129.753	0.58	0.889
Qa-245	1954.88	244.56	5046.	32741.	27.284	1.46	0.986
Qa-344	2751.47	344.18	2747.	92688.	77.240	0.70	1.110
Qa-779	6229.01	778.93	2533.	24747.	20.623	1.70	1.527
Qa-964	7710.11	964.03	1640.	23914.	19.928	1.61	1.661
Qa-1408	11263.89	1408.03	167.	25907.	21.589	1.28	2.032

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi	COMMENTS
QA-122		9.9048E-01				4.64E+03	
			121.78	9.905E-01	(	1.489E-03	2.92E-01 2.92E+01 G
Qa-245		9.9427E-01				4.64E+03	
			244.67	9.943E-01	(	5.026E-03	7.29E-01 7.62E+00 G
Qa-344		9.8941E-01				4.64E+03	
			344.30	9.894E-01	(	1.304E-03	3.51E-01 2.70E+01 G
Qa-779		1.0178E+00				4.64E+03	
			778.90	1.018E+00	(	4.822E-03	8.50E-01 1.30E+01 G

```
      ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 17:29:47
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140106001_QCAsLeft.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Qa-964       1.0184E+00                                        4.64E+03
                            964.00 1.018E+00  (  4.018E-03 8.07E-01 1.46E+01 G

Qa-1408      9.8970E-01                                        4.64E+03
                           1408.08 9.897E-01  (  1.152E-03 6.42E-01 2.12E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 17:29:47
Curtis & Tompkins HPS Lab Spectrum name: 6_20140106001_QCAsLeft.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3257E-01	9.9048E-01	5.7764E-03	1.1322E-01	1.489E-03
Qa-245	8.3575E-01	9.9427E-01	1.4496E-02	1.1443E-01	5.026E-03
Qa-344	8.3167E-01	9.8941E-01	6.9468E-03	1.1317E-01	1.304E-03
Qa-779	8.5551E-01	1.0178E+00	1.7302E-02	1.1747E-01	4.822E-03
Qa-964	8.5602E-01	1.0184E+00	1.6427E-02	1.1742E-01	4.018E-03
Qa-1408	8.3192E-01	9.8970E-01	1.2700E-02	1.1370E-01	1.152E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1112.0 to 2041.4 keV) 5.043E+00 uCi
Total Decayed Activity (1112.0 to 2041.4 keV) 6.0000000E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE06
Seqnum : 1554011902001
Cal : 08-JAN-2014 06:45:06,04-JAN-2014 11:46:48

Run Name : QUALITY CONTROL CHEC
File : 6_20140108_001
Caldate : 08-JAN-2014, 04-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 06:22
Dead Time : 7.95 %

Standards: S19584

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9824	uCi	.0057552	974.37	972.00 - 976.00	121.93	121.58 - 121.98	0.85	0.77 - 0.95	-1.76	5	
QA-779	1.000	1.009	uCi	.017635					1.52	1.40 - 1.71	0.92	5	
QA-1408	1.000	0.9885	uCi	.012978	11264.15	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.99	1.85 - 2.26	-1.15	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 06:45:23
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108001_QCAsLeft.An1

Sample description
     RCCV,S19584,Quality control Check (QC Source #3)


Spectrum Filename: C:\User\SPC\Det6\6_20140108001_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 06:22:55
       Live time:               1200
       Real time:               1304
       Dead time:                  7.95 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_QC.Clb
     HPGE06 S19584 6_20140104001_Energy


       Energy Calibration
            Created:               1/8/2014 06:45:06
            Zero offset:           0.078 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.421E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/4/2014 11:46:48
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2041.45keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 06:45:23
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0776

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
40.01	11160.	2.02	1.12	1.628E-02				
45.50	6519.	2.02	0.78	1.616E-02				
46.87	1696.	7.32	0.78	1.612E-02				
75.12	726.	12.20	0.81	1.548E-02				
121.93	154396.	0.29	0.85	1.440E-02	121.78	29.240	9.824E-01	QA122
244.57	32159.	0.62	0.99	1.159E-02	244.67	7.616	9.768E-01	Qa245
295.83	1703.	7.34	1.05	1.041E-02				
329.36	540.	18.03	0.45	9.639E-03				
344.17	92610.	0.36	1.10	9.299E-03	344.30	27.000	9.888E-01	Qa344
367.59	3095.	4.38	1.09	9.067E-03				
411.09	6711.	2.18	1.18	8.639E-03				
415.93	520.	15.20	1.20	8.591E-03				
443.94	8961.	1.77	1.19	8.315E-03				
488.71	1257.	8.29	1.05	7.874E-03				
503.27	589.	14.43	1.08	7.731E-03				
564.05	1141.	6.24	1.30	7.131E-03				
566.53	433.	14.33	1.30	7.106E-03				
586.33	1152.	9.30	1.38	6.912E-03				
674.65	417.	13.88	1.40	6.043E-03				
678.70	1011.	6.32	1.41	6.003E-03				
688.75	1819.	3.85	1.42	5.904E-03				
719.34	784.	13.60	1.43	5.602E-03				
764.88	418.	13.10	1.48	5.153E-03				
778.92	24805.	0.86	1.53	5.015E-03	778.90	12.990	1.020E+00	Qa779
810.14	820.	12.84	1.25	4.897E-03				
867.38	7240.	1.90	1.63	4.681E-03				
919.46	769.	9.77	1.51	4.484E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 06:45:23
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
926.32	565.	13.31	0.38	4.458E-03				
964.09	23084.	0.70	1.65	4.315E-03	964.00	14.580	9.833E-01	Qa964
1005.15	1311.	5.90	1.58	4.222E-03				
1085.92	14792.	0.90	1.75	4.039E-03				
1089.80	2518.	3.18	1.75	4.030E-03				
1112.03	20634.	0.83	1.84	3.979E-03				
1123.03	396.	14.63	0.97	3.954E-03				
1213.06	1948.	2.84	1.85	3.750E-03				
1299.17	2213.	2.94	1.71	3.554E-03				
1408.03	25915.	0.65	1.99	3.307E-03	1408.08	21.210	9.903E-01	Qa1408
1457.59	665.	4.09	1.39	3.194E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
319.32	40.01	9688.	11160.	6.855E+05	4.04	1.118	-	s
363.20	45.49	5428.	6519.	4.035E+05	4.04	0.781	-	D
374.12	46.86	6850.	1696.	1.052E+05	14.63	0.783	-	D
599.90	75.15	3733.	553.	3.576E+04	32.37	0.813	-	D
2365.08	295.83	3094.	1703.	1.636E+05	14.68	1.051	-	
2633.22	329.36	2294.	540.	5.603E+04	36.07	0.447	-	s
2938.99	367.59	2684.	3095.	3.414E+05	8.76	1.086	-	
3286.87	411.09	2499.	6711.	7.769E+05	4.37	1.179	-	
3325.62	415.93	1431.	520.	6.053E+04	30.39	1.200	-	
3549.68	443.94	2592.	8961.	1.078E+06	3.55	1.195	-	
3907.76	488.71	1882.	1257.	1.597E+05	16.58	1.050	-	
4024.26	503.27	1510.	589.	7.624E+04	28.86	1.084	-	s
4510.41	564.17	1965.	1141.	1.600E+05	12.48	1.302	-	D
4530.27	566.65	1707.	433.	6.090E+04	28.67	1.304	-	D
4688.64	586.33	2025.	1152.	1.666E+05	18.61	1.380	-	
5427.43	678.68	1714.	982.	1.636E+05	19.54	1.134	-	
5507.67	688.71	2246.	1987.	3.365E+05	12.88	1.172	-	
5752.70	719.34	1926.	784.	1.399E+05	27.21	1.434	-	
6117.85	764.98	1346.	464.	8.997E+04	34.48	0.558	-	s
6479.25	810.14	1710.	820.	1.674E+05	25.67	1.255	-	s
6937.21	867.38	1940.	7240.	1.547E+06	3.80	1.629	-	
7353.90	919.46	976.	769.	1.715E+05	19.55	1.514	-	
7408.83	926.32	996.	565.	1.267E+05	26.61	0.378	-	s
8039.61	1005.15	754.	1311.	3.105E+05	11.80	1.581	-	
8686.00	1085.83	1512.	14792.	3.662E+06	1.80	1.748	-	D
8717.01	1089.71	1938.	2518.	6.248E+05	6.35	1.751	-	D
8894.97	1112.03	1168.	20634.	5.185E+06	1.67	1.840	-	s
8982.98	1123.03	592.	396.	1.001E+05	29.26	0.966	-	s
9704.10	1213.13	706.	2137.	5.700E+05	8.33	1.817	-	
10392.73	1299.17	264.	2213.	6.227E+05	5.87	1.708	-	

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 06:45:23
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108001_QCAsLeft.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
11660.85	1457.59	8.	665.	2.081E+05	8.19	1.386	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.37	121.93	10446.	154396.	128.663	0.59	0.854
Qa-245	1955.02	244.56	5402.	32508.	27.090	1.49	1.001
Qa-344	2751.64	344.17	3326.	92610.	77.175	0.72	1.096
Qa-779	6229.50	778.93	2780.	24534.	20.445	1.75	1.524
Qa-964	7710.53	964.03	1709.	24021.	20.017	1.63	1.648
Qa-1408	11264.15	1408.03	297.	25869.	21.558	1.31	1.991

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Code	MDA Value uCi		COMMENTS
QA-122		9.8238E-01					4.64E+03	
			121.78	9.824E-01	(	1.515E-03	2.93E-01 2.92E+01	G
Qa-245		9.8742E-01					4.64E+03	
			244.67	9.874E-01	(	5.202E-03	7.47E-01 7.62E+00	G
Qa-344		9.8882E-01					4.64E+03	
			344.30	9.888E-01	(	1.435E-03	3.60E-01 2.70E+01	G
Qa-779		1.0092E+00					4.64E+03	
			778.90	1.009E+00	(	5.054E-03	8.74E-01 1.30E+01	G
Qa-964		1.0232E+00					4.64E+03	
			964.00	1.023E+00	(	4.103E-03	8.16E-01 1.46E+01	G
Qa-1408		9.8849E-01					4.64E+03	
			1408.08	9.885E-01	(	1.534E-03	6.56E-01 2.12E+01	G

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 06:45:23
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108001_QCAsLeft.An1

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.2557E-01	9.8238E-01	5.7552E-03	1.1230E-01	1.515E-03
Qa-245	8.2980E-01	9.8742E-01	1.4753E-02	1.1369E-01	5.202E-03
Qa-344	8.3098E-01	9.8882E-01	7.1221E-03	1.1311E-01	1.435E-03
Qa-779	8.4815E-01	1.0092E+00	1.7635E-02	1.1656E-01	5.054E-03
Qa-964	8.5984E-01	1.0232E+00	1.6689E-02	1.1799E-01	4.103E-03
Qa-1408	8.3071E-01	9.8849E-01	1.2978E-02	1.1359E-01	1.534E-03

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 06:45:23
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108001_QCAsLeft.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity ( 1111.9 to  2041.5 keV)     5.025E+00  uCi
 Total Decayed Activity ( 1111.9 to  2041.5 keV) 5.9795108E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 7_20130221001_QCAsLeft
Acquired: 2/21/2013 11:55:56
Detector: HPGE07 51-TP32743A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1408 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	974.00	967.00	969.00	973.90	979.00	981.00	PASS
Energy	121.78	121.28	121.45	121.79	122.11	122.28	PASS
FWHM	0.80	0.55	0.60	0.89	1.00	1.05	PASS
ActivityDiff	1.00	-7.00	-5.00	0.42	5.00	7.00	PASS
QA-779							
FWHM	1.50	1.10	1.20	1.52	1.80	1.90	PASS
ActivityDiff	1.00	-7.00	-5.00	-4.20	5.00	7.00	PASS
QA-1408							
Channel	11264.00	11257.00	11259.00	11262.90	11269.00	11271.00	PASS
Energy	1408.08	1407.58	1407.75	1408.05	1408.41	1408.58	PASS
FWHM	2.00	1.60	1.70	2.03	2.30	2.40	PASS
ActivityDiff	1.00	-7.00	-5.00	-1.51	5.00	7.00	PASS

Analyst: Philip Smith Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  2/21/2013 12:07:29
Curtis & Tompkins HPS Lab       Spectrum name: 7_20130221001_QCAsLeft.An1

Sample description
     RCCV,S19585,Quality control Check


Spectrum Filename: C:\User\SPC\Det7\7_20130221001_QCAsLeft.An1

Acquisition information
       Start time:                 2/21/2013 11:55:56
       Live time:                600
       Real time:                627
       Dead time:                  4.28 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_QC.Clb
     HPGE07 S19585 7_20130220001_Energy


       Energy Calibration
            Created:               2/21/2013 12:07:04
            Zero offset:          -0.036 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.315E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/20/2013 20:31:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    24.98keV )
       Stop channel:           16336 (  2041.76keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 12:07:29
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0142

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.77	3125.	4.44	1.05	1.546E-02				
45.25	2386.	3.64	0.82	1.535E-02				
46.70	709.	11.68	0.82	1.533E-02				
121.79	79271.	0.41	0.89	1.391E-02	121.78	29.240	9.958E-01	QA122
244.67	16931.	0.98	1.00	1.159E-02	244.67	7.616	9.798E-01	Qa245
296.03	897.	9.70	0.93	1.033E-02				
344.28	48045.	0.50	1.10	9.137E-03	344.30	27.000	9.951E-01	Qa344
367.79	1500.	3.87	1.11	8.909E-03				
411.09	3639.	2.55	1.25	8.486E-03				
443.96	4696.	2.03	1.22	8.166E-03				
488.68	689.	9.39	1.19	7.730E-03				
503.47	255.	17.38	1.24	7.586E-03				
564.05	637.	8.18	1.29	6.994E-03				
566.37	264.	18.13	1.29	6.971E-03				
586.35	516.	9.47	1.31	6.778E-03				
674.76	281.	15.26	1.39	5.916E-03				
678.64	523.	8.38	1.40	5.879E-03				
688.72	1239.	7.78	1.26	5.780E-03				
719.18	402.	15.68	0.78	5.484E-03				
778.85	12986.	1.09	1.52	4.902E-03	778.90	12.990	1.042E+00	Qa779
810.39	432.	18.38	0.83	4.808E-03				
867.32	3883.	2.88	1.57	4.639E-03				
919.11	508.	12.37	1.53	4.486E-03				
926.13	304.	16.26	0.62	4.465E-03				
963.98	12362.	1.14	1.65	4.353E-03	964.00	14.580	9.952E-01	Qa964
1005.24	796.	8.34	1.69	4.249E-03				
1085.87	7692.	1.25	1.75	4.047E-03				

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 12:07:29
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1089.82	1320.	4.37	1.76	4.037E-03				
1112.02	10745.	1.20	1.77	3.981E-03				
1213.05	1037.	5.49	1.88	3.728E-03				
1299.15	1152.	3.60	1.92	3.512E-03				
1408.05	13664.	0.88	2.03	3.239E-03	1408.08	21.210	1.016E+00	Qa1408

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.22	39.77	4242.	3125.	2.022E+05	8.88	1.053	-	s
362.07	45.25	2577.	2386.	1.554E+05	7.28	0.815	-	D
373.60	46.69	3078.	709.	4.627E+04	23.37	0.817	-	D
2367.08	296.03	1551.	897.	8.687E+04	19.39	0.927	-	
2939.83	367.65	1390.	1750.	1.964E+05	11.48	1.005	-	s
3287.16	411.09	958.	3639.	4.289E+05	5.10	1.246	-	
3549.99	443.96	932.	4696.	5.751E+05	4.06	1.220	-	
3907.68	488.68	796.	689.	8.919E+04	18.78	1.185	-	
4025.76	503.45	803.	332.	4.374E+04	36.69	0.227	-	s
4510.43	564.21	1041.	637.	9.110E+04	16.37	1.293	-	D
4529.04	566.54	1016.	264.	3.791E+04	36.26	1.295	-	D
4688.67	586.33	1135.	618.	9.115E+04	26.59	0.900	-	s
5426.97	678.64	657.	542.	9.225E+04	21.40	1.215	-	
5507.60	688.72	1168.	1239.	2.143E+05	15.57	1.263	-	
5751.24	719.18	778.	402.	7.338E+04	31.35	0.783	-	s
6480.79	810.39	933.	432.	8.988E+04	36.76	0.829	-	s
6936.22	867.32	1178.	3883.	8.369E+05	5.75	1.567	-	
7350.58	919.11	583.	508.	1.132E+05	24.74	1.534	-	
7406.76	926.13	455.	304.	6.806E+04	32.53	0.617	-	s
8039.66	1005.24	469.	796.	1.873E+05	16.68	1.693	-	
8684.19	1085.80	974.	7586.	1.874E+06	3.12	1.816	-	
8715.80	1089.75	907.	902.	2.234E+05	18.16	1.865	-	sD
8893.97	1112.02	638.	10745.	2.699E+06	2.41	1.767	-	s
9702.38	1213.05	325.	1037.	2.782E+05	10.99	1.876	-	
10391.40	1299.15	86.	1152.	3.282E+05	7.21	1.918	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 12:07:29
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.93	121.79	5109.	79271.	132.119	0.82	0.886
Qa-245	1956.39	244.67	2408.	16931.	28.218	1.97	0.998
Qa-344	2752.94	344.28	1764.	48045.	80.075	1.00	1.102
Qa-779	6228.57	778.85	1118.	12986.	21.644	2.19	1.524
Qa-964	7709.52	963.98	888.	12362.	20.603	2.28	1.648
Qa-1408	11262.96	1408.05	112.	13648.	22.746	1.77	2.034

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Code	MDA Value uCi		COMMENTS
QA-122		9.9582E-01					4.64E+03	
			121.78	9.958E-01	(	2.092E-03	4.09E-01 2.92E+01	G
Qa-245		9.7982E-01					4.64E+03	
			244.67	9.798E-01	(	6.617E-03	9.84E-01 7.62E+00	G
Qa-344		9.9508E-01					4.64E+03	
			344.30	9.951E-01	(	2.027E-03	5.00E-01 2.70E+01	G
Qa-779		1.0420E+00					4.64E+03	
			778.90	1.042E+00	(	6.251E-03	1.09E+00 1.30E+01	G
Qa-964		9.9525E-01					4.64E+03	
			964.00	9.952E-01	(	5.590E-03	1.14E+00 1.46E+01	G
Qa-1408		1.0151E+00					4.64E+03	
			1408.08	1.015E+00	(	1.838E-03	8.85E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 12:07:29
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.7796E-01	9.9582E-01	8.1538E-03	1.1398E-01	2.092E-03
Qa-245	8.6385E-01	9.7982E-01	1.9287E-02	1.1351E-01	6.617E-03
Qa-344	8.7730E-01	9.9508E-01	9.9542E-03	1.1404E-01	2.027E-03
Qa-779	9.1868E-01	1.0420E+00	2.2775E-02	1.2112E-01	6.251E-03
Qa-964	8.7745E-01	9.9525E-01	2.2669E-02	1.1586E-01	5.590E-03
Qa-1408	8.9491E-01	1.0151E+00	1.7976E-02	1.1727E-01	1.838E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (586.2 to 2041.8 keV) 5.310E+00 uCi
Total Decayed Activity (586.2 to 2041.8 keV) 6.0230412E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 2/21/2013 12:07:29
Curtis & Tompkins HPS Lab Spectrum name: 7_20130221001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564009082001
Cal : 06-JAN-2014 07:33:28,20-FEB-2013 20:31:28

Run Name : QUALITY CONTROL CHEC
File : 7_20140106_001
Caldate : 06-JAN-2014, 20-FEB-2013
Live Time : 600 sec

IDF : 1.0
Time : 06-JAN-2014 07:22
Dead Time : 4.1 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9975	uCi	.0081719	974.02	972.00 - 976.00	121.79	121.58 - 121.98	0.90	0.80 - 0.98	-0.25	5	
QA-779	1.000	1.041	uCi	.024183					1.48	1.37 - 1.67	4.07	5	
QA-1408	1.000	1.014	uCi	.0185	11266.41	11259.00 - 11269.00	1408.06	1407.58 - 1408.58	1.95	1.80 - 2.20	1.44	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:33:53
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106001_QCAsLeft.An1

Sample description
     RCCV,S19585,Quality control Check


Spectrum Filename: C:\User\SPC\Det7\7_20140106001_QCAsLeft.An1

Acquisition information
       Start time:                 1/6/2014 07:22:26
       Live time:                600
       Real time:                626
       Dead time:                  4.10 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_QC.Clb
     HPGE07 S19585 7_20130220001_Energy


       Energy Calibration
            Created:               1/6/2014 07:33:28
            Zero offset:          -0.010 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.439E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/20/2013 20:31:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2041.12keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:33:53
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0145

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.85	1272.	6.52	1.30	1.562E-02				
39.76	2849.	4.83	1.05	1.546E-02				
45.48	2664.	5.17	0.90	1.535E-02				
121.79	75710.	0.41	0.90	1.391E-02	121.78	29.240	9.975E-01	QA122
244.66	16412.	1.03	1.04	1.159E-02	244.67	7.616	9.961E-01	Qa245
295.93	934.	10.05	1.04	1.033E-02				
329.45	341.	16.20	0.92	9.503E-03				
344.28	46096.	0.51	1.11	9.137E-03	344.30	27.000	1.001E+00	Qa344
367.64	1619.	5.75	1.16	8.909E-03				
411.10	3593.	2.79	1.22	8.486E-03				
443.96	4545.	2.45	1.23	8.165E-03				
488.62	591.	13.17	1.08	7.730E-03				
563.97	587.	8.48	1.32	6.998E-03				
586.30	513.	9.11	1.34	6.779E-03				
678.73	550.	12.64	0.69	5.878E-03				
688.70	1028.	9.27	1.51	5.781E-03				
719.39	373.	11.77	1.45	5.481E-03				
765.00	285.	18.33	0.61	5.037E-03				
778.86	12366.	1.16	1.48	4.902E-03	778.90	12.990	1.041E+00	Qa779
810.21	363.	17.46	0.59	4.809E-03				
867.31	3785.	2.83	1.74	4.639E-03				
919.32	463.	15.59	1.19	4.485E-03				
963.96	11753.	1.10	1.69	4.353E-03	964.00	14.580	9.924E-01	Qa964
1005.21	750.	8.39	0.50	4.249E-03				
1085.87	7446.	1.27	1.73	4.047E-03				
1089.95	1347.	3.96	1.73	4.037E-03				
1112.00	10192.	1.16	1.71	3.981E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:33:53
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1213.02	1051.	5.09	1.70	3.728E-03				
1250.12	265.	15.74	0.88	3.635E-03				
1299.16	1087.	3.67	1.59	3.512E-03				
1408.06	13004.	0.91	1.95	3.239E-03	1408.08	21.210	1.014E+00	Qa1408
1457.80	278.	6.00	0.85	3.114E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.78	30.85	1749.	1272.	8.141E+04	13.03	1.302	-	s
318.01	39.76	4242.	2849.	1.843E+05	9.67	1.054	-	s
363.77	45.48	3788.	2664.	1.735E+05	10.34	0.905	-	s
2366.79	295.93	1676.	934.	9.042E+04	20.10	1.039	-	
2634.95	329.45	821.	341.	3.587E+04	32.40	0.916	-	
2940.44	367.64	1260.	1619.	1.817E+05	11.51	1.161	-	s
3288.09	411.10	1170.	3593.	4.234E+05	5.57	1.224	-	
3550.94	443.96	1310.	4545.	5.566E+05	4.90	1.232	-	
3908.19	488.62	1032.	591.	7.645E+04	26.35	1.078	-	
4511.02	563.82	945.	587.	8.388E+04	16.96	1.316	-	D
4689.36	586.26	929.	515.	7.602E+04	27.11	0.606	-	s
5429.15	678.73	823.	550.	9.354E+04	25.28	0.687	-	s
5508.96	688.70	1183.	1028.	1.778E+05	18.54	1.508	-	
5754.71	719.42	806.	396.	7.232E+04	32.94	0.690	-	s
6119.46	765.00	595.	285.	5.654E+04	36.66	0.612	-	s
6481.21	810.21	701.	363.	7.540E+04	34.93	0.588	-	s
6938.17	867.31	1086.	3785.	8.159E+05	5.66	1.743	-	
7354.37	919.32	678.	463.	1.032E+05	31.18	1.188	-	s
8041.78	1005.21	422.	750.	1.764E+05	16.79	0.495	-	s
8686.69	1085.79	930.	7382.	1.824E+06	3.14	1.787	-	
8719.39	1089.88	667.	996.	2.467E+05	13.11	1.290	-	sD
8896.45	1112.00	496.	10192.	2.560E+06	2.32	1.708	-	s
9705.01	1213.02	258.	1051.	2.819E+05	10.17	1.697	-	
10002.00	1250.12	186.	265.	7.282E+04	31.49	0.875	-	s
10394.56	1299.16	77.	1087.	3.095E+05	7.33	1.595	-	
11664.60	1457.80	0.	278.	8.927E+04	12.00	0.850	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:33:53
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.02	121.79	4450.	75710.	126.184	0.82	0.902
Qa-245	1956.77	244.66	2424.	16412.	27.353	2.06	1.039
Qa-344	2753.60	344.28	1678.	46096.	76.827	1.02	1.113
Qa-779	6230.36	778.86	1134.	12366.	20.610	2.32	1.484
Qa-964	7711.64	963.96	678.	11753.	19.588	2.20	1.695
Qa-1408	11266.41	1408.06	107.	13004.	21.674	1.82	1.946

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Code	MDA Value uCi		COMMENTS
QA-122		9.9750E-01					4.64E+03	
			121.78	9.975E-01	(	2.048E-03	4.10E-01 2.92E+01	G
Qa-245		9.9613E-01					4.64E+03	
			244.67	9.961E-01	(	6.963E-03	1.03E+00 7.62E+00	G
Qa-344		1.0013E+00					4.64E+03	
			344.30	1.001E+00	(	2.074E-03	5.10E-01 2.70E+01	G
Qa-779		1.0407E+00					4.64E+03	
			778.90	1.041E+00	(	6.603E-03	1.16E+00 1.30E+01	G
Qa-964		9.9235E-01					4.64E+03	
			964.00	9.924E-01	(	5.124E-03	1.10E+00 1.46E+01	G
Qa-1408		1.0144E+00					4.64E+03	
			1408.08	1.014E+00	(	1.878E-03	9.12E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:33:53
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3852E-01	9.9750E-01	8.1719E-03	1.1417E-01	2.048E-03
Qa-245	8.3737E-01	9.9613E-01	2.0505E-02	1.1556E-01	6.963E-03
Qa-344	8.4172E-01	1.0013E+00	1.0219E-02	1.1477E-01	2.074E-03
Qa-779	8.7481E-01	1.0407E+00	2.4183E-02	1.2124E-01	6.603E-03
Qa-964	8.3420E-01	9.9235E-01	2.1871E-02	1.1538E-01	5.124E-03
Qa-1408	8.5273E-01	1.0144E+00	1.8500E-02	1.1728E-01	1.878E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (586.2 to 2041.1 keV) 5.079E+00 uCi
Total Decayed Activity (586.2 to 2041.1 keV) 6.0423536E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:33:53
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE07
Seqnum : 1564011942001
Cal : 08-JAN-2014 07:13:44,20-FEB-2013 20:31:28

Run Name : QUALITY CONTROL CHEC
File : 7_20140108_001
Caldate : 08-JAN-2014, 20-FEB-2013
Live Time : 600 sec

IDF : 1.0
Time : 08-JAN-2014 07:02
Dead Time : 4.09 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9934	uCi	.0082924	973.97	972.00 - 976.00	121.79	121.58 - 121.98	0.88	0.80 - 0.98	-0.66	5	
QA-779	1.000	1.020	uCi	.024392					1.56	1.37 - 1.67	1.96	5	
QA-1408	1.000	0.9897	uCi	.019066	11265.99	11259.00 - 11269.00	1408.07	1407.58 - 1408.58	2.01	1.80 - 2.20	-1.03	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:14:09
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108001_QCAsLeft.An1

Sample description
     RCCV,S19585,Quality control Check


Spectrum Filename: C:\User\SPC\Det7\7_20140108001_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 07:02:43
       Live time:                600
       Real time:                626
       Dead time:                  4.09 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_QC.Clb
     HPGE07 S19585 7_20130220001_Energy


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/20/2013 20:31:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:14:09
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0149

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.82	1354.	6.43	1.20	1.562E-02				
39.71	3211.	4.23	1.04	1.546E-02				
45.25	2198.	3.87	0.81	1.535E-02				
46.53	698.	11.84	0.81	1.533E-02				
84.62	490.	17.96	0.86	1.461E-02				
121.79	75376.	0.42	0.88	1.391E-02	121.78	29.240	9.934E-01	QA122
244.66	16374.	0.98	1.01	1.159E-02	244.67	7.616	9.941E-01	Qa245
295.98	983.	9.83	1.00	1.033E-02				
344.28	46209.	0.51	1.14	9.137E-03	344.30	27.000	1.004E+00	Qa344
367.63	1642.	5.01	1.10	8.909E-03				
411.11	3474.	2.39	1.25	8.486E-03				
443.96	4425.	2.30	1.26	8.165E-03				
488.69	602.	9.11	1.13	7.730E-03				
503.23	286.	19.26	0.39	7.588E-03				
564.08	648.	13.24	1.04	6.995E-03				
586.22	677.	11.28	0.88	6.779E-03				
678.76	662.	11.33	1.16	5.878E-03				
688.38	1004.	8.00	1.48	5.784E-03				
719.37	374.	11.99	1.47	5.481E-03				
778.86	12112.	1.20	1.56	4.902E-03	778.90	12.990	1.020E+00	Qa779
810.15	471.	13.93	1.18	4.809E-03				
867.31	3663.	2.61	1.68	4.639E-03				
919.31	440.	15.97	0.95	4.485E-03				
963.98	11533.	1.12	1.68	4.353E-03	964.00	14.580	9.741E-01	Qa964
1005.02	650.	8.07	1.57	4.250E-03				
1085.87	7525.	1.25	1.77	4.047E-03				
1089.93	1287.	4.20	1.78	4.037E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:14:09
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1112.10	9552.	1.11	1.79	3.981E-03				
1212.95	1133.	5.17	1.89	3.728E-03				
1299.22	1085.	3.65	1.39	3.512E-03				
1408.06	12793.	0.94	2.01	3.239E-03	1408.08	21.210	9.982E-01	Qa1408
1457.70	321.	5.58	1.47	3.114E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.47	30.82	1891.	1354.	8.668E+04	12.87	1.202	-	s
317.54	39.71	4010.	3211.	2.078E+05	8.46	1.042	-	s
361.83	45.24	2528.	2198.	1.432E+05	7.75	0.806	-	D
372.09	46.53	3069.	698.	4.555E+04	23.68	0.807	-	D
676.73	84.62	2418.	490.	3.354E+04	35.92	0.855	-	
2367.14	295.98	1672.	983.	9.518E+04	19.67	0.995	-	
2940.26	367.63	1068.	1642.	1.843E+05	10.02	1.101	-	s
3288.05	411.11	816.	3474.	4.094E+05	4.78	1.250	-	
3550.83	443.96	1147.	4425.	5.420E+05	4.61	1.262	-	
3908.66	488.69	633.	602.	7.791E+04	18.21	1.131	-	
4025.00	503.23	687.	286.	3.769E+04	38.52	0.392	-	s
4511.76	564.08	1294.	648.	9.269E+04	26.49	1.035	-	s
4688.93	586.22	955.	677.	9.989E+04	22.56	0.876	-	s
5429.28	678.76	870.	662.	1.125E+05	22.66	1.155	-	
5506.25	688.38	941.	1004.	1.736E+05	16.01	1.480	-	
5755.07	719.48	787.	447.	8.163E+04	29.05	0.724	-	s
6480.60	810.15	722.	471.	9.786E+04	27.87	1.182	-	s
6937.98	867.31	915.	3663.	7.895E+05	5.22	1.682	-	
7354.06	919.31	716.	440.	9.821E+04	31.94	0.947	-	s
8039.98	1005.02	350.	650.	1.529E+05	16.14	1.569	-	
8686.41	1085.80	1141.	7179.	1.774E+06	3.44	1.717	-	
8718.97	1089.86	648.	944.	2.340E+05	13.15	1.414	-	D
8896.07	1111.99	581.	10138.	2.546E+06	2.40	1.819	-	s
9704.14	1212.95	281.	1133.	3.040E+05	10.35	1.890	-	
10394.68	1299.22	65.	1085.	3.090E+05	7.31	1.387	-	s
11663.28	1457.70	0.	321.	1.031E+05	11.16	1.468	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:14:09
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.97	121.79	4816.	75376.	125.628	0.83	0.881
Qa-245	1956.70	244.66	2148.	16374.	27.290	1.95	1.008
Qa-344	2753.45	344.28	1772.	46209.	77.015	1.03	1.142
Qa-779	6230.18	778.86	1168.	12112.	20.186	2.39	1.559
Qa-964	7711.52	963.98	708.	11533.	19.222	2.23	1.681
Qa-1408	11265.99	1408.07	229.	12684.	21.140	1.93	2.012

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Code	MDA Value uCi		COMMENTS
QA-122		9.9339E-01					4.64E+03	
			121.78	9.934E-01	(	2.131E-03	4.17E-01 2.92E+01	G
Qa-245		9.9410E-01					4.64E+03	
			244.67	9.941E-01	(	6.557E-03	9.77E-01 7.62E+00	G
Qa-344		1.0041E+00					4.64E+03	
			344.30	1.004E+00	(	2.131E-03	5.14E-01 2.70E+01	G
Qa-779		1.0196E+00					4.64E+03	
			778.90	1.020E+00	(	6.704E-03	1.20E+00 1.30E+01	G
Qa-964		9.7413E-01					4.64E+03	
			964.00	9.741E-01	(	5.235E-03	1.12E+00 1.46E+01	G
Qa-1408		9.8973E-01					4.64E+03	
			1408.08	9.897E-01	(	2.750E-03	9.63E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:14:09
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3482E-01	9.9339E-01	8.2924E-03	1.1371E-01	2.131E-03
Qa-245	8.3542E-01	9.9410E-01	1.9433E-02	1.1514E-01	6.557E-03
Qa-344	8.4378E-01	1.0041E+00	1.0312E-02	1.1509E-01	2.131E-03
Qa-779	8.5683E-01	1.0196E+00	2.4392E-02	1.1893E-01	6.704E-03
Qa-964	8.1864E-01	9.7413E-01	2.1736E-02	1.1331E-01	5.235E-03
Qa-1408	8.3174E-01	9.8973E-01	1.9066E-02	1.1459E-01	2.750E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (64.8 to 2041.3 keV) 5.021E+00 uCi
Total Decayed Activity (64.8 to 2041.3 keV) 5.9749861E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:14:09
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 8_20130408001_QCAsLeft
Acquired: 4/8/2013 11:13:48
Detector: HPGE08 50-TP42229A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1408 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	974.00	967.00	969.00	973.90	979.00	981.00	PASS
Energy	121.78	121.28	121.45	121.78	122.11	122.28	PASS
FWHM	0.86	0.76	0.79	0.86	0.93	0.96	PASS
ActivityDiff	1.00	-7.00	-5.00	0.48	5.00	7.00	PASS
QA-779							
FWHM	1.47	1.29	1.35	1.53	1.59	1.65	PASS
ActivityDiff	1.00	-7.00	-5.00	-1.25	5.00	7.00	PASS
QA-1408							
Channel	11264.00	11257.00	11259.00	11263.40	11269.00	11271.00	PASS
Energy	1408.08	1407.58	1407.75	1408.07	1408.41	1408.58	PASS
FWHM	1.94	1.71	1.78	2.01	2.10	2.17	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.45	5.00	7.00	PASS

Analyst: Philip Smith Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/8/2013 11:25:46
Curtis & Tompkins HPS Lab       Spectrum name: 8_20130408001_QCAsLeft.An1

Sample description
     RCCV,S19585,Quality control Check


Spectrum Filename: C:\User\SPC\Det8\8_20130408001_QCAsLeft.An1

Acquisition information
       Start time:                 4/8/2013 11:13:48
       Live time:                600
       Real time:                674
       Dead time:                 10.96 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_QC.Clb
     HPGE08 S19585 8_20130407001_Energy


       Energy Calibration
            Created:               4/8/2013 11:25:28
            Zero offset:           0.020 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.209E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/7/2013 12:02:30
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.02keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 11:25:46
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0215

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.59	958.	6.22	0.82	1.477E-02				
32.09	462.	15.56	0.82	1.475E-02				
39.82	2061.	5.91	1.02	1.462E-02				
45.36	1660.	5.07	0.83	1.452E-02				
46.68	534.	15.23	0.83	1.450E-02				
121.78	74858.	0.42	0.86	1.323E-02	121.78	29.240	9.952E-01	QA122
244.71	16492.	1.01	1.00	1.116E-02	244.67	7.616	9.986E-01	Qa245
295.97	850.	9.23	0.79	9.947E-03				
344.25	45956.	0.50	1.08	8.808E-03	344.30	27.000	9.943E-01	Qa344
367.63	1578.	6.16	1.20	8.595E-03				
411.06	3408.	2.71	1.19	8.200E-03				
443.93	4523.	2.53	1.19	7.901E-03				
488.65	571.	11.02	1.27	7.494E-03				
564.02	644.	7.68	1.24	6.809E-03				
566.37	245.	19.30	1.24	6.788E-03				
586.45	723.	9.98	0.97	6.605E-03				
678.57	514.	11.47	1.12	5.768E-03				
688.64	1058.	7.86	1.23	5.676E-03				
719.28	356.	17.48	0.96	5.398E-03				
765.01	272.	15.11	1.41	4.983E-03				
778.86	12414.	1.14	1.53	4.856E-03	778.90	12.990	1.012E+00	Qa779
810.56	422.	17.24	0.36	4.735E-03				
867.34	3753.	3.03	1.31	4.519E-03				
919.21	492.	11.59	1.34	4.321E-03				
926.44	290.	18.60	0.50	4.294E-03				
964.01	11872.	1.08	1.45	4.151E-03	964.00	14.580	1.009E+00	Qa964
1005.14	668.	9.33	1.44	4.052E-03				

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 11:25:46
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1085.83	7464.	1.25	1.69	3.859E-03				
1089.83	1380.	3.75	1.69	3.849E-03				
1111.97	10055.	1.16	1.73	3.796E-03				
1212.91	996.	4.97	1.35	3.554E-03				
1299.22	1019.	3.96	1.77	3.347E-03				
1408.06	12854.	0.91	2.01	3.087E-03	1408.08	21.210	1.010E+00	Qa1408
1457.64	317.	5.62	0.95	2.968E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
244.51	30.62	1297.	958.	6.481E+04	12.45	0.820	- D
256.51	32.12	2352.	462.	3.131E+04	31.13	0.821	- D
318.36	39.82	3645.	2061.	1.410E+05	11.81	1.022	- s
362.62	45.44	2713.	1660.	1.143E+05	10.14	0.831	- D
373.25	46.77	3040.	534.	3.683E+04	30.46	0.832	- D
2367.17	295.97	1326.	850.	8.546E+04	18.46	0.794	- s
2940.44	367.63	1358.	1578.	1.836E+05	12.33	1.204	- s
3287.84	411.06	1068.	3408.	4.156E+05	5.42	1.193	-
3550.69	443.93	1362.	4523.	5.724E+05	5.06	1.188	-
3908.49	488.65	789.	571.	7.623E+04	22.04	1.273	-
4511.32	564.01	903.	644.	9.464E+04	15.36	1.238	- D
4530.14	566.37	997.	245.	3.611E+04	38.60	1.240	- D
4690.73	586.45	896.	723.	1.095E+05	19.95	0.967	- s
5427.68	678.57	690.	514.	8.917E+04	22.94	1.118	-
5508.22	688.64	975.	1058.	1.864E+05	15.71	1.230	-
5753.34	719.28	763.	356.	6.592E+04	34.95	0.957	- s
6118.22	764.90	696.	337.	6.771E+04	35.60	1.153	-
6483.52	810.56	840.	422.	8.912E+04	34.48	0.362	- s
6937.70	867.34	1235.	3753.	8.304E+05	6.05	1.313	-
7352.68	919.21	492.	492.	1.138E+05	23.18	1.342	-
7410.50	926.44	504.	290.	6.754E+04	37.21	0.496	- s
8040.04	1005.14	441.	668.	1.648E+05	18.67	1.439	-
8685.13	1085.78	808.	7439.	1.928E+06	3.07	1.674	-
8717.13	1089.78	624.	1140.	2.961E+05	12.10	1.047	- sD
8894.67	1111.97	480.	10055.	2.649E+06	2.32	1.729	-
9702.23	1212.91	234.	996.	2.802E+05	9.93	1.346	- s
10392.70	1299.22	91.	1019.	3.044E+05	7.93	1.769	-
11660.05	1457.64	0.	317.	1.068E+05	11.23	0.949	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 11:25:46
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.90	121.78	5124.	74858.	124.762	0.84	0.855
Qa-245	1957.15	244.71	2477.	16492.	27.487	2.03	1.000
Qa-344	2753.41	344.25	1642.	45956.	76.594	1.01	1.081
Qa-779	6229.89	778.86	1086.	12414.	20.691	2.27	1.530
Qa-964	7711.06	964.01	684.	11872.	19.786	2.17	1.452
Qa-1408	11263.49	1408.07	156.	12782.	21.304	1.87	2.009

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		9.9525E-01				4.64E+03	
			121.78	9.952E-01	(	2.218E-03 4.20E-01 2.92E+01	G
Qa-245		9.9858E-01				4.64E+03	
			244.67	9.986E-01	(	7.021E-03 1.01E+00 7.62E+00	G
Qa-344		9.9427E-01				4.64E+03	
			344.30	9.943E-01	(	2.042E-03 5.05E-01 2.70E+01	G
Qa-779		1.0125E+00				4.64E+03	
			778.90	1.012E+00	(	6.261E-03 1.14E+00 1.30E+01	G
Qa-964		1.0091E+00				4.64E+03	
			964.00	1.009E+00	(	5.181E-03 1.08E+00 1.46E+01	G
Qa-1408		1.0045E+00				4.64E+03	
			1408.08	1.004E+00	(	2.285E-03 9.33E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 11:25:46
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.7144E-01	9.9525E-01	8.3641E-03	1.1393E-01	2.218E-03
Qa-245	8.7436E-01	9.9858E-01	2.0222E-02	1.1578E-01	7.021E-03
Qa-344	8.7059E-01	9.9427E-01	1.0040E-02	1.1395E-01	2.042E-03
Qa-779	8.8655E-01	1.0125E+00	2.3013E-02	1.1786E-01	6.261E-03
Qa-964	8.8360E-01	1.0091E+00	2.1855E-02	1.1726E-01	5.181E-03
Qa-1408	8.7951E-01	1.0045E+00	1.8739E-02	1.1619E-01	2.285E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (586.4 to 2042.1 keV) 5.266E+00 uCi
Total Decayed Activity (586.4 to 2042.1 keV) 6.0141716E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 4/8/2013 11:25:46
Curtis & Tompkins HPS Lab Spectrum name: 8_20130408001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574009095001
Cal : 06-JAN-2014 07:47:05,07-APR-2013 12:02:30

Run Name : QUALITY CONTROL CHEC
File : 8_20140106_001
Caldate : 06-JAN-2014, 07-APR-2013
Live Time : 600 sec

IDF : 1.0
Time : 06-JAN-2014 07:35
Dead Time : 10.53 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9920	uCi	.0085159	974.06	972.00 - 976.00	121.78	121.58 - 121.98	0.86	0.77 - 0.95	-0.80	5	
QA-779	1.000	1.000	uCi	.022232					1.43	1.32 - 1.62	0.00	5	
QA-1408	1.000	1.003	uCi	.018924	11263.47	11259.00 - 11269.00	1408.06	1407.58 - 1408.58	1.88	1.75 - 2.13	0.33	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:47:22
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140106001_QCAsLeft.An1

Sample description
     RCCV,S19585,Quality control Check


Spectrum Filename: C:\User\SPC\Det8\8_20140106001_QCAsLeft.An1

Acquisition information
       Start time:                 1/6/2014 07:35:27
       Live time:                600
       Real time:                671
       Dead time:                 10.53 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_QC.Clb
     HPGE08 S19585 8_20130407001_Energy


       Energy Calibration
            Created:               1/6/2014 07:47:05
            Zero offset:          -0.009 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.738E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/7/2013 12:02:30
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2042.04keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:47:22
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0218

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.78	505.	13.19	1.05	1.477E-02				
39.88	1962.	6.39	1.03	1.462E-02				
45.32	1664.	4.65	0.79	1.453E-02				
46.65	540.	14.10	0.80	1.450E-02				
121.78	71633.	0.43	0.86	1.323E-02	121.78	29.240	9.920E-01	QA122
244.71	15498.	1.05	0.99	1.115E-02	244.67	7.616	9.774E-01	Qa245
296.01	973.	9.08	0.84	9.945E-03				
344.26	44245.	0.51	1.07	8.808E-03	344.30	27.000	9.971E-01	Qa344
367.62	1564.	5.02	1.17	8.595E-03				
411.05	3249.	2.73	1.13	8.200E-03				
443.94	4108.	1.82	1.15	7.901E-03				
488.74	542.	12.82	1.05	7.494E-03				
563.90	561.	16.12	1.14	6.810E-03				
586.22	617.	11.09	0.97	6.607E-03				
656.51	314.	19.88	1.21	5.968E-03				
678.63	499.	8.70	1.35	5.768E-03				
688.46	1054.	7.28	1.11	5.678E-03				
719.28	366.	16.58	0.47	5.398E-03				
778.87	11771.	1.11	1.43	4.856E-03	778.90	12.990	1.000E+00	Qa779
810.39	374.	14.33	0.79	4.736E-03				
867.34	3570.	2.68	1.56	4.519E-03				
919.21	424.	14.09	1.07	4.321E-03				
964.01	11520.	1.12	1.58	4.151E-03	964.00	14.580	1.020E+00	Qa964
1005.01	698.	9.12	1.55	4.053E-03				
1085.84	7235.	1.27	1.66	3.859E-03				
1089.81	1177.	4.27	1.66	3.850E-03				
1112.00	9848.	1.22	1.67	3.796E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:47:22
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1212.89	923.	6.21	1.08	3.554E-03				
1299.10	1008.	3.72	1.40	3.348E-03				
1408.06	12257.	0.94	1.88	3.087E-03	1408.08	21.210	1.003E+00	Qa1408
1457.63	286.	5.91	0.50	2.968E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.27	30.78	1406.	505.	3.420E+04	26.38	1.046	-	s
319.06	39.88	3715.	1962.	1.342E+05	12.78	1.030	-	s
362.58	45.26	2156.	1664.	1.145E+05	9.29	0.794	-	D
373.20	46.59	2629.	540.	3.723E+04	28.20	0.796	-	D
2367.64	296.01	1483.	973.	9.781E+04	18.15	0.835	-	
2940.41	367.62	980.	1564.	1.819E+05	10.05	1.166	-	s
3287.77	411.05	958.	3249.	3.963E+05	5.45	1.133	-	
3550.70	443.92	875.	4165.	5.272E+05	4.35	1.148	-	
3909.19	488.74	893.	542.	7.233E+04	25.64	1.047	-	
4510.46	563.90	1362.	561.	8.243E+04	32.23	1.141	-	
4688.96	586.22	866.	617.	9.341E+04	22.18	0.967	-	s
5251.22	656.51	729.	314.	5.256E+04	39.75	1.209	-	
5427.54	678.55	915.	561.	9.719E+04	26.90	0.895	-	s
5506.79	688.46	818.	1054.	1.856E+05	14.56	1.112	-	
5753.30	719.28	755.	366.	6.784E+04	33.16	0.473	-	s
6482.18	810.39	556.	374.	7.908E+04	28.65	0.792	-	s
6937.69	867.34	905.	3570.	7.900E+05	5.37	1.559	-	
7352.68	919.21	561.	424.	9.807E+04	28.18	1.069	-	s
8039.03	1005.01	436.	698.	1.721E+05	18.25	1.551	-	
8685.02	1085.76	843.	7144.	1.851E+06	3.12	1.661	-	
8716.78	1089.73	776.	840.	2.181E+05	17.28	1.450	-	sD
8894.94	1112.00	575.	9848.	2.594E+06	2.45	1.669	-	s
9702.09	1212.89	329.	923.	2.598E+05	12.42	1.080	-	s
10391.74	1299.10	64.	1008.	3.012E+05	7.45	1.398	-	s
11660.07	1457.63	0.	286.	9.637E+04	11.83	0.500	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:47:22
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.06	121.78	4873.	71633.	119.389	0.86	0.857
Qa-245	1957.36	244.71	2331.	15498.	25.830	2.10	0.991
Qa-344	2753.53	344.26	1486.	44245.	73.742	1.02	1.068
Qa-779	6230.02	778.87	877.	11771.	19.618	2.22	1.430
Qa-964	7711.07	964.01	685.	11520.	19.200	2.24	1.584
Qa-1408	11263.47	1408.06	118.	12257.	20.429	1.89	1.879

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Code	MDA Value uCi		COMMENTS
QA-122		9.9201E-01					4.64E+03	
			121.78	9.920E-01	(	2.252E-03	4.29E-01 2.92E+01	G
Qa-245		9.7743E-01					4.64E+03	
			244.67	9.774E-01	(	7.095E-03	1.05E+00 7.62E+00	G
Qa-344		9.9708E-01					4.64E+03	
			344.30	9.971E-01	(	2.024E-03	5.12E-01 2.70E+01	G
Qa-779		9.9996E-01					4.64E+03	
			778.90	1.000E+00	(	5.862E-03	1.11E+00 1.30E+01	G
Qa-964		1.0200E+00					4.64E+03	
			964.00	1.020E+00	(	5.399E-03	1.12E+00 1.46E+01	G
Qa-1408		1.0033E+00					4.64E+03	
			1408.08	1.003E+00	(	2.068E-03	9.43E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:47:22
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3391E-01	9.9201E-01	8.5159E-03	1.1357E-01	2.252E-03
Qa-245	8.2165E-01	9.7743E-01	2.0516E-02	1.1346E-01	7.095E-03
Qa-344	8.3817E-01	9.9708E-01	1.0216E-02	1.1429E-01	2.024E-03
Qa-779	8.4059E-01	9.9996E-01	2.2232E-02	1.1630E-01	5.862E-03
Qa-964	8.5744E-01	1.0200E+00	2.2807E-02	1.1866E-01	5.399E-03
Qa-1408	8.4340E-01	1.0033E+00	1.8924E-02	1.1609E-01	2.068E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (51.0 to 2042.0 keV) 5.035E+00 uCi
Total Decayed Activity (51.0 to 2042.0 keV) 5.9897885E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:47:22
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE08
Seqnum : 1574011955002
Cal : 08-JAN-2014 07:40:12,07-APR-2013 12:02:30

Run Name : QUALITY CONTROL CHEC
File : 8_20140108_002
Caldate : 08-JAN-2014, 07-APR-2013
Live Time : 600 sec

IDF : 1.0
Time : 08-JAN-2014 07:28
Dead Time : 10.58 %

Standards: S19585

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9975	uCi	.008388	974.04	972.00 - 976.00	121.78	121.58 - 121.98	0.87	0.77 - 0.95	-0.25	5	
QA-779	1.000	0.9960	uCi	.022622					1.42	1.32 - 1.62	-0.40	5	
QA-1408	1.000	1.002	uCi	.018929	11263.43	11259.00 - 11269.00	1408.07	1407.58 - 1408.58	1.83	1.75 - 2.13	0.22	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:40:29
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108002_QCAsLeft.An1

Sample description
     RCCV,S19585,Quality control Check


Spectrum Filename: C:\User\SPC\Det8\8_20140108002_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 07:28:34
       Live time:                600
       Real time:                671
       Dead time:                 10.58 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_QC.Clb
     HPGE08 S19585 8_20130407001_Energy


       Energy Calibration
            Created:               1/8/2014 07:40:12
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.420E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/7/2013 12:02:30
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:40:29
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108002_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0190

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.88	1778.	6.76	1.00	1.462E-02				
45.34	1607.	5.00	0.78	1.452E-02				
46.67	459.	16.15	0.78	1.450E-02				
121.78	72005.	0.42	0.87	1.323E-02	121.78	29.240	9.975E-01	QA122
244.70	15674.	1.02	0.98	1.116E-02	244.67	7.616	9.888E-01	Qa245
295.91	909.	8.23	0.98	9.948E-03				
344.25	44274.	0.51	1.10	8.808E-03	344.30	27.000	9.980E-01	Qa344
367.54	1566.	5.49	1.24	8.595E-03				
411.08	3213.	2.78	1.13	8.200E-03				
443.91	4199.	2.36	1.13	7.901E-03				
488.59	668.	12.13	0.81	7.495E-03				
563.80	582.	10.15	1.16	6.811E-03				
586.26	519.	13.25	1.20	6.607E-03				
674.82	251.	15.20	1.38	5.803E-03				
678.63	562.	7.75	1.38	5.769E-03				
688.61	930.	8.01	1.11	5.677E-03				
719.25	338.	11.85	1.41	5.398E-03				
764.68	328.	19.96	0.71	4.985E-03				
778.87	11721.	1.14	1.42	4.856E-03	778.90	12.990	9.960E-01	Qa779
810.21	415.	16.14	0.59	4.737E-03				
867.32	3687.	2.91	1.48	4.519E-03				
919.24	470.	16.28	1.24	4.321E-03				
926.02	264.	13.11	1.56	4.296E-03				
964.00	11528.	1.18	1.59	4.151E-03	964.00	14.580	1.021E+00	Qa964
1004.98	581.	5.71	1.61	4.053E-03				
1085.81	7271.	1.26	1.66	3.859E-03				
1089.89	1300.	3.78	1.66	3.849E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:40:29
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108002_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1111.97	9693.	1.19	1.68	3.796E-03				
1212.82	1053.	4.78	1.73	3.555E-03				
1249.91	227.	13.76	0.31	3.466E-03				
1274.28	188.	15.15	0.74	3.407E-03				
1299.09	1050.	3.91	1.54	3.348E-03				
1408.06	12285.	0.93	1.83	3.087E-03	1408.08	21.210	1.006E+00	Qa1408
1457.69	303.	5.74	0.73	2.968E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.94	39.88	3615.	1778.	1.216E+05	13.51	1.005	-	s
362.65	45.38	2424.	1607.	1.106E+05	10.00	0.782	-	D
373.27	46.70	2522.	459.	3.166E+04	32.31	0.784	-	D
2366.80	295.91	1173.	909.	9.138E+04	16.47	0.980	-	
2939.78	367.54	1144.	1566.	1.822E+05	10.99	1.241	-	s
3288.00	411.08	971.	3213.	3.918E+05	5.56	1.129	-	
3550.60	443.91	1047.	4199.	5.314E+05	4.73	1.130	-	
3908.02	488.59	1018.	668.	8.918E+04	24.25	0.812	-	s
4509.60	563.80	745.	582.	8.540E+04	20.31	1.165	-	
4689.23	586.26	914.	519.	7.849E+04	26.51	1.200	-	
5396.44	674.67	524.	269.	4.642E+04	35.29	0.378	-	s
5428.29	678.47	647.	582.	1.009E+05	14.89	1.380	-	D
5508.02	688.61	873.	930.	1.638E+05	16.03	1.108	-	
5752.98	719.24	663.	306.	5.669E+04	35.55	0.995	-	s
6116.45	764.68	760.	328.	6.576E+04	39.92	0.714	-	s
6480.66	810.21	752.	415.	8.753E+04	32.28	0.589	-	s
6937.51	867.32	1104.	3687.	8.158E+05	5.82	1.477	-	
7352.86	919.24	737.	470.	1.087E+05	32.56	1.243	-	
7407.14	926.02	464.	288.	6.705E+04	35.46	0.983	-	s
8038.79	1004.77	258.	581.	1.432E+05	11.41	1.612	-	D
8684.98	1085.76	795.	7225.	1.872E+06	3.06	1.750	-	
8717.64	1089.84	559.	1068.	2.775E+05	11.89	1.230	-	sD
8894.67	1111.97	485.	9693.	2.553E+06	2.37	1.682	-	
9701.46	1212.82	224.	1053.	2.962E+05	9.56	1.732	-	
9998.16	1249.91	130.	227.	6.562E+04	27.52	0.306	-	s
10193.14	1274.28	97.	188.	5.512E+04	30.31	0.740	-	s
10391.58	1299.09	82.	1050.	3.138E+05	7.82	1.545	-	
11660.46	1457.69	0.	303.	1.021E+05	11.49	0.729	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:40:29
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108002_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.04	121.78	4468.	72005.	120.009	0.84	0.865
Qa-245	1957.23	244.70	2275.	15674.	26.124	2.04	0.982
Qa-344	2753.45	344.25	1564.	44274.	73.790	1.03	1.101
Qa-779	6230.02	778.87	967.	11721.	19.535	2.27	1.415
Qa-964	7710.90	964.00	787.	11497.	19.162	2.32	1.586
Qa-1408	11263.43	1408.07	137.	12240.	20.400	1.89	1.831

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		9.9746E-01				4.64E+03	
			121.78	9.975E-01	(	2.157E-03 4.20E-01 2.92E+01	G
Qa-245		9.8885E-01				4.64E+03	
			244.67	9.888E-01	(	7.010E-03 1.02E+00 7.62E+00	G
Qa-344		9.9803E-01				4.64E+03	
			344.30	9.980E-01	(	2.077E-03 5.15E-01 2.70E+01	G
Qa-779		9.9601E-01				4.64E+03	
			778.90	9.960E-01	(	6.158E-03 1.14E+00 1.30E+01	G
Qa-964		1.0183E+00				4.64E+03	
			964.00	1.018E+00	(	5.788E-03 1.16E+00 1.46E+01	G
Qa-1408		1.0022E+00				4.64E+03	
			1408.08	1.002E+00	(	2.231E-03 9.44E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:40:29
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108002_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3824E-01	9.9746E-01	8.3880E-03	1.1418E-01	2.157E-03
Qa-245	8.3100E-01	9.8885E-01	2.0220E-02	1.1469E-01	7.010E-03
Qa-344	8.3872E-01	9.9803E-01	1.0275E-02	1.1440E-01	2.077E-03
Qa-779	8.3702E-01	9.9601E-01	2.2622E-02	1.1594E-01	6.158E-03
Qa-964	8.5574E-01	1.0183E+00	2.3574E-02	1.1862E-01	5.788E-03
Qa-1408	8.4221E-01	1.0022E+00	1.8929E-02	1.1597E-01	2.231E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1085.6 to 2042.1 keV) 5.043E+00 uCi
Total Decayed Activity (1085.6 to 2042.1 keV) 6.0008349E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:40:29
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108002_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1583525113001
Cal : 30-DEC-2013 16:14:21,29-DEC-2013 16:56:20

Run Name : QUALITY CONTROL CHEC
File : 9_20131230_001
Caldate : 30-DEC-2013, 29-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 30-DEC-2013 15:53
Dead Time : 3.95 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9788	uCi	.0060696	973.90	972.00 - 976.00	121.91	121.58 - 121.98	0.86	0.76 - 0.92	-2.12	5	
QA-779	1.000	1.008	uCi	.016482					1.45	1.33 - 1.63	0.80	5	
QA-1408	1.000	0.9937	uCi	.013119	11263.32	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.91	1.76 - 2.15	-0.63	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 16:14:38
Curtis & Tompkins HPS Lab       Spectrum name: 9_20131230001_QCAsLeft.An1

Sample description
     RCCV,S19587,Quality control Check (QC Source #5)


Spectrum Filename: C:\User\SPC\Det9\9_20131230001_QCAsLeft.An1

Acquisition information
       Start time:                 12/30/2013 15:53:03
       Live time:               1200
       Real time:               1249
       Dead time:                  3.95 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_QC.Clb
     HPGE09 S19587 9_20131229001_Energy


       Energy Calibration
            Created:               12/30/2013 16:14:21
            Zero offset:           0.147 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -2.910E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/29/2013 16:56:20
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.86keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 16:14:38
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0682

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
40.14	2542.	5.82	0.97	1.479E-02				
45.60	2476.	4.28	0.80	1.469E-02				
47.06	777.	12.90	0.80	1.467E-02				
121.91	142166.	0.31	0.86	1.329E-02	121.78	29.240	9.788E-01	QA122
244.64	31182.	0.71	1.00	1.104E-02	244.67	7.616	9.926E-01	Qa245
295.81	1712.	5.72	1.03	9.877E-03				
344.12	87055.	0.35	1.08	8.779E-03	344.30	27.000	9.835E-01	Qa344
367.49	3013.	3.80	1.10	8.562E-03				
410.98	6402.	1.50	1.14	8.162E-03				
443.84	8724.	1.44	1.15	7.860E-03				
488.57	1137.	8.83	1.16	7.450E-03				
503.41	475.	17.60	0.46	7.313E-03				
563.92	1133.	6.06	1.27	6.758E-03				
566.56	343.	17.09	1.28	6.734E-03				
586.13	1156.	10.74	1.22	6.553E-03				
674.54	457.	12.66	1.37	5.741E-03				
678.68	945.	6.49	1.37	5.703E-03				
688.65	1856.	5.33	1.43	5.612E-03				
719.35	776.	11.98	1.20	5.330E-03				
778.92	23396.	0.82	1.45	4.783E-03	778.90	12.990	1.008E+00	Qa779
810.58	624.	11.92	1.35	4.675E-03				
867.42	6917.	1.44	1.52	4.481E-03				
919.37	705.	9.57	1.01	4.305E-03				
926.07	502.	15.64	1.19	4.282E-03				
964.02	22696.	0.79	1.62	4.153E-03	964.00	14.580	1.003E+00	Qa964
1005.19	1116.	4.49	1.63	4.056E-03				
1085.89	14334.	0.90	1.69	3.868E-03				

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 16:14:38
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1089.81	2405.	2.99	1.69	3.859E-03				
1112.04	19508.	0.89	1.72	3.807E-03				
1212.91	1944.	4.58	1.70	3.572E-03				
1249.92	338.	14.43	0.82	3.485E-03				
1274.24	416.	15.14	0.51	3.428E-03				
1299.21	2055.	3.02	1.38	3.370E-03				
1408.03	24537.	0.66	1.91	3.116E-03	1408.08	21.210	9.937E-01	Qa1408
1457.55	639.	4.41	1.49	3.001E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
319.85	40.14	5863.	2542.	1.718E+05	11.64	0.971	-	s
363.51	45.54	4365.	2476.	1.685E+05	8.55	0.799	-	D
375.20	47.01	4641.	777.	5.300E+04	25.80	0.800	-	D
2364.86	295.81	2184.	1712.	1.733E+05	11.43	1.030	-	
2938.25	367.49	2142.	3013.	3.519E+05	7.59	1.102	-	s
3286.08	410.97	1594.	6450.	7.903E+05	3.55	1.182	-	
3549.01	443.84	1618.	8724.	1.110E+06	2.89	1.148	-	
3906.82	488.57	1862.	1137.	1.526E+05	17.66	1.157	-	
4025.53	503.41	1511.	475.	6.490E+04	35.19	0.461	-	s
4509.53	563.85	1791.	1133.	1.676E+05	12.12	1.274	-	D
4530.72	566.50	1551.	343.	5.100E+04	34.18	1.276	-	D
4687.24	586.13	2421.	1156.	1.765E+05	21.49	1.222	-	
5395.07	674.61	1308.	457.	7.957E+04	33.40	0.893	-	s
5428.21	678.75	1854.	983.	1.724E+05	21.69	1.244	-	
5507.39	688.65	1584.	1856.	3.307E+05	10.65	1.425	-	
5752.97	719.35	1607.	776.	1.456E+05	23.96	1.195	-	
6482.87	810.58	1142.	624.	1.335E+05	23.84	1.348	-	
6937.40	867.39	1868.	7281.	1.625E+06	3.81	1.510	-	
7353.30	919.37	874.	705.	1.638E+05	19.13	1.007	-	s
7406.83	926.07	1066.	502.	1.171E+05	31.28	1.194	-	s
8039.84	1005.18	895.	1312.	3.235E+05	13.50	1.313	-	s
8685.24	1085.84	2028.	13896.	3.592E+06	2.41	1.657	-	
8716.54	1089.76	1654.	1658.	4.297E+05	13.25	1.565	-	sD
8894.81	1112.04	1292.	19508.	5.124E+06	1.78	1.716	-	
9701.92	1212.91	749.	1944.	5.443E+05	9.17	1.699	-	
9998.13	1249.92	340.	338.	9.698E+04	28.85	0.818	-	s
10192.69	1274.24	374.	416.	1.213E+05	30.29	0.508	-	s
10392.47	1299.21	231.	2055.	6.097E+05	6.05	1.382	-	s
11659.54	1457.55	20.	639.	2.129E+05	8.82	1.490	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 16:14:38
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230001_QCAsLeft.An1

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.90	121.91	10221.	142166.	118.471	0.62	0.859
Qa-245	1955.55	244.64	4227.	31182.	25.985	1.42	1.001
Qa-344	2751.20	344.11	2990.	88248.	73.540	0.73	1.096
Qa-779	6229.58	778.92	2030.	23396.	19.497	1.64	1.449
Qa-964	7710.51	964.02	1326.	22696.	18.913	1.58	1.623
Qa-1408	11263.32	1408.03	204.	24537.	20.447	1.32	1.913

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		9.7879E-01				4.64E+03	
			121.78	9.788E-01	(	3.262E-03 3.10E-01 2.92E+01	G
Qa-245		9.9260E-01				4.64E+03	
			244.67	9.926E-01	(	9.731E-03 7.12E-01 7.62E+00	G
Qa-344		9.9698E-01				4.64E+03	
			344.30	9.970E-01	(	2.910E-03 3.65E-01 2.70E+01	G
Qa-779		1.0080E+00				4.64E+03	
			778.90	1.008E+00	(	9.161E-03 8.18E-01 1.30E+01	G
Qa-964		1.0034E+00				4.64E+03	
			964.00	1.003E+00	(	7.622E-03 7.88E-01 1.46E+01	G
Qa-1408		9.9368E-01				4.64E+03	
			1408.08	9.937E-01	(	2.808E-03 6.60E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.

```
     ORTEC g v - i (1087) Env32  G53W4.26  12/30/2013 16:14:38
Curtis & Tompkins HPS Lab       Spectrum name: 9_20131230001_QCAsLeft.An1

  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi           uCi          uCi
_____________________________________________________________________________
QA-122       8.2362E-01    9.7879E-01   6.0696E-03    1.1191E-01  3.262E-03
Qa-245       8.3523E-01    9.9260E-01   1.4144E-02    1.1420E-01  9.731E-03
Qa-344       8.3892E-01    9.9698E-01   7.2796E-03    1.1405E-01  2.910E-03
Qa-779       8.4818E-01    1.0080E+00   1.6482E-02    1.1625E-01  9.161E-03
Qa-964       8.4428E-01    1.0034E+00   1.5811E-02    1.1563E-01  7.622E-03
Qa-1408      8.3614E-01    9.9368E-01   1.3119E-02    1.1420E-01  2.808E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (  573.8 to  2041.9 keV)     5.026E+00  uCi
Total Decayed Activity (  573.8 to  2041.9 keV) 5.9733958E+00  uCi
```

ORTEC g v - i (1087) Env32 G53W4.26 12/30/2013 16:14:38
Curtis & Tompkins HPS Lab Spectrum name: 9_20131230001_QCAsLeft.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1584011944001
Cal : 08-JAN-2014 07:26:14,29-DEC-2013 16:56:20

Run Name : QUALITY CONTROL CHEC
File : 9_20140108_001
Caldate : 08-JAN-2014, 29-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:04
Dead Time : 3.93 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9761	uCi	.0060473	973.78	972.00 - 976.00	121.89	121.58 - 121.98	0.88	0.76 - 0.92	-2.39	5	
QA-779	1.000	0.9979	uCi	.017082					1.48	1.33 - 1.63	-0.21	5	
QA-1408	1.000	0.9836	uCi	.013706	11262.48	11259.00 - 11269.00	1408.05	1407.58 - 1408.58	1.98	1.76 - 2.15	-1.64	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:26:31
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108001_QCAsLeft.An1

Sample description
     RCCV,S19587,Quality control Check (QC Source #5)


Spectrum Filename: C:\User\SPC\Det9\9_20140108001_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 07:04:56
       Live time:               1200
       Real time:               1249
       Dead time:                  3.93 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_QC.Clb
     HPGE09 S19587 9_20131229001_Energy


       Energy Calibration
            Created:               1/8/2014 07:26:14
            Zero offset:           0.095 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.675E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/29/2013 16:56:20
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.11keV )
       Stop channel:           16336 (  2041.83keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:26:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0710

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.75	1252.	6.91	1.15	1.497E-02				
40.10	2568.	6.25	0.99	1.479E-02				
45.55	2547.	4.17	0.81	1.470E-02				
46.94	856.	12.15	0.81	1.467E-02				
121.89	141585.	0.31	0.88	1.329E-02	121.78	29.240	9.761E-01	QA122
244.64	30956.	0.73	0.99	1.104E-02	244.67	7.616	9.867E-01	Qa245
295.87	1810.	7.29	1.14	9.876E-03				
344.13	88195.	0.37	1.12	8.778E-03	344.30	27.000	9.977E-01	Qa344
367.48	3062.	3.78	1.00	8.562E-03				
411.00	6549.	2.28	1.15	8.162E-03				
416.00	558.	16.45	0.39	8.116E-03				
443.89	8549.	1.80	1.19	7.860E-03				
488.58	1183.	7.70	1.00	7.449E-03				
564.02	1199.	5.75	1.29	6.755E-03				
566.53	372.	17.17	1.29	6.732E-03				
586.30	1001.	6.31	1.31	6.552E-03				
674.76	408.	12.75	1.39	5.739E-03				
678.67	957.	6.42	1.39	5.703E-03				
688.64	1910.	6.64	1.39	5.612E-03				
719.41	684.	9.06	1.43	5.328E-03				
723.88	315.	18.52	1.43	5.287E-03				
765.00	497.	16.93	1.57	4.910E-03				
778.98	23132.	0.86	1.48	4.782E-03	778.90	12.990	9.979E-01	Qa779
810.52	672.	16.46	1.02	4.675E-03				
867.43	7032.	2.38	1.50	4.481E-03				
919.33	728.	7.23	1.60	4.305E-03				
926.34	500.	10.02	1.60	4.281E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:26:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
964.08	22399.	0.80	1.67	4.152E-03	964.00	14.580	9.915E-01	Qa964
1005.21	1228.	7.23	1.25	4.056E-03				
1085.93	14433.	0.89	1.73	3.868E-03				
1089.99	2492.	2.86	1.73	3.859E-03				
1112.08	19158.	0.88	1.71	3.807E-03				
1123.09	275.	14.01	1.76	3.781E-03				
1212.93	1935.	4.29	1.66	3.572E-03				
1274.47	345.	16.60	1.23	3.428E-03				
1299.19	2139.	2.82	1.77	3.370E-03				
1408.04	24382.	0.69	1.99	3.116E-03	1408.08	21.210	9.887E-01	Qa1408
1457.48	624.	4.00	1.50	3.001E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
245.12	30.75	2307.	1252.	8.366E+04	13.82	1.149	-	s
319.86	40.10	6435.	2568.	1.736E+05	12.49	0.990	-	s
363.44	45.52	4353.	2547.	1.733E+05	8.33	0.807	-	D
374.53	46.91	4984.	856.	5.835E+04	24.31	0.808	-	D
2364.97	295.87	3253.	1810.	1.833E+05	14.58	1.139	-	
2937.69	367.48	2106.	3062.	3.576E+05	7.56	1.003	-	s
3285.68	411.00	2586.	6549.	8.024E+05	4.56	1.154	-	
3325.68	416.00	1710.	558.	6.875E+04	32.90	0.389	-	s
3548.73	443.89	2454.	8549.	1.088E+06	3.61	1.186	-	
3906.21	488.58	1615.	1183.	1.588E+05	15.39	1.005	-	
4509.53	564.17	1779.	1199.	1.775E+05	11.51	1.291	-	D
4529.64	566.69	1855.	372.	5.527E+04	34.34	1.293	-	D
4687.74	586.30	1496.	1001.	1.528E+05	12.62	1.310	-	D
5396.02	674.84	1162.	393.	6.848E+04	35.29	1.209	-	s
5427.25	678.75	1773.	1051.	1.843E+05	19.62	1.529	-	
5506.36	688.64	2184.	1910.	3.404E+05	13.28	1.391	-	
5753.09	719.48	1789.	713.	1.338E+05	28.08	0.944	-	s
6117.20	765.00	1429.	497.	1.012E+05	33.85	1.575	-	
6481.33	810.52	1867.	672.	1.438E+05	32.93	1.021	-	s
6936.64	867.43	2611.	7032.	1.569E+06	4.75	1.497	-	
7351.86	919.32	1020.	728.	1.691E+05	14.45	1.596	-	D
7407.92	926.33	1003.	500.	1.167E+05	20.03	1.601	-	D
8038.89	1005.21	914.	1228.	3.029E+05	14.47	1.251	-	s
8684.22	1085.86	1717.	14097.	3.644E+06	2.28	1.709	-	
8716.69	1089.92	1080.	1989.	5.155E+05	8.64	1.633	-	D
8894.02	1112.08	1102.	19158.	5.032E+06	1.76	1.711	-	
8982.10	1123.14	604.	275.	7.271E+04	28.02	1.761	-	D
9701.04	1212.93	680.	1935.	5.417E+05	8.59	1.655	-	
10193.50	1274.47	362.	345.	1.006E+05	33.20	1.227	-	s
10391.32	1299.19	189.	2139.	6.347E+05	5.65	1.774	-	

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:26:31
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108001_QCAsLeft.An1

  Channel   Energy Background   Net area  Eff*Area  Uncert   FWHM Suspected
 11658.09  1457.48         0.       624. 2.079E+05    8.01   1.501  -      s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   L - Peak written from unknown list.
   C - Area < Critical level.

-------------------------------------------------------------
 This section based on library: QC.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________
 QA-122    973.78   121.89      9959.    141585.   117.988     0.62   0.876
 Qa-245   1955.37   244.64      4518.     30956.    25.796     1.46   0.988
 Qa-344   2750.94   344.13      3404.     88195.    73.496     0.74   1.118
 Qa-779   6229.04   778.98      2263.     23132.    19.277     1.71   1.477
 Qa-964   7709.87   964.08      1403.     22399.    18.666     1.61   1.671
 Qa-1408 11262.48  1408.05       444.     24257.    20.214     1.39   1.984

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
            uCi           keV     uCi           uCi            COMMENTS
 ____________________________________________________________________________

QA-122       9.7606E-01                                      4.64E+03
                           121.78 9.761E-01  (  1.603E-03 3.10E-01 2.92E+01 G

Qa-245       9.8667E-01                                      4.64E+03
                           244.67 9.867E-01  (  4.992E-03 7.32E-01 7.62E+00 G

Qa-344       9.9767E-01                                      4.64E+03
                           344.30 9.977E-01  (  1.538E-03 3.71E-01 2.70E+01 G

Qa-779       9.9787E-01                                      4.64E+03
                           778.90 9.979E-01  (  4.782E-03 8.56E-01 1.30E+01 G

Qa-964       9.9150E-01                                      4.64E+03
                           964.00 9.915E-01  (  3.863E-03 8.03E-01 1.46E+01 G

Qa-1408      9.8364E-01                                      4.64E+03
                          1408.08 9.836E-01  (  1.990E-03 6.97E-01 2.12E+01 G
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:26:31
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108001_QCAsLeft.An1

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.2025E-01	9.7606E-01	6.0473E-03	1.1159E-01	1.603E-03
Qa-245	8.2917E-01	9.8667E-01	1.4437E-02	1.1356E-01	4.992E-03
Qa-344	8.3842E-01	9.9767E-01	7.4095E-03	1.1414E-01	1.538E-03
Qa-779	8.3859E-01	9.9787E-01	1.7082E-02	1.1519E-01	4.782E-03
Qa-964	8.3323E-01	9.9150E-01	1.5926E-02	1.1431E-01	3.863E-03
Qa-1408	8.2663E-01	9.8364E-01	1.3706E-02	1.1313E-01	1.990E-03

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:26:31
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108001_QCAsLeft.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity ( 1130.1 to  2041.8 keV)     4.986E+00  uCi
 Total Decayed Activity ( 1130.1 to  2041.8 keV) 5.9334121E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE09
Seqnum : 1584014752001
Cal : 10-JAN-2014 06:14:13,29-DEC-2013 16:56:20

Run Name : QUALITY CONTROL CHEC
File : 9_20140110_001
Caldate : 10-JAN-2014, 29-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 10-JAN-2014 05:52
Dead Time : 3.92 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9788	uCi	.0060705	973.75	972.00 - 976.00	121.91	121.58 - 121.98	0.88	0.76 - 0.92	-2.12	5	
QA-779	1.000	1.019	uCi	.017141					1.49	1.33 - 1.63	1.89	5	
QA-1408	1.000	0.9807	uCi	.013621	11262.59	11259.00 - 11269.00	1408.04	1407.58 - 1408.58	1.88	1.76 - 2.15	-1.93	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:14:32
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110001_QCAsLeft.An1

Sample description
     RCCV,S19587,Quality control Check (QC Source #5)


Spectrum Filename: C:\User\SPC\Det9\9_20140110001_QCAsLeft.An1

Acquisition information
       Start time:                 1/10/2014 05:52:57
       Live time:               1200
       Real time:               1249
       Dead time:                  3.92 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_QC.Clb
     HPGE09 S19587 9_20131229001_Energy


       Energy Calibration
            Created:               1/10/2014 06:14:13
            Zero offset:           0.150 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -3.168E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/29/2013 16:56:20
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.16keV )
       Stop channel:           16336 (  2041.98keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:14:32
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0700

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
40.05	2844.	6.01	1.03	1.480E-02				
45.82	2928.	5.39	0.76	1.469E-02				
121.91	141947.	0.31	0.88	1.329E-02	121.78	29.240	9.788E-01	QA122
244.64	30978.	0.63	1.00	1.104E-02	244.67	7.616	9.877E-01	Qa245
295.81	1579.	6.86	1.10	9.877E-03				
329.19	541.	16.27	0.92	9.118E-03				
344.10	88373.	0.37	1.10	8.779E-03	344.30	27.000	1.000E+00	Qa344
367.49	3037.	4.23	1.03	8.562E-03				
410.95	6412.	1.92	1.16	8.163E-03				
416.10	409.	16.87	0.77	8.115E-03				
443.86	8722.	1.62	1.16	7.860E-03				
488.61	1049.	7.86	1.17	7.449E-03				
503.39	406.	19.64	0.82	7.313E-03				
563.93	1197.	5.67	1.28	6.758E-03				
566.71	400.	15.07	1.29	6.732E-03				
586.23	1213.	7.79	1.10	6.553E-03				
674.63	465.	12.35	1.37	5.740E-03				
678.73	980.	6.15	1.38	5.702E-03				
688.62	1778.	6.10	1.26	5.612E-03				
719.42	733.	8.11	1.41	5.329E-03				
764.85	394.	14.94	1.44	4.911E-03				
778.94	23613.	0.84	1.49	4.783E-03	778.90	12.990	1.019E+00	Qa779
810.10	680.	12.63	0.68	4.676E-03				
867.35	6988.	1.80	1.49	4.482E-03				
919.36	787.	12.52	0.56	4.305E-03				
926.23	581.	11.91	0.69	4.281E-03				
964.03	22548.	0.80	1.57	4.153E-03	964.00	14.580	9.984E-01	Qa964

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:14:32
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1005.03	1212.	6.86	1.55	4.057E-03				
1085.90	14272.	0.90	1.67	3.868E-03				
1089.90	2501.	2.76	1.68	3.859E-03				
1112.03	19366.	0.89	1.76	3.807E-03				
1212.93	1953.	4.10	1.62	3.572E-03				
1292.95	122.	18.90	1.80	3.385E-03				
1299.22	2061.	3.16	1.78	3.370E-03				
1408.04	24218.	0.69	1.88	3.116E-03	1408.08	21.210	9.823E-01	Qa1408
1457.58	619.	4.41	1.47	3.001E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
319.11	40.05	6944.	2844.	1.922E+05	12.02	1.028	-	s
365.26	45.82	5790.	2928.	1.993E+05	10.79	0.757	-	s
2364.60	295.81	2601.	1579.	1.598E+05	13.72	1.096	-	
2631.59	329.19	2002.	541.	5.933E+04	32.54	0.916	-	
2938.00	367.49	2495.	3037.	3.547E+05	8.46	1.034	-	
3285.59	410.95	1850.	6412.	7.855E+05	3.83	1.161	-	
3326.75	416.10	1209.	409.	5.040E+04	33.74	0.767	-	s
3548.78	443.86	2111.	8722.	1.110E+06	3.24	1.158	-	
3906.80	488.61	1437.	1049.	1.408E+05	15.72	1.166	-	
4025.03	503.39	1488.	406.	5.551E+04	39.28	0.817	-	s
4509.25	563.86	1705.	1197.	1.771E+05	11.34	1.284	-	D
4531.49	566.65	1616.	400.	5.942E+04	30.13	1.287	-	D
4687.63	586.23	1678.	1213.	1.852E+05	15.58	1.098	-	s
5395.38	674.70	1596.	525.	9.147E+04	35.13	0.764	-	s
5428.15	678.80	1337.	995.	1.745E+05	16.83	0.968	-	s
5506.74	688.62	1818.	1778.	3.168E+05	12.21	1.263	-	
5753.28	719.44	1490.	780.	1.463E+05	22.42	1.066	-	s
6116.83	764.89	1550.	472.	9.602E+04	37.73	0.221	-	s
6478.49	810.10	1340.	680.	1.454E+05	25.27	0.682	-	s
6936.53	867.35	1620.	6988.	1.559E+06	3.61	1.490	-	
7352.62	919.36	1393.	787.	1.828E+05	25.04	0.562	-	s
7407.60	926.23	878.	581.	1.358E+05	23.83	0.688	-	s
8038.03	1005.03	826.	1212.	2.988E+05	13.72	1.550	-	
8684.57	1085.84	1798.	13962.	3.609E+06	2.29	1.665	-	
8716.55	1089.84	1250.	1874.	4.855E+05	9.70	1.413	-	D
8894.10	1112.03	1224.	19366.	5.087E+06	1.77	1.764	-	s
9701.40	1212.93	602.	1953.	5.469E+05	8.19	1.619	-	
10341.00	1292.87	182.	191.	5.643E+04	38.04	0.391	-	s
10391.82	1299.22	279.	2061.	6.116E+05	6.32	1.780	-	
11659.02	1457.58	15.	619.	2.063E+05	8.83	1.475	-	s

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:14:32
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110001_QCAsLeft.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.75	121.91	10156.	141947.	118.289	0.62	0.876
Qa-245	1955.34	244.64	4797.	31467.	26.222	1.49	1.021
Qa-344	2750.91	344.10	3225.	88373.	73.644	0.74	1.098
Qa-779	6229.22	778.94	2262.	23613.	19.677	1.68	1.493
Qa-964	7709.96	964.03	1344.	22548.	18.790	1.60	1.572
Qa-1408	11262.59	1408.04	432.	24178.	20.149	1.39	1.877

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi	COMMENTS
QA-122		9.7884E-01				4.64E+03	
			121.78	9.788E-01	(	1.619E-03 3.10E-01 2.92E+01	G
Qa-245		1.0033E+00				4.64E+03	
			244.67	1.003E+00	(	5.145E-03 7.45E-01 7.62E+00	G
Qa-344		9.9998E-01				4.64E+03	
			344.30	1.000E+00	(	1.497E-03 3.68E-01 2.70E+01	G
Qa-779		1.0189E+00				4.64E+03	
			778.90	1.019E+00	(	4.782E-03 8.41E-01 1.30E+01	G
Qa-964		9.9839E-01				4.64E+03	
			964.00	9.984E-01	(	3.782E-03 7.99E-01 1.46E+01	G
Qa-1408		9.8073E-01				4.64E+03	
			1408.08	9.807E-01	(	1.963E-03 6.94E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:14:32
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110001_QCAsLeft.An1

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi            uCi          uCi
_____________________________________________________________________________
QA-122       8.2235E-01    9.7884E-01   6.0705E-03    1.1191E-01  1.619E-03
Qa-245       8.4287E-01    1.0033E+00   1.4951E-02    1.1551E-01  5.145E-03
Qa-344       8.4011E-01    9.9998E-01   7.3607E-03    1.1440E-01  1.497E-03
Qa-779       8.5603E-01    1.0189E+00   1.7141E-02    1.1758E-01  4.782E-03
Qa-964       8.3878E-01    9.9839E-01   1.5963E-02    1.1509E-01  3.782E-03
Qa-1408      8.2394E-01    9.8073E-01   1.3621E-02    1.1279E-01  1.963E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:14:32
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110001_QCAsLeft.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  573.9 to  2042.0 keV)     5.024E+00  uCi
 Total Decayed Activity (  573.9 to  2042.0 keV) 5.9801159E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE10
Seqnum : 1594011971001
Cal : 08-JAN-2014 07:52:53,30-DEC-2013 15:43:50

Run Name : QUALITY CONTROL CHEC
File : 10_20140108_001
Caldate : 08-JAN-2014, 30-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:31
Dead Time : 3.62 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9765	uCi	.0062128	974.38	972.00 - 976.00	121.88	121.58 - 121.98	0.90	0.77 - 0.95	-2.35	5	
QA-779	1.000	1.019	uCi	.018661					1.45	1.30 - 1.58	1.91	5	
QA-1408	1.000	1.007	uCi	.01439	11263.36	11259.00 - 11269.00	1408.04	1407.58 - 1408.58	1.89	1.75 - 2.13	0.67	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:53:09
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108001_QCAsLeft.An1

Sample description
     RCCV,S19587,Quality control Check (QC Source #5)


Spectrum Filename: C:\User\SPC\Det10\10_20140108001_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 07:31:34
       Live time:               1200
       Real time:               1245
       Dead time:                  3.62 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_QC.Clb
     HPGE10 S19587 10_20131230001_Energy


       Energy Calibration
            Created:               1/8/2014 07:52:53
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.220E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 15:43:50
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.73keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:53:09
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0519

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
40.20	655.	17.88	0.80	1.321E-02				
45.77	1007.	13.29	0.89	1.313E-02				
121.88	128335.	0.32	0.90	1.204E-02	121.78	29.240	9.765E-01	QA122
244.65	28882.	0.66	1.01	1.030E-02	244.67	7.616	9.869E-01	Qa245
295.78	1559.	8.64	1.03	9.218E-03				
344.15	81164.	0.38	1.12	8.196E-03	344.30	27.000	9.833E-01	Qa344
367.56	2663.	4.73	1.17	7.988E-03				
411.01	6102.	2.11	1.07	7.606E-03				
443.85	7875.	1.61	1.24	7.317E-03				
488.41	1146.	8.13	1.13	6.924E-03				
502.89	373.	15.69	1.23	6.797E-03				
563.96	1038.	6.59	1.28	6.257E-03				
586.23	1113.	9.23	1.34	6.063E-03				
656.77	418.	16.88	0.66	5.442E-03				
674.59	387.	13.57	1.36	5.285E-03				
678.66	839.	7.09	1.37	5.249E-03				
688.64	1774.	5.87	1.20	5.161E-03				
719.27	823.	10.65	1.15	4.892E-03				
764.64	552.	15.97	1.00	4.492E-03				
778.89	21568.	0.92	1.45	4.367E-03	778.90	12.990	1.019E+00	Qa779
810.41	668.	11.25	1.04	4.275E-03				
867.38	6462.	2.26	1.51	4.110E-03				
919.38	807.	11.61	0.95	3.959E-03				
925.98	518.	13.76	1.10	3.940E-03				
964.01	20666.	0.86	1.60	3.829E-03	964.00	14.580	9.920E-01	Qa964
1005.16	1033.	4.56	1.61	3.737E-03				
1085.85	13076.	0.95	1.67	3.557E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:53:09
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1089.86	2225.	3.01	1.67	3.548E-03				
1108.88	664.	12.35	1.68	3.506E-03				
1112.11	16591.	0.83	1.69	3.499E-03				
1212.86	1845.	4.23	2.02	3.274E-03				
1299.14	1764.	3.50	1.83	3.081E-03				
1408.03	22645.	0.71	1.89	2.838E-03	1408.08	21.210	1.008E+00	Qa1408
1457.67	548.	4.99	2.08	2.727E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
321.25	40.20	4356.	655.	4.960E+04	35.77	0.801	-	
365.77	45.77	4830.	1007.	7.671E+04	26.58	0.895	-	s
2365.03	295.78	3381.	1559.	1.691E+05	17.28	1.028	-	
2939.06	367.56	2451.	2663.	3.334E+05	9.47	1.174	-	s
3286.55	411.01	2012.	6102.	8.023E+05	4.22	1.073	-	
3549.23	443.85	1775.	7875.	1.076E+06	3.22	1.244	-	
3905.68	488.41	1602.	1146.	1.655E+05	16.26	1.127	-	
4021.48	502.89	1528.	373.	5.490E+04	31.39	1.227	-	D
4511.39	564.14	2312.	1245.	1.989E+05	18.35	1.075	-	s
4688.05	586.23	1849.	1113.	1.836E+05	18.45	1.341	-	
5252.32	656.77	1113.	418.	7.683E+04	33.76	0.657	-	s
5394.77	674.58	1119.	409.	7.739E+04	34.18	1.067	-	s
5427.32	678.65	1504.	926.	1.764E+05	19.85	1.404	-	
5507.27	688.64	1619.	1774.	3.437E+05	11.74	1.203	-	s
5752.27	719.27	1429.	823.	1.683E+05	21.29	1.146	-	
6115.19	764.64	1444.	552.	1.229E+05	31.94	1.001	-	s
6481.37	810.41	1106.	668.	1.563E+05	22.49	1.040	-	s
6937.14	867.38	2124.	6462.	1.572E+06	4.52	1.509	-	
7353.19	919.38	1210.	807.	2.039E+05	23.22	0.946	-	s
7405.97	925.98	878.	518.	1.315E+05	27.52	1.100	-	s
8039.29	1005.14	570.	1090.	2.917E+05	11.60	1.739	-	
8684.67	1085.80	1380.	13089.	3.679E+06	2.23	1.792	-	
8716.64	1089.81	951.	1889.	5.324E+05	6.52	1.670	-	D
8869.34	1108.81	3031.	664.	1.893E+05	24.71	1.683	-	D
8895.21	1112.04	1256.	16591.	4.742E+06	1.67	1.685	-	D
9701.41	1212.86	549.	1845.	5.635E+05	8.45	2.022	-	
10391.83	1299.14	244.	1764.	5.725E+05	7.00	1.833	-	
11660.56	1457.67	23.	548.	2.009E+05	9.99	2.081	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:53:09
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.38	121.88	8519.	128335.	106.946	0.64	0.900
Qa-245	1956.10	244.65	4151.	29122.	24.268	1.49	1.005
Qa-344	2751.84	344.15	3001.	81164.	67.636	0.77	1.118
Qa-779	6229.22	778.89	2355.	21568.	17.973	1.83	1.448
Qa-964	7710.26	964.01	1414.	20666.	17.222	1.72	1.600
Qa-1408	11263.36	1408.04	398.	22607.	18.839	1.43	1.886

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Code	MDA Value uCi	COMMENTS
QA-122		9.7650E-01				4.64E+03	
			121.78	9.765E-01	(	1.636E-03 3.18E-01 2.92E+01	G
Qa-245		9.9514E-01				4.64E+03	
			244.67	9.951E-01	(	5.130E-03 7.44E-01 7.62E+00	G
Qa-344		9.8332E-01				4.64E+03	
			344.30	9.833E-01	(	1.546E-03 3.83E-01 2.70E+01	G
Qa-779		1.0191E+00				4.64E+03	
			778.90	1.019E+00	(	5.343E-03 9.16E-01 1.30E+01	G
Qa-964		9.9203E-01				4.64E+03	
			964.00	9.920E-01	(	4.205E-03 8.60E-01 1.46E+01	G
Qa-1408		1.0067E+00				4.64E+03	
			1408.08	1.007E+00	(	2.069E-03 7.15E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:53:09
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.2063E-01	9.7650E-01	6.2128E-03	1.1165E-01	1.636E-03
Qa-245	8.3628E-01	9.9514E-01	1.4812E-02	1.1457E-01	5.130E-03
Qa-344	8.2635E-01	9.8332E-01	7.5259E-03	1.1251E-01	1.546E-03
Qa-779	8.5639E-01	1.0191E+00	1.8661E-02	1.1783E-01	5.343E-03
Qa-964	8.3367E-01	9.9203E-01	1.7053E-02	1.1453E-01	4.205E-03
Qa-1408	8.4601E-01	1.0067E+00	1.4390E-02	1.1583E-01	2.069E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1123.2 to 2041.7 keV) 5.019E+00 uCi
Total Decayed Activity (1123.2 to 2041.7 keV) 5.9727483E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:53:09
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE10
Seqnum : 1594014792001
Cal : 10-JAN-2014 06:53:23,30-DEC-2013 15:43:50

Run Name : QUALITY CONTROL CHEC
File : 10_20140110_001
Caldate : 10-JAN-2014, 30-DEC-2013
Live Time : 1200 sec

IDF : 1.0
Time : 10-JAN-2014 06:32
Dead Time : 3.62 %

Standards: S19587

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9817	uCi	.0064492	974.28	972.00 - 976.00	121.88	121.58 - 121.98	0.91	0.77 - 0.95	-1.83	5	
QA-779	1.000	1.010	uCi	.017602					1.45	1.30 - 1.58	1.02	5	
QA-1408	1.000	1.006	uCi	.01414	11263.43	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.97	1.75 - 2.13	0.58	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:53:40
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110001_QCAsLeft.An1

Sample description
     RCCV,S19587,Quality control Check (QC Source #5)


Spectrum Filename: C:\User\SPC\Det10\10_20140110001_QCAsLeft.An1

Acquisition information
       Start time:                 1/10/2014 06:32:11
       Live time:               1200
       Real time:               1245
       Dead time:                  3.62 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_QC.Clb
     HPGE10 S19587 10_20131230001_Energy


       Energy Calibration
            Created:               1/10/2014 06:53:23
            Zero offset:           0.031 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.401E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 15:43:50
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.69keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:53:40
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0508

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.61	604.	11.53	0.75	1.334E-02				
40.15	780.	15.46	0.69	1.321E-02				
45.82	1385.	9.69	1.01	1.313E-02				
121.88	128974.	0.33	0.91	1.204E-02	121.78	29.240	9.817E-01	QA122
244.65	29564.	0.82	1.02	1.030E-02	244.67	7.616	1.011E+00	Qa245
295.87	1516.	7.96	0.95	9.216E-03				
329.15	534.	19.87	0.42	8.513E-03				
344.15	81857.	0.38	1.10	8.196E-03	344.30	27.000	9.920E-01	Qa344
367.54	2691.	4.42	1.16	7.989E-03				
410.97	6101.	2.06	1.20	7.606E-03				
416.00	424.	19.21	0.17	7.562E-03				
443.85	8062.	1.88	1.16	7.317E-03				
488.54	981.	9.60	1.46	6.923E-03				
503.46	371.	17.35	1.32	6.792E-03				
563.96	1139.	5.92	1.26	6.259E-03				
586.22	968.	9.90	1.29	6.063E-03				
674.40	352.	15.91	1.34	5.285E-03				
678.59	885.	6.80	1.35	5.248E-03				
688.61	1552.	7.87	1.17	5.162E-03				
719.35	835.	11.38	1.31	4.891E-03				
764.61	493.	18.71	1.22	4.492E-03				
778.90	21410.	0.87	1.45	4.367E-03	778.90	12.990	1.012E+00	Qa779
810.67	580.	15.10	0.46	4.274E-03				
867.37	6792.	2.30	1.59	4.110E-03				
919.17	782.	10.21	1.24	3.959E-03				
926.14	511.	14.02	1.16	3.939E-03				
964.02	20868.	0.84	1.57	3.829E-03	964.00	14.580	1.002E+00	Qa964

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:53:40
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1005.21	1081.	7.63	1.41	3.737E-03				
1085.85	13029.	0.95	1.68	3.557E-03				
1089.77	2209.	3.23	1.69	3.549E-03				
1112.02	17732.	0.89	1.75	3.499E-03				
1212.98	1743.	2.96	1.79	3.274E-03				
1249.73	364.	16.06	0.89	3.191E-03				
1299.18	1893.	3.08	1.80	3.081E-03				
1408.03	22601.	0.70	1.97	2.838E-03	1408.08	21.210	1.007E+00	Qa1408
1457.65	607.	4.06	1.43	2.727E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Channel	Peak Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
244.50	30.61	1698.	604.	4.527E+04	23.06	0.748	-	s
320.79	40.15	4444.	780.	5.909E+04	30.92	0.692	-	
366.11	45.82	4620.	1385.	1.055E+05	19.39	1.006	-	s
2365.68	295.87	2968.	1516.	1.645E+05	15.93	0.946	-	
2631.87	329.15	2495.	534.	6.275E+04	39.73	0.425	-	s
2938.84	367.54	2243.	2691.	3.369E+05	8.83	1.155	-	s
3286.20	410.97	1894.	6101.	8.021E+05	4.12	1.203	-	
3326.42	416.00	1482.	424.	5.612E+04	38.42	0.175	-	s
3549.21	443.85	2353.	8062.	1.102E+06	3.75	1.156	-	
3906.66	488.54	1680.	981.	1.417E+05	19.20	1.456	-	s
4025.94	503.46	1106.	371.	5.457E+04	34.69	1.319	-	
4509.90	563.99	1709.	1139.	1.820E+05	11.85	1.256	-	D
4687.91	586.22	1786.	968.	1.597E+05	19.79	1.286	-	s
5428.50	678.80	1698.	1020.	1.945E+05	19.62	1.406	-	
5506.96	688.61	2090.	1552.	3.007E+05	15.74	1.175	-	
5752.90	719.35	1575.	835.	1.707E+05	22.75	1.309	-	
6114.97	764.61	1570.	493.	1.097E+05	37.43	1.224	-	
6483.43	810.67	1390.	580.	1.357E+05	30.19	0.461	-	s
6937.06	867.37	2298.	6792.	1.653E+06	4.61	1.589	-	
7351.45	919.17	1017.	782.	1.975E+05	20.42	1.240	-	
7407.23	926.14	906.	511.	1.297E+05	28.04	1.159	-	s
8039.86	1005.21	841.	1081.	2.892E+05	15.26	1.413	-	
8684.73	1085.80	1757.	12832.	3.607E+06	2.45	1.728	-	
8716.12	1089.72	1469.	1620.	4.566E+05	12.96	1.471	-	sD
8894.55	1112.02	1056.	17732.	5.068E+06	1.78	1.749	-	
9701.48	1212.86	600.	1803.	5.508E+05	8.59	1.579	-	
9996.57	1249.73	403.	364.	1.142E+05	32.12	0.888	-	s
10392.26	1299.18	198.	1893.	6.145E+05	6.16	1.804	-	
11660.58	1457.65	0.	607.	2.226E+05	8.12	1.427	-	s

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:53:40
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110001_QCAsLeft.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	974.28	121.88	9715.	128974.	107.479	0.66	0.909
Qa-245	1956.06	244.65	5396.	29564.	24.637	1.63	1.024
Qa-344	2751.79	344.15	3016.	81857.	68.215	0.76	1.101
Qa-779	6229.25	778.90	2046.	21375.	17.812	1.74	1.454
Qa-964	7710.34	964.02	1357.	20868.	17.390	1.68	1.569
Qa-1408	11263.43	1408.03	308.	22580.	18.816	1.41	1.974

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi	COMMENTS
QA-122		9.8166E-01				4.64E+03	
			121.78	9.817E-01	(	1.748E-03 3.28E-01 2.92E+01	G
Qa-245		1.0106E+00				4.64E+03	
			244.67	1.011E+00	(	5.851E-03 8.16E-01 7.62E+00	G
Qa-344		9.9201E-01				4.64E+03	
			344.30	9.920E-01	(	1.551E-03 3.82E-01 2.70E+01	G
Qa-779		1.0102E+00				4.64E+03	
			778.90	1.010E+00	(	4.981E-03 8.71E-01 1.30E+01	G
Qa-964		1.0020E+00				4.64E+03	
			964.00	1.002E+00	(	4.121E-03 8.42E-01 1.46E+01	G
Qa-1408		1.0058E+00				4.64E+03	
			1408.08	1.006E+00	(	1.820E-03 7.03E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:53:40
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110001_QCAsLeft.An1

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi            uCi          uCi
_____________________________________________________________________________
QA-122       8.2471E-01    9.8166E-01   6.4492E-03    1.1225E-01  1.748E-03
Qa-245       8.4900E-01    1.0106E+00   1.6488E-02    1.1654E-01  5.851E-03
Qa-344       8.3342E-01    9.9201E-01   7.5697E-03    1.1350E-01  1.551E-03
Qa-779       8.4873E-01    1.0102E+00   1.7602E-02    1.1667E-01  4.981E-03
Qa-964       8.4182E-01    1.0020E+00   1.6883E-02    1.1563E-01  4.121E-03
Qa-1408      8.4497E-01    1.0058E+00   1.4140E-02    1.1569E-01  1.820E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:53:40
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110001_QCAsLeft.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  586.1 to  2041.7 keV)     5.043E+00  uCi
 Total Decayed Activity (  586.1 to  2041.7 keV) 6.0022559E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604005225002
Cal : 03-JAN-2014 15:27:04,21-FEB-2013 21:48:39

Run Name : QUALITY CONTROL CHEC
File : 11_20140103_002
Caldate : 03-JAN-2014, 21-FEB-2013
Live Time : 1200 sec

IDF : 1.0
Time : 03-JAN-2014 15:05
Dead Time : 7.24 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9869	uCi	.0067631	973.89	972.00 - 976.00	121.94	121.58 - 121.98	0.84	0.77 - 0.94	-1.31	5	
QA-779	1.000	1.029	uCi	.017516					1.50	1.33 - 1.63	2.94	5	
QA-1408	1.000	0.9981	uCi	.014009	11263.22	11259.00 - 11269.00	1408.05	1407.58 - 1408.58	2.03	1.77 - 2.17	-0.20	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 15:27:21
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140103002_QCAsLeft.An1

Sample description
     RCCV,S19586,Quality control Check


Spectrum Filename: C:\User\SPC\Det11\11_20140103002_QCAsLeft.An1

Acquisition information
       Start time:                 1/3/2014 15:05:05
       Live time:               1200
       Real time:               1294
       Dead time:                  7.24 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_QC.Clb
     HPGE11 S19586 11_20140102001_Energy


       Energy Calibration
            Created:               1/3/2014 15:27:04
            Zero offset:           0.072 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.292E-08 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 21:48:39
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.10keV )
       Stop channel:           16336 (  2041.11keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 15:27:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103002_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1038

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.94	9399.	2.30	1.07	1.180E-02				
45.41	5191.	2.34	0.75	1.174E-02				
46.75	1592.	7.49	0.75	1.173E-02				
121.94	118033.	0.34	0.83	1.095E-02	121.78	29.240	9.869E-01	QA122
244.59	27255.	0.85	0.96	9.690E-03	244.67	7.616	9.892E-01	Qa245
295.80	1467.	8.52	1.07	8.705E-03				
329.04	640.	16.90	1.04	8.065E-03				
344.10	78123.	0.41	1.10	7.775E-03	344.30	27.000	9.972E-01	Qa344
367.43	2711.	4.55	1.18	7.589E-03				
410.97	5977.	2.16	1.13	7.245E-03				
443.83	7752.	1.84	1.17	6.985E-03				
488.69	1110.	8.60	1.02	6.631E-03				
503.38	427.	16.81	0.44	6.515E-03				
564.05	1010.	6.51	1.30	6.035E-03				
566.38	393.	15.82	1.30	6.017E-03				
586.28	1049.	10.80	1.34	5.860E-03				
674.75	407.	13.65	1.41	5.162E-03				
678.73	869.	6.79	1.41	5.131E-03				
688.59	1931.	5.58	1.59	5.052E-03				
719.37	648.	12.72	1.40	4.809E-03				
779.01	21665.	0.85	1.50	4.339E-03	778.90	12.990	1.029E+00	Qa779
810.63	670.	15.93	1.39	4.253E-03				
867.44	6410.	2.08	1.64	4.099E-03				
919.41	683.	7.51	1.63	3.958E-03				
926.29	473.	17.81	0.72	3.940E-03				
964.11	20441.	0.86	1.67	3.837E-03	964.00	14.580	9.784E-01	Qa964
1005.30	1102.	7.87	1.78	3.744E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 15:27:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103002_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1085.97	13028.	0.95	1.77	3.563E-03				
1089.83	2166.	3.50	1.78	3.554E-03				
1112.12	17573.	0.96	1.79	3.503E-03				
1213.01	2018.	4.26	1.58	3.276E-03				
1274.88	310.	12.41	1.28	3.136E-03				
1299.26	1873.	2.91	1.97	3.081E-03				
1408.05	22441.	0.70	2.03	2.836E-03	1408.08	21.210	9.993E-01	Qa1408
1457.63	546.	4.54	1.83	2.724E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
318.60	39.94	9117.	9399.	7.967E+05	4.60	1.073	-	s
362.28	45.36	4782.	5191.	4.421E+05	4.68	0.752	-	D
373.03	46.71	6316.	1592.	1.357E+05	14.99	0.753	-	D
2363.56	295.80	3074.	1467.	1.685E+05	17.04	1.074	-	
2629.25	329.04	2454.	640.	7.929E+04	33.80	1.036	-	s
2936.19	367.43	2314.	2711.	3.572E+05	9.10	1.175	-	s
3284.30	410.97	2054.	5977.	8.250E+05	4.32	1.128	-	
3547.04	443.83	2165.	7752.	1.110E+06	3.68	1.168	-	
3905.74	488.69	1664.	1110.	1.673E+05	17.19	1.022	-	
4023.23	503.38	1240.	427.	6.548E+04	33.61	0.439	-	s
4508.58	564.12	1610.	1058.	1.753E+05	12.36	1.299	-	D
4527.23	566.45	1649.	476.	7.907E+04	25.83	1.302	-	D
4686.21	586.28	2102.	1049.	1.790E+05	21.59	1.340	-	
5393.12	674.66	1206.	443.	8.574E+04	33.54	0.941	-	s
5425.01	678.64	1362.	936.	1.825E+05	18.29	1.361	-	
5504.57	688.59	1670.	1931.	3.821E+05	11.17	1.587	-	s
5750.81	719.37	1368.	648.	1.348E+05	25.44	1.402	-	
6480.93	810.63	1701.	670.	1.575E+05	31.87	1.390	-	
6935.50	867.44	1807.	6410.	1.564E+06	4.16	1.635	-	
7351.22	919.39	1154.	811.	2.048E+05	22.02	1.330	-	
7406.38	926.29	1122.	473.	1.200E+05	35.62	0.718	-	s
8038.76	1005.30	893.	1102.	2.944E+05	15.75	1.782	-	
8684.41	1085.91	1087.	13028.	3.657E+06	1.89	1.773	-	D
8715.31	1089.77	1782.	2166.	6.093E+05	6.99	1.776	-	D
8893.74	1112.12	1269.	17573.	5.016E+06	1.92	1.787	-	
9701.46	1213.01	591.	2018.	6.160E+05	8.53	1.584	-	
10196.85	1274.88	195.	310.	9.885E+04	24.82	1.276	-	s
10391.99	1299.26	173.	1873.	6.080E+05	5.83	1.974	-	
11660.29	1457.63	8.	546.	2.005E+05	9.08	1.827	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 15:27:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103002_QCAsLeft.An1

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.89	121.94	9294.	118033.	98.361	0.69	0.835
Qa-245	1954.18	244.59	5121.	27255.	22.713	1.70	0.957
Qa-344	2749.63	344.10	4024.	78123.	65.103	0.82	1.104
Qa-779	6227.95	779.01	1865.	21665.	18.054	1.70	1.502
Qa-964	7709.09	964.11	1360.	20441.	17.034	1.72	1.666
Qa-1408	11263.22	1408.05	238.	22412.	18.677	1.40	2.029

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		9.8688E-01				4.64E+03	
			121.78	9.869E-01	(	1.878E-03 3.43E-01 2.92E+01	G
Qa-245		9.8922E-01				4.64E+03	
			244.67	9.892E-01	(	6.052E-03 8.48E-01 7.62E+00	G
Qa-344		9.9717E-01				4.64E+03	
			344.30	9.972E-01	(	1.887E-03 4.10E-01 2.70E+01	G
Qa-779		1.0294E+00				4.64E+03	
			778.90	1.029E+00	(	4.781E-03 8.51E-01 1.30E+01	G
Qa-964		9.7842E-01				4.64E+03	
			964.00	9.784E-01	(	4.113E-03 8.60E-01 1.46E+01	G
Qa-1408		9.9805E-01				4.64E+03	
			1408.08	9.980E-01	(	1.599E-03 7.02E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/3/2014 15:27:21
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140103002_QCAsLeft.An1

  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi           uCi          uCi
_____________________________________________________________________________
QA-122       8.2993E-01    9.8688E-01   6.7631E-03    1.1287E-01  1.878E-03
Qa-245       8.3190E-01    9.8922E-01   1.6770E-02    1.1417E-01  6.052E-03
Qa-344       8.3858E-01    9.9717E-01   8.1797E-03    1.1413E-01  1.887E-03
Qa-779       8.6572E-01    1.0294E+00   1.7516E-02    1.1882E-01  4.781E-03
Qa-964       8.2281E-01    9.7842E-01   1.6832E-02    1.1296E-01  4.113E-03
Qa-1408      8.3932E-01    9.9805E-01   1.4009E-02    1.1480E-01  1.599E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity ( 1112.0 to  2041.1 keV)     5.028E+00  uCi
Total Decayed Activity ( 1112.0 to  2041.1 keV) 5.9791765E+00  uCi
```

ORTEC g v - i (1087) Env32 G53W4.26 1/3/2014 15:27:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140103002_QCAsLeft.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604010485001
Cal : 07-JAN-2014 07:07:34,21-FEB-2013 21:48:39

Run Name : QUALITY CONTROL CHEC
File : 11_20140107_001
Caldate : 07-JAN-2014, 21-FEB-2013
Live Time : 1200 sec

IDF : 1.0
Time : 07-JAN-2014 06:45
Dead Time : 7.26 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9903	uCi	.0065657	973.93	972.00 - 976.00	121.97	121.58 - 121.98	0.85	0.77 - 0.94	-0.97	5	
QA-779	1.000	1.002	uCi	.017005					1.46	1.33 - 1.63	0.15	5	
QA-1408	1.000	0.9869	uCi	.014056	11263.35	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	1.98	1.77 - 2.17	-1.31	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 07:07:50
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107001_QCAsLeft.An1

Sample description
     RCCV,S19586,Quality control Check


Spectrum Filename: C:\User\SPC\Det11\11_20140107001_QCAsLeft.An1

Acquisition information
       Start time:                 1/7/2014 06:45:34
       Live time:               1200
       Real time:               1294
       Dead time:                  7.26 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_QC.Clb
     HPGE11 S19586 11_20140102001_Energy


       Energy Calibration
            Created:               1/7/2014 07:07:34
            Zero offset:           0.117 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.072E-08 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 21:48:39
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.14keV )
       Stop channel:           16336 (  2041.22keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 07:07:50
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1006

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.84	436.	17.89	0.76	1.189E-02				
39.96	9771.	2.37	1.11	1.180E-02				
45.47	5297.	2.34	0.77	1.174E-02				
46.92	1379.	8.26	0.77	1.173E-02				
121.97	118378.	0.33	0.85	1.095E-02	121.78	29.240	9.903E-01	QA122
244.59	27240.	0.67	0.98	9.690E-03	244.67	7.616	9.892E-01	Qa245
295.82	1487.	5.14	1.03	8.704E-03				
344.07	78428.	0.39	1.07	7.776E-03	344.30	27.000	1.002E+00	Qa344
367.49	2609.	4.71	1.18	7.588E-03				
410.94	5835.	1.97	1.13	7.245E-03				
415.73	361.	18.83	0.40	7.207E-03				
443.81	7469.	1.37	1.17	6.985E-03				
488.61	991.	8.38	1.24	6.632E-03				
563.98	1054.	6.21	1.29	6.038E-03				
566.36	422.	15.08	1.29	6.019E-03				
586.20	1140.	10.16	0.94	5.861E-03				
674.68	396.	13.27	1.39	5.162E-03				
678.69	892.	6.60	1.39	5.130E-03				
688.60	1770.	6.90	1.48	5.052E-03				
719.36	683.	8.73	1.43	4.809E-03				
764.94	378.	14.11	1.47	4.450E-03				
778.97	21066.	0.85	1.46	4.339E-03	778.90	12.990	1.002E+00	Qa779
810.54	732.	14.09	1.66	4.253E-03				
867.39	6369.	1.97	1.55	4.099E-03				
919.15	772.	10.45	1.76	3.959E-03				
926.15	378.	16.94	1.39	3.940E-03				
964.05	20174.	0.84	1.70	3.838E-03	964.00	14.580	9.662E-01	Qa964

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 07:07:50
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1005.22	1053.	4.60	1.68	3.744E-03				
1085.91	12746.	0.96	1.74	3.563E-03				
1089.96	2127.	3.21	1.75	3.553E-03				
1112.04	17580.	0.99	1.82	3.504E-03				
1213.01	1740.	4.66	1.80	3.276E-03				
1299.19	1886.	3.29	1.93	3.081E-03				
1408.03	22169.	0.71	1.98	2.836E-03	1408.08	21.210	9.877E-01	Qa1408
1457.56	603.	4.07	1.50	2.724E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Channel	Peak Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
245.55	30.84	2264.	436.	3.671E+04	35.77	0.757	-	s
318.45	39.96	9969.	9771.	8.282E+05	4.74	1.105	-	s
362.47	45.41	5050.	5297.	4.511E+05	4.69	0.769	-	D
374.11	46.87	5800.	1379.	1.176E+05	16.53	0.771	-	D
2363.86	295.82	2303.	1575.	1.810E+05	13.04	0.948	-	
2936.89	367.49	2314.	2609.	3.438E+05	9.42	1.176	-	
3284.35	410.94	1645.	5835.	8.054E+05	3.94	1.133	-	
3322.61	415.73	1186.	361.	5.014E+04	37.65	0.396	-	s
3547.12	443.80	1852.	7691.	1.101E+06	3.39	1.230	-	
3905.48	488.61	1405.	991.	1.495E+05	16.75	1.237	-	
4508.28	563.77	1618.	1054.	1.746E+05	12.42	1.288	-	D
4527.32	566.15	1810.	422.	7.006E+04	30.15	1.290	-	D
4686.06	586.20	2117.	1140.	1.945E+05	20.32	0.944	-	s
5393.81	674.68	972.	406.	7.875E+04	30.37	0.985	-	s
5425.82	678.68	1583.	906.	1.765E+05	21.11	0.930	-	s
5505.20	688.60	2018.	1770.	3.502E+05	13.79	1.485	-	
5751.94	719.45	1767.	788.	1.638E+05	26.46	0.830	-	s
6115.63	764.91	1206.	393.	8.823E+04	37.64	1.030	-	s
6480.76	810.54	1596.	732.	1.720E+05	28.18	1.659	-	
6935.63	867.39	1613.	6369.	1.554E+06	3.94	1.549	-	
7349.78	919.15	989.	772.	1.950E+05	20.89	1.758	-	
7405.87	926.15	830.	378.	9.606E+04	33.88	1.386	-	s
8039.43	1005.32	830.	1196.	3.195E+05	14.07	1.403	-	
8684.10	1085.87	1906.	12182.	3.419E+06	2.61	1.737	-	
8716.50	1089.91	1020.	1644.	4.627E+05	9.44	1.360	-	sD
8893.63	1112.04	1345.	17580.	5.018E+06	1.97	1.816	-	
9701.90	1213.01	630.	1740.	5.312E+05	9.33	1.802	-	
10391.86	1299.19	228.	1886.	6.121E+05	6.58	1.931	-	
11659.99	1457.56	0.	603.	2.214E+05	8.14	1.504	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 07:07:50
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107001_QCAsLeft.An1

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.93	121.97	8095.	118378.	98.648	0.66	0.849
Qa-245	1954.27	244.60	4112.	27542.	22.952	1.54	0.990
Qa-344	2749.65	344.07	3199.	78428.	65.357	0.79	1.069
Qa-779	6228.13	778.97	1790.	21066.	17.555	1.70	1.460
Qa-964	7709.10	964.05	1197.	20174.	16.812	1.68	1.700
Qa-1408	11263.35	1408.03	276.	22150.	18.458	1.42	1.983

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi		COMMENTS
QA-122		9.9030E-01				4.64E+03		
			121.78	9.903E-01	(	1.754E-03	3.32E-01 2.92E+01	G
Qa-245		1.0002E+00				4.64E+03		
			244.67	1.000E+00	(	5.426E-03	7.72E-01 7.62E+00	G
Qa-344		1.0016E+00				4.64E+03		
			344.30	1.002E+00	(	1.683E-03	3.94E-01 2.70E+01	G
Qa-779		1.0015E+00				4.64E+03		
			778.90	1.002E+00	(	4.687E-03	8.49E-01 1.30E+01	G
Qa-964		9.6619E-01				4.64E+03		
			964.00	9.662E-01	(	3.860E-03	8.41E-01 1.46E+01	G
Qa-1408		9.8691E-01				4.64E+03		
			1408.08	9.869E-01	(	1.724E-03	7.12E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 07:07:50
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107001_QCAsLeft.An1

  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi           uCi          uCi
_____________________________________________________________________________
QA-122       8.3235E-01    9.9030E-01   6.5657E-03    1.1325E-01  1.754E-03
Qa-245       8.4066E-01    1.0002E+00   1.5445E-02    1.1523E-01  5.426E-03
Qa-344       8.4186E-01    1.0016E+00   7.9016E-03    1.1462E-01  1.683E-03
Qa-779       8.4177E-01    1.0015E+00   1.7005E-02    1.1559E-01  4.687E-03
Qa-964       8.1208E-01    9.6619E-01   1.6252E-02    1.1149E-01  3.860E-03
Qa-1408      8.2950E-01    9.8691E-01   1.4056E-02    1.1354E-01  1.724E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (  586.2 to  2041.2 keV)     4.998E+00  uCi
Total Decayed Activity (  586.2 to  2041.2 keV) 5.9467025E+00  uCi
```

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 07:07:50
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107001_QCAsLeft.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE11
Seqnum : 1604011948001
Cal : 08-JAN-2014 07:30:05,21-FEB-2013 21:48:39

Run Name : QUALITY CONTROL CHEC
File : 11_20140108_001
Caldate : 08-JAN-2014, 21-FEB-2013
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:08
Dead Time : 7.23 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9980	uCi	.006771	973.83	972.00 - 976.00	121.96	121.58 - 121.98	0.85	0.77 - 0.94	-0.20	5	
QA-779	1.000	0.9961	uCi	.016707					1.49	1.33 - 1.63	-0.39	5	
QA-1408	1.000	0.9917	uCi	.013839	11262.92	11259.00 - 11269.00	1408.03	1407.58 - 1408.58	2.03	1.77 - 2.17	-0.83	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:30:21
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108001_QCAsLeft.An1

Sample description
     RCCV,S19586,Quality control Check


Spectrum Filename: C:\User\SPC\Det11\11_20140108001_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 07:08:05
       Live time:               1200
       Real time:               1294
       Dead time:                  7.23 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_QC.Clb
     HPGE11 S19586 11_20140102001_Energy


       Energy Calibration
            Created:               1/8/2014 07:30:05
            Zero offset:           0.125 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.054E-08 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 21:48:39
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.31keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:30:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1033

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.94	1500.	7.13	1.56	1.189E-02				
39.97	9836.	2.18	1.07	1.180E-02				
45.46	5358.	2.30	0.78	1.174E-02				
46.85	1554.	7.76	0.79	1.173E-02				
121.96	119280.	0.34	0.85	1.095E-02	121.78	29.240	9.980E-01	QA122
244.59	27301.	0.82	0.97	9.690E-03	244.67	7.616	9.916E-01	Qa245
295.85	1519.	7.87	1.10	8.704E-03				
344.08	77424.	0.40	1.11	7.776E-03	344.30	27.000	9.889E-01	Qa344
367.50	2656.	3.95	1.08	7.588E-03				
410.90	5972.	2.15	1.19	7.245E-03				
443.81	7709.	1.70	1.17	6.985E-03				
488.41	1042.	9.59	1.10	6.633E-03				
503.25	505.	18.08	1.45	6.516E-03				
563.97	965.	6.85	1.28	6.037E-03				
586.15	1187.	9.51	1.22	5.861E-03				
674.66	394.	13.46	1.38	5.162E-03				
678.68	906.	6.55	1.39	5.130E-03				
688.69	1644.	5.70	1.53	5.051E-03				
719.44	616.	8.71	1.42	4.809E-03				
778.97	20949.	0.84	1.49	4.339E-03	778.90	12.990	9.961E-01	Qa779
810.65	750.	11.37	1.70	4.253E-03				
867.40	6290.	2.09	1.57	4.099E-03				
919.41	803.	10.87	1.30	3.958E-03				
926.14	519.	14.60	0.61	3.940E-03				
964.06	20410.	0.85	1.64	3.837E-03	964.00	14.580	9.776E-01	Qa964
1005.17	1205.	6.84	1.82	3.745E-03				
1085.91	12935.	0.95	1.75	3.563E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:30:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1089.84	2300.	3.09	1.75	3.554E-03				
1112.04	17438.	0.95	1.85	3.504E-03				
1213.08	1586.	3.23	1.86	3.276E-03				
1249.88	341.	19.50	1.15	3.193E-03				
1299.17	1886.	3.29	1.97	3.081E-03				
1408.02	22301.	0.69	2.03	2.836E-03	1408.08	21.210	9.938E-01	Qa1408
1457.59	595.	4.10	1.25	2.724E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
246.26	30.94	3207.	1500.	1.262E+05	14.26	1.565	-	s
318.45	39.97	8841.	9836.	8.337E+05	4.37	1.075	-	s
362.31	45.43	4917.	5358.	4.563E+05	4.60	0.784	-	D
373.41	46.82	6492.	1554.	1.325E+05	15.52	0.785	-	D
2363.93	295.85	2900.	1519.	1.745E+05	15.74	1.096	-	
2936.85	367.50	1858.	2656.	3.500E+05	7.91	1.077	-	
3283.88	410.90	1982.	5972.	8.242E+05	4.30	1.186	-	
3547.07	443.81	1841.	7709.	1.104E+06	3.39	1.173	-	
3903.74	488.41	1788.	1042.	1.571E+05	19.18	1.095	-	
4022.44	503.25	1669.	505.	7.755E+04	36.16	1.446	-	s
4508.11	563.93	1705.	965.	1.599E+05	13.70	1.281	-	D
4685.45	586.15	1992.	1187.	2.025E+05	19.02	1.221	-	s
5393.69	674.69	1104.	423.	8.194E+04	32.89	0.803	-	s
5425.87	678.71	1652.	990.	1.931E+05	20.27	1.354	-	
5505.69	688.69	1459.	1644.	3.255E+05	11.40	1.529	-	
5750.91	719.34	932.	600.	1.247E+05	20.74	1.177	-	s
6481.41	810.65	1256.	750.	1.764E+05	22.75	1.703	-	
6935.51	867.40	1805.	6290.	1.534E+06	4.18	1.575	-	
7351.64	919.41	1117.	803.	2.029E+05	21.73	1.301	-	
7405.53	926.14	934.	519.	1.318E+05	29.21	0.605	-	s
8037.93	1005.17	775.	1205.	3.218E+05	13.67	1.818	-	
8684.20	1085.87	1054.	12935.	3.631E+06	1.90	1.748	-	D
8715.65	1089.80	1376.	2300.	6.473E+05	6.18	1.751	-	D
8893.29	1112.04	1155.	17438.	4.977E+06	1.90	1.846	-	
9702.06	1213.03	520.	1586.	4.842E+05	6.46	1.856	-	D
9996.72	1249.88	480.	341.	1.068E+05	39.00	1.154	-	s
10391.32	1299.17	257.	1886.	6.119E+05	6.57	1.971	-	
11659.82	1457.59	0.	595.	2.184E+05	8.20	1.249	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:30:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.83	121.96	9071.	119280.	99.400	0.68	0.849
Qa-245	1954.10	244.59	4758.	27301.	22.751	1.63	0.970
Qa-344	2749.56	344.08	3268.	77424.	64.520	0.79	1.106
Qa-779	6227.94	778.97	1681.	20949.	17.458	1.68	1.489
Qa-964	7708.97	964.06	1320.	20410.	17.008	1.71	1.638
Qa-1408	11262.92	1408.03	196.	22254.	18.545	1.40	2.028

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		9.9799E-01				4.64E+03	
			121.78	9.980E-01	(	1.857E-03 3.39E-01 2.92E+01	G
Qa-245		9.9157E-01				4.64E+03	
			244.67	9.916E-01	(	5.837E-03 8.16E-01 7.62E+00	G
Qa-344		9.8894E-01				4.64E+03	
			344.30	9.889E-01	(	1.701E-03 3.97E-01 2.70E+01	G
Qa-779		9.9612E-01				4.64E+03	
			778.90	9.961E-01	(	4.542E-03 8.39E-01 1.30E+01	G
Qa-964		9.7760E-01				4.64E+03	
			964.00	9.776E-01	(	4.054E-03 8.53E-01 1.46E+01	G
Qa-1408		9.9166E-01				4.64E+03	
			1408.08	9.917E-01	(	1.452E-03 6.98E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:30:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3869E-01	9.9799E-01	6.7710E-03	1.1414E-01	1.857E-03
Qa-245	8.3329E-01	9.9157E-01	1.6188E-02	1.1435E-01	5.837E-03
Qa-344	8.3108E-01	9.8894E-01	7.8496E-03	1.1317E-01	1.701E-03
Qa-779	8.3711E-01	9.9612E-01	1.6707E-02	1.1494E-01	4.542E-03
Qa-964	8.2155E-01	9.7760E-01	1.6677E-02	1.1284E-01	4.054E-03
Qa-1408	8.3337E-01	9.9166E-01	1.3839E-02	1.1405E-01	1.452E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1249.8 to 2041.3 keV) 4.995E+00 uCi
Total Decayed Activity (1249.8 to 2041.3 keV) 5.9438872E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:30:21
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614005283003
Cal : 03-JAN-2014 20:28:37,30-DEC-2012 16:03:28

Run Name : QUALITY CONTROL CHEC
File : 12_20140103_003
Caldate : 03-JAN-2014, 30-DEC-2012
Live Time : 1200 sec

IDF : 1.0
Time : 03-JAN-2014 20:07
Dead Time : 4.03 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.014	uCi	.0069424	973.85	972.00 - 976.00	121.79	121.58 - 121.98	0.88	0.80 - 0.98	1.41	5	
QA-779	1.000	1.025	uCi	.019016					1.51	1.33 - 1.63	2.48	5	
QA-1408	1.000	1.023	uCi	.014518	11264.17	11259.00 - 11269.00	1408.08	1407.58 - 1408.58	1.92	1.73 - 2.11	2.27	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 09:47:22
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103003_QCAsLeft.An1

Sample description
     RCCV,S19586,Quality control Check (QC Source #6)


Spectrum Filename: C:\User\SPC\Det12\12_20140103003_QCAsLeft.An1

Acquisition information
       Start time:                 1/3/2014 20:07:14
       Live time:              1200
       Real time:              1250
       Dead time:                  4.03 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_QC.Clb
     HPGE12 S19586 12_20140103001_Energy


       Energy Calibration
            Created:               1/3/2014 20:28:37
            Zero offset:           0.088 keV
            Gain:                  0.125 keV/channel
            Quadratic:             2.596E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 16:03:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.08keV )
       Stop channel:           16336 (  2042.25keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 09:47:22
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103003_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0099

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.80	1336.	7.42	1.07	1.178E-02				
40.02	2214.	6.64	0.84	1.169E-02				
45.45	1857.	5.89	0.80	1.164E-02				
46.80	717.	14.33	0.81	1.163E-02				
121.79	120647.	0.34	0.88	1.090E-02	121.78	29.240	1.014E+00	QA122
244.65	27823.	0.82	1.03	9.701E-03	244.67	7.616	1.009E+00	Qa245
295.99	1467.	8.74	1.06	8.639E-03				
344.30	77956.	0.40	1.10	7.640E-03	344.30	27.000	1.012E+00	Qa344
367.76	2698.	4.79	1.08	7.453E-03				
411.20	5750.	2.34	1.17	7.107E-03				
444.09	7634.	1.79	1.21	6.845E-03				
488.85	1006.	8.25	1.23	6.489E-03				
503.53	344.	15.96	1.26	6.372E-03				
564.14	1059.	6.24	1.32	5.890E-03				
566.54	350.	17.58	1.32	5.871E-03				
586.36	895.	9.31	0.97	5.713E-03				
656.41	410.	18.65	0.33	5.155E-03				
674.58	390.	14.32	1.41	5.010E-03				
678.69	946.	6.41	1.41	4.978E-03				
688.55	1720.	5.78	1.46	4.899E-03				
719.37	696.	8.38	1.45	4.654E-03				
723.49	260.	19.08	1.45	4.621E-03				
778.89	20776.	0.93	1.51	4.180E-03	778.90	12.990	1.025E+00	Qa779
810.32	585.	12.69	1.52	4.089E-03				
867.36	6252.	1.50	1.56	3.923E-03				
919.32	751.	8.31	1.64	3.772E-03				
925.96	478.	16.92	0.44	3.752E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 09:47:22
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103003_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
964.04	19620.	0.86	1.61	3.642E-03	964.00	14.580	9.896E-01	Qa964
1005.25	1154.	8.04	0.76	3.546E-03				
1085.89	12797.	0.93	1.72	3.359E-03				
1089.83	2231.	3.08	1.72	3.350E-03				
1112.09	16901.	0.91	1.69	3.298E-03				
1212.98	1680.	4.35	1.54	3.063E-03				
1249.64	358.	16.85	1.02	2.978E-03				
1299.13	1844.	3.07	2.05	2.863E-03				
1408.08	21138.	0.71	1.92	2.610E-03	1408.08	21.210	1.023E+00	Qa1408
1457.64	529.	4.35	1.50	2.495E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
245.72	30.80	2830.	1336.	1.134E+05	14.84	1.073	-	s
319.56	40.02	5872.	2214.	1.894E+05	13.27	0.841	-	s
362.95	45.50	5061.	1857.	1.595E+05	11.79	0.805	-	D
373.81	46.86	4919.	717.	6.168E+04	28.65	0.806	-	D
2367.68	295.99	3186.	1467.	1.698E+05	17.48	1.058	-	s
2941.99	367.76	2453.	2698.	3.620E+05	9.58	1.084	-	s
3289.48	411.20	2208.	5750.	8.091E+05	4.68	1.167	-	
3552.70	444.09	2007.	7634.	1.115E+06	3.58	1.213	-	
3910.78	488.85	1402.	1006.	1.551E+05	16.50	1.234	-	
4028.06	503.51	1193.	348.	5.455E+04	39.71	1.014	-	s
4513.15	564.12	1657.	1059.	1.799E+05	12.48	1.316	-	D
4532.32	566.52	1714.	350.	5.956E+04	35.16	1.318	-	D
4690.92	586.36	1476.	895.	1.567E+05	18.61	0.967	-	s
5251.36	656.41	1238.	410.	7.961E+04	37.29	0.327	-	s
5429.73	678.71	1393.	968.	1.944E+05	17.75	1.417	-	
5508.47	688.55	1514.	1720.	3.512E+05	11.56	1.464	-	
5754.67	719.32	1593.	807.	1.734E+05	24.24	0.898	-	s
6482.65	810.32	1069.	585.	1.430E+05	25.37	1.521	-	
6938.94	867.36	1898.	6260.	1.596E+06	4.36	1.474	-	
7354.66	919.32	684.	751.	1.991E+05	16.63	1.641	-	
7407.77	925.96	1062.	478.	1.273E+05	33.83	0.436	-	s
8042.00	1005.25	898.	1154.	3.255E+05	16.08	0.757	-	s
8686.89	1085.87	1490.	12209.	3.635E+06	2.43	1.670	-	
8718.41	1089.81	1293.	1695.	5.060E+05	11.71	1.566	-	D
8896.67	1112.09	928.	16901.	5.125E+06	1.82	1.688	-	
9703.65	1212.98	531.	1680.	5.484E+05	8.70	1.544	-	
9996.89	1249.64	422.	358.	1.203E+05	33.70	1.020	-	s
10392.81	1299.13	166.	1844.	6.442E+05	6.14	2.049	-	
11660.61	1457.64	0.	529.	2.120E+05	8.70	1.500	-	s

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 09:47:22
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103003_QCAsLeft.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.85	121.79	9783.	120647.	100.539	0.68	0.884
Qa-245	1956.94	244.65	4871.	27823.	23.186	1.63	1.031
Qa-344	2754.22	344.30	3213.	77956.	64.963	0.79	1.098
Qa-779	6231.25	778.89	2184.	20776.	17.313	1.86	1.509
Qa-964	7712.33	964.04	1234.	19620.	16.350	1.72	1.613
Qa-1408	11264.17	1408.08	156.	21138.	17.615	1.42	1.916

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi		COMMENTS
QA-122		1.0141E+00				4.64E+03		
			121.78	1.014E+00	(	1.937E-03	3.42E-01 2.92E+01	G
Qa-245		1.0086E+00				4.64E+03		
			244.67	1.009E+00	(	5.895E-03	8.17E-01 7.62E+00	G
Qa-344		1.0122E+00				4.64E+03		
			344.30	1.012E+00	(	1.715E-03	3.97E-01 2.70E+01	G
Qa-779		1.0248E+00				4.64E+03		
			778.90	1.025E+00	(	5.371E-03	9.28E-01 1.30E+01	G
Qa-964		9.8965E-01				4.64E+03		
			964.00	9.896E-01	(	4.128E-03	8.60E-01 1.46E+01	G
Qa-1408		1.0227E+00				4.64E+03		
			1408.08	1.023E+00	(	1.408E-03	7.10E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 09:47:22
Curtis & Tompkins HPS Lab Spectrum name: 12_20140103003_QCAsLeft.An1

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi            uCi          uCi
_____________________________________________________________________________
QA-122       8.5280E-01    1.0141E+00   6.9424E-03    1.1598E-01  1.937E-03
Qa-245       8.4817E-01    1.0086E+00   1.6484E-02    1.1632E-01  5.895E-03
Qa-344       8.5121E-01    1.0122E+00   8.0306E-03    1.1584E-01  1.715E-03
Qa-779       8.6177E-01    1.0248E+00   1.9016E-02    1.1853E-01  5.371E-03
Qa-964       8.3223E-01    9.8965E-01   1.7032E-02    1.1426E-01  4.128E-03
Qa-1408      8.6001E-01    1.0227E+00   1.4518E-02    1.1765E-01  1.408E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 09:47:22
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140103003_QCAsLeft.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  586.2 to  2042.3 keV)     5.106E+00  uCi
 Total Decayed Activity (  586.2 to  2042.3 keV) 6.0720444E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614011949002
Cal : 08-JAN-2014 07:54:39,30-DEC-2012 16:03:28

Run Name : QUALITY CONTROL CHEC
File : 12_20140108_002
Caldate : 08-JAN-2014, 30-DEC-2012
Live Time : 1200 sec

IDF : 1.0
Time : 08-JAN-2014 07:33
Dead Time : 4.02 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9962	uCi	.0068858	973.88	972.00 - 976.00	121.80	121.58 - 121.98	0.89	0.80 - 0.98	-0.38	5	
QA-779	1.000	1.001	uCi	.017941					1.49	1.33 - 1.63	0.10	5	
QA-1408	1.000	1.036	uCi	.014771	11263.32	11259.00 - 11269.00	1408.07	1407.58 - 1408.58	1.86	1.73 - 2.11	3.60	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:54:56
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108002_QCAsLeft.An1

Sample description
     RCCV,S19586,Quality control Check (QC Source #6)


Spectrum Filename: C:\User\SPC\Det12\12_20140108002_QCAsLeft.An1

Acquisition information
       Start time:                 1/8/2014 07:33:21
       Live time:               1200
       Real time:               1250
       Dead time:                  4.02 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_QC.Clb
     HPGE12 S19586 12_20140103001_Energy


       Energy Calibration
            Created:               1/8/2014 07:54:39
            Zero offset:           0.094 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.482E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 16:03:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2042.47keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:54:56
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108002_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0145

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.54	1646.	4.60	0.81	1.179E-02				
31.68	1208.	8.78	0.81	1.178E-02				
40.06	2134.	7.52	1.01	1.169E-02				
45.44	1895.	5.53	0.82	1.164E-02				
46.78	756.	13.89	0.82	1.163E-02				
121.80	118442.	0.35	0.89	1.090E-02	121.78	29.240	9.962E-01	QA122
244.66	27351.	0.67	1.01	9.701E-03	244.67	7.616	9.922E-01	Qa245
295.86	1545.	7.48	0.96	8.642E-03				
344.29	77518.	0.40	1.09	7.640E-03	344.30	27.000	1.007E+00	Qa344
367.67	2799.	4.72	1.28	7.453E-03				
411.19	5807.	2.42	1.16	7.107E-03				
415.90	409.	19.43	0.87	7.070E-03				
444.08	7662.	1.78	1.16	6.845E-03				
488.70	1060.	10.75	1.24	6.490E-03				
564.10	1020.	6.27	1.28	5.891E-03				
566.88	301.	19.13	1.28	5.869E-03				
586.36	1060.	10.04	1.25	5.713E-03				
674.73	318.	17.33	1.37	5.009E-03				
678.63	795.	7.24	1.37	4.978E-03				
688.69	1598.	6.05	1.37	4.898E-03				
719.32	558.	10.33	1.40	4.655E-03				
764.74	433.	17.29	0.54	4.293E-03				
778.88	20280.	0.90	1.49	4.180E-03	778.90	12.990	1.001E+00	Qa779
810.38	581.	14.15	0.70	4.089E-03				
867.35	6208.	2.46	1.54	3.923E-03				
919.42	728.	11.71	1.32	3.771E-03				
926.28	393.	11.24	1.55	3.751E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:54:56
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108002_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
964.01	19770.	0.84	1.57	3.642E-03	964.00	14.580	9.979E-01	Qa964
1005.08	1160.	6.64	1.43	3.546E-03				
1085.88	12666.	0.95	1.66	3.359E-03				
1089.86	2189.	2.88	1.67	3.349E-03				
1112.06	16686.	0.98	1.61	3.298E-03				
1212.97	1637.	4.58	1.80	3.063E-03				
1250.07	330.	16.65	1.47	2.977E-03				
1274.35	335.	15.66	0.92	2.921E-03				
1299.17	1801.	3.16	1.81	2.863E-03				
1408.07	21400.	0.71	1.86	2.610E-03	1408.08	21.210	1.036E+00	Qa1408
1457.71	499.	4.48	0.93	2.495E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
243.63	30.39	2045.	1646.	1.397E+05	9.20	0.809	-	D
252.73	31.53	5025.	1208.	1.026E+05	17.57	0.810	-	D
319.78	40.06	6565.	2134.	1.825E+05	15.04	1.009	-	s
362.86	45.46	4546.	1895.	1.628E+05	11.06	0.824	-	D
373.60	46.80	5136.	756.	6.501E+04	27.79	0.825	-	D
2366.62	295.86	2742.	1545.	1.787E+05	14.95	0.955	-	
2941.18	367.67	2525.	2799.	3.756E+05	9.44	1.285	-	s
3289.34	411.19	2325.	5807.	8.171E+05	4.84	1.158	-	
3327.09	415.90	1438.	409.	5.780E+04	38.87	0.868	-	s
3552.54	444.08	2007.	7662.	1.119E+06	3.57	1.159	-	
3909.50	488.70	2092.	1060.	1.632E+05	21.51	1.238	-	
4512.72	563.94	1536.	1020.	1.732E+05	12.54	1.280	-	D
4534.95	566.72	1507.	301.	5.128E+04	38.26	1.282	-	D
4690.82	586.36	1901.	1060.	1.856E+05	20.07	1.246	-	
5428.88	678.62	1131.	847.	1.701E+05	17.31	1.001	-	s
5509.41	688.69	1521.	1598.	3.262E+05	12.11	1.371	-	
5753.79	719.24	1550.	671.	1.442E+05	27.84	1.302	-	
6117.79	764.74	1201.	433.	1.008E+05	34.57	0.540	-	s
6482.86	810.38	1236.	581.	1.421E+05	28.30	0.697	-	s
6938.63	867.35	2257.	6208.	1.582E+06	4.92	1.541	-	
7355.08	919.42	1107.	728.	1.929E+05	23.42	1.315	-	
7411.20	926.43	784.	469.	1.251E+05	27.99	1.515	-	
8040.26	1005.08	690.	1160.	3.270E+05	13.27	1.431	-	
8686.24	1085.84	1137.	12469.	3.712E+06	2.21	1.645	-	
8718.10	1089.82	994.	1833.	5.474E+05	9.38	1.422	-	D
8895.93	1112.06	1184.	16686.	5.060E+06	1.96	1.613	-	
9703.05	1212.97	578.	1637.	5.343E+05	9.17	1.799	-	
9999.72	1250.07	378.	330.	1.108E+05	33.30	1.466	-	s
10193.93	1274.35	298.	335.	1.146E+05	31.33	0.915	-	s
10392.42	1299.17	201.	1801.	6.289E+05	6.31	1.809	-	

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:54:56
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108002_QCAsLeft.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
11660.33	1457.71	0.	499.	2.000E+05	8.95	0.934	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.88	121.80	9820.	118442.	98.702	0.69	0.893
Qa-245	1956.86	244.65	4576.	27481.	22.901	1.60	1.016
Qa-344	2754.09	344.29	3502.	77518.	64.598	0.81	1.092
Qa-779	6230.87	778.88	1932.	20280.	16.900	1.79	1.486
Qa-964	7711.79	964.01	1152.	19770.	16.475	1.69	1.573
Qa-1408	11263.32	1408.07	208.	21400.	17.833	1.43	1.864

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi	COMMENTS
QA-122		9.9624E-01				4.64E+03	
			121.78	9.962E-01	(	1.942E-03 3.46E-01 2.92E+01	G
Qa-245		9.9689E-01				4.64E+03	
			244.67	9.969E-01	(	5.717E-03 8.02E-01 7.62E+00	G
Qa-344		1.0072E+00				4.64E+03	
			344.30	1.007E+00	(	1.791E-03 4.03E-01 2.70E+01	G
Qa-779		1.0010E+00				4.64E+03	
			778.90	1.001E+00	(	5.055E-03 8.96E-01 1.30E+01	G
Qa-964		9.9787E-01				4.64E+03	
			964.00	9.979E-01	(	3.992E-03 8.44E-01 1.46E+01	G
Qa-1408		1.0360E+00				4.64E+03	
			1408.08	1.036E+00	(	1.627E-03 7.13E-01 2.12E+01	G

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:54:56
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108002_QCAsLeft.An1

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3722E-01	9.9624E-01	6.8858E-03	1.1394E-01	1.942E-03
Qa-245	8.3776E-01	9.9689E-01	1.5982E-02	1.1493E-01	5.717E-03
Qa-344	8.4642E-01	1.0072E+00	8.1133E-03	1.1527E-01	1.791E-03
Qa-779	8.4120E-01	1.0010E+00	1.7941E-02	1.1568E-01	5.055E-03
Qa-964	8.3858E-01	9.9787E-01	1.6842E-02	1.1516E-01	3.992E-03
Qa-1408	8.7067E-01	1.0360E+00	1.4771E-02	1.1920E-01	1.627E-03

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:54:56
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108002_QCAsLeft.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  586.3 to  2042.5 keV)     5.072E+00  uCi
 Total Decayed Activity (  586.3 to  2042.5 keV) 6.0352349E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD Soil

DOE HASL 300 4.5.2.3

Inst : HPGE12
Seqnum : 1614014793001
Cal : 10-JAN-2014 06:54:40,30-DEC-2012 16:03:28

Run Name : QUALITY CONTROL CHEC
File : 12_20140110_001
Caldate : 10-JAN-2014, 30-DEC-2012
Live Time : 1200 sec

IDF : 1.0
Time : 10-JAN-2014 06:33
Dead Time : 4 %

Standards: S19586

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.008	uCi	.0069013	973.90	972.00 - 976.00	121.79	121.58 - 121.98	0.90	0.80 - 0.98	0.78	5	
QA-779	1.000	1.018	uCi	.018263					1.45	1.33 - 1.63	1.76	5	
QA-1408	1.000	1.020	uCi	.014503	11262.96	11259.00 - 11269.00	1408.08	1407.58 - 1408.58	1.89	1.73 - 2.11	1.99	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:54:57
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110001_QCAsLeft.An1

Sample description
     RCCV,S19586,Quality control Check (QC Source #6)


Spectrum Filename: C:\User\SPC\Det12\12_20140110001_QCAsLeft.An1

Acquisition information
       Start time:                 1/10/2014 06:33:22
       Live time:               1200
       Real time:               1250
       Dead time:                  4.00 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_QC.Clb
     HPGE12 S19586 12_20140103001_Energy


       Energy Calibration
            Created:               1/10/2014 06:54:40
            Zero offset:           0.076 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.351E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 16:03:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QC.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.07keV )
       Stop channel:           16336 (  2042.54keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:54:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0091

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.96	2346.	6.87	1.10	1.169E-02				
45.45	1992.	5.42	0.84	1.164E-02				
46.78	629.	16.26	0.84	1.163E-02				
121.79	119781.	0.34	0.90	1.090E-02	121.78	29.240	1.008E+00	QA122
244.65	27714.	0.77	1.01	9.701E-03	244.67	7.616	1.006E+00	Qa245
295.91	1390.	6.85	1.05	8.641E-03				
329.83	534.	18.50	1.03	7.939E-03				
344.29	77379.	0.41	1.13	7.640E-03	344.30	27.000	1.006E+00	Qa344
367.72	2661.	4.50	1.11	7.453E-03				
411.24	5726.	2.53	1.17	7.107E-03				
444.08	7758.	1.72	1.13	6.845E-03				
488.82	933.	10.55	1.05	6.489E-03				
503.53	474.	18.68	0.71	6.372E-03				
564.00	872.	10.55	1.26	5.891E-03				
586.40	1114.	9.54	1.36	5.712E-03				
674.75	390.	14.11	1.37	5.009E-03				
678.66	861.	6.97	1.37	4.978E-03				
688.48	1716.	6.69	1.31	4.900E-03				
719.37	686.	8.47	1.41	4.654E-03				
723.29	269.	19.33	1.41	4.623E-03				
764.70	449.	17.19	0.87	4.293E-03				
778.90	20610.	0.90	1.45	4.180E-03	778.90	12.990	1.018E+00	Qa779
810.39	587.	15.44	0.47	4.088E-03				
867.34	6183.	2.01	1.52	3.923E-03				
919.10	734.	13.26	1.67	3.772E-03				
926.27	413.	10.72	1.56	3.751E-03				
964.03	19871.	0.84	1.62	3.642E-03	964.00	14.580	1.003E+00	Qa964

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:54:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1005.19	1115.	5.90	1.47	3.546E-03				
1085.90	12535.	0.95	1.67	3.359E-03				
1089.82	2163.	3.07	1.67	3.350E-03				
1112.08	17015.	0.92	1.72	3.298E-03				
1213.04	1781.	4.99	1.55	3.063E-03				
1274.20	274.	14.37	0.54	2.921E-03				
1299.14	1697.	3.38	1.68	2.863E-03				
1408.08	21060.	0.71	1.88	2.610E-03	1408.08	21.210	1.020E+00	Qa1408
1457.71	526.	4.36	1.12	2.495E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Channel	Peak Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
319.10	39.96	6570.	2346.	2.006E+05	13.75	1.104	-	s
363.02	45.47	4836.	1992.	1.711E+05	10.85	0.840	-	D
373.72	46.81	4910.	629.	5.406E+04	32.52	0.841	-	D
2367.02	295.91	2129.	1390.	1.608E+05	13.70	1.053	-	
2638.42	329.83	2254.	534.	6.730E+04	37.01	1.034	-	s
2941.52	367.72	2247.	2661.	3.570E+05	9.00	1.106	-	
3289.67	411.24	2449.	5726.	8.057E+05	5.05	1.168	-	
3552.45	444.08	1901.	7758.	1.133E+06	3.44	1.133	-	
3910.34	488.82	1786.	933.	1.437E+05	21.10	1.046	-	
4028.07	503.53	1602.	474.	7.439E+04	37.37	0.706	-	s
4511.75	564.00	1808.	872.	1.480E+05	21.10	1.256	-	
4690.95	586.40	1888.	1114.	1.951E+05	19.08	1.361	-	s
5428.80	678.63	1425.	800.	1.608E+05	21.01	1.146	-	
5507.57	688.48	1877.	1716.	3.503E+05	13.37	1.310	-	
5754.72	719.38	1416.	778.	1.672E+05	22.57	1.254	-	s
6117.27	764.70	1255.	449.	1.047E+05	34.39	0.875	-	s
6482.76	810.39	1386.	587.	1.436E+05	30.87	0.473	-	s
6938.30	867.34	1573.	6183.	1.576E+06	4.02	1.521	-	
7352.27	919.10	1288.	734.	1.947E+05	26.53	1.665	-	
7410.08	926.33	792.	415.	1.107E+05	30.98	1.002	-	s
8040.88	1005.19	585.	1115.	3.144E+05	11.81	1.474	-	
8686.17	1085.87	1453.	12234.	3.643E+06	2.40	1.663	-	
8717.55	1089.80	1087.	1713.	5.115E+05	10.17	1.408	-	D
8895.80	1112.08	938.	17015.	5.159E+06	1.83	1.717	-	
9703.21	1213.04	694.	1781.	5.814E+05	9.98	1.554	-	
10192.32	1274.20	209.	274.	9.377E+04	28.74	0.544	-	s
10391.79	1299.14	226.	1697.	5.928E+05	6.77	1.676	-	
11659.89	1457.71	0.	526.	2.109E+05	8.72	1.116	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:54:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110001_QCAsLeft.An1

This section based on library: QC.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	973.90	121.79	9684.	119781.	99.817	0.68	0.903
Qa-245	1956.92	244.65	4026.	27714.	23.095	1.53	1.008
Qa-344	2754.09	344.29	3655.	77379.	64.482	0.81	1.130
Qa-779	6230.85	778.90	1971.	20610.	17.175	1.79	1.449
Qa-964	7711.61	964.03	1135.	19871.	16.559	1.69	1.621
Qa-1408	11262.96	1408.08	172.	21060.	17.550	1.42	1.885

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		1.0078E+00				4.64E+03	
			121.78	1.008E+00	(	1.929E-03 3.42E-01 2.92E+01	G
Qa-245		1.0056E+00				4.64E+03	
			244.67	1.006E+00	(	5.364E-03 7.66E-01 7.62E+00	G
Qa-344		1.0057E+00				4.64E+03	
			344.30	1.006E+00	(	1.831E-03 4.07E-01 2.70E+01	G
Qa-779		1.0176E+00				4.64E+03	
			778.90	1.018E+00	(	5.107E-03 8.97E-01 1.30E+01	G
Qa-964		1.0033E+00				4.64E+03	
			964.00	1.003E+00	(	3.963E-03 8.43E-01 1.46E+01	G
Qa-1408		1.0199E+00				4.64E+03	
			1408.08	1.020E+00	(	1.482E-03 7.11E-01 2.12E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:54:57
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110001_QCAsLeft.An1

  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi           uCi          uCi
_____________________________________________________________________________
QA-122       8.4668E-01    1.0078E+00   6.9013E-03    1.1526E-01  1.929E-03
Qa-245       8.4485E-01    1.0056E+00   1.5399E-02    1.1583E-01  5.364E-03
Qa-344       8.4491E-01    1.0057E+00   8.1916E-03    1.1511E-01  1.831E-03
Qa-779       8.5490E-01    1.0176E+00   1.8263E-02    1.1760E-01  5.107E-03
Qa-964       8.4288E-01    1.0033E+00   1.6909E-02    1.1578E-01  3.963E-03
Qa-1408      8.5685E-01    1.0199E+00   1.4503E-02    1.1734E-01  1.482E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   75.2 to  2042.5 keV)     5.091E+00  uCi
Total Decayed Activity (   75.2 to  2042.5 keV) 6.0598984E+00  uCi
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:54:57
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110001_QCAsLeft.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 6_20140108002_BG
Acquired: 1/8/2014 06:46:07
Detector: HPGE06 51-TP32744A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.96	1.75	1.82	1.90	2.10	2.17	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 06:56:14
Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det6\6_20140108002_BG.An1

Acquisition information
       Start time:                 1/8/2014 06:46:07
       Live time:                600
       Real time:                600
       Dead time:                  0.04 %
       Detector ID:                    6

Detector system
     HPGE06 51-TP32744A


Calibration
       Filename:                   6_QC.Clb
     HPGE06 S19584 6_20140104001_Energy


       Energy Calibration
            Created:               1/8/2014 06:45:06
            Zero offset:           0.078 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.421E-09 keV/channel^2

       Efficiency Calibration
            Created:               1/4/2014 11:46:48
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2041.45keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 06:56:14
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 06:56:14
Curtis & Tompkins HPS Lab Spectrum name: 6_20140108002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	2.9654E+00			
Am-241	<	6.7565E-01			
Bi-212	<	5.9564E+00			
Bi-214	<	1.2609E+00			
Co-60	<	1.0127E+00			
Cs-137	<	7.4374E-01			
Eu-152	<	1.5471E+00			
Eu-154	<	3.0306E+00			
K-40	<	1.1388E+01			
Pa-234	<	5.6026E+00			
Pb-210	<	5.6641E+00			
Pb-212	<	7.6854E-01			
Pb-214	<	3.4048E+00			
Ra-226	<	8.3447E+00			
Th-230	<	1.3307E+02			
Th-234	<	4.6001E+00			
Tl-208	<	6.5029E-01			
U-235	<	1.2428E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 06:56:14
 Curtis & Tompkins HPS Lab       Spectrum name: 6_20140108002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2041.5 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 7_20140106002_BG
Acquired: 1/6/2014 07:34:46
Detector: HPGE07 51-TP32743A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.92	1.73	1.80	1.96	2.05	2.12	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:45:01
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det7\7_20140106002_BG.An1

Acquisition information
       Start time:                 1/6/2014 07:34:46
       Live time:                600
       Real time:                600
       Dead time:                  0.05 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_QC.Clb
     HPGE07 S19585 7_20130220001_Energy


       Energy Calibration
            Created:               1/6/2014 07:33:28
            Zero offset:          -0.010 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -6.439E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/20/2013 20:31:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2041.12keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:45:01
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
   510.68       15.  25.82   0.15  7.515E-03


 ************ U N I D E N T I F I E D     P E A K    S U M M A R Y ************
   Peak Centroid  Background Net Area  Efficiency  Uncert   FWHM  Suspected
 Channel   Energy   Counts     Counts   * Area    2 Sigma %  keV   Nuclide
 ____________________________________________________________________________
  4084.69   510.68         0.        15. 1.996E+03   51.64   0.146 TL-208  s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   L - Peak written from unknown list.
   C - Area < Critical level.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K    S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:45:01
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140106002_BG.An1


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
            Energy   Counts     Counts     Cts/Sec  2 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:45:01
Curtis & Tompkins HPS Lab Spectrum name: 7_20140106002_BG.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	2.9693E+00			
Am-241	<	1.4185E+00			
Bi-212	<	6.0878E+00			
Bi-214	<	1.2862E+00			
Co-60	<	1.0159E+00			
Cs-137	<	7.5927E-01			
Eu-152	<	2.2262E+00			
Eu-154	<	3.0615E+00			
K-40	<	1.1683E+01			
Pa-234	<	7.9727E+00			
Pb-210	<	5.9610E+00			
Pb-212	<	2.0364E+00			
Pb-214	<	2.0003E+00			
Ra-226	<	8.4973E+00			
Th-230	<	6.9733E+01			
Th-234	<	1.1747E+01			
Tl-208	<	6.6314E-01			
U-235	<	8.0053E-01			

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2041.1 keV) 0.000E+00 DPS

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 7_20140108002_BG
Acquired: 1/8/2014 07:15:01
Detector: HPGE07 51-TP32743A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.92	1.73	1.80	1.85	2.05	2.12	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:25:17
Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det7\7_20140108002_BG.An1

Acquisition information
       Start time:                 1/8/2014 07:15:01
       Live time:                600
       Real time:                600
       Dead time:                  0.05 %
       Detector ID:                    7

Detector system
     HPGE07 51-TP32743A


Calibration
       Filename:                   7_QC.Clb
     HPGE07 S19585 7_20130220001_Energy


       Energy Calibration
            Created:               1/8/2014 07:13:44
            Zero offset:           0.002 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.817E-09 keV/channel^2

       Efficiency Calibration
            Created:               2/20/2013 20:31:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2041.26keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:25:17
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:25:17
Curtis & Tompkins HPS Lab Spectrum name: 7_20140108002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	2.9693E+00			
Am-241	<	1.0030E+00			
Bi-212	<	6.0878E+00			
Bi-214	<	1.2862E+00			
Co-60	<	1.0159E+00			
Cs-137	<	7.5927E-01			
Eu-152	<	2.2262E+00			
Eu-154	<	3.0615E+00			
K-40	<	2.8617E+01			
Pa-234	<	5.6375E+00			
Pb-210	<	5.9610E+00			
Pb-212	<	7.6969E-01			
Pb-214	<	2.5824E+00			
Ra-226	<	8.4973E+00			
Th-230	<	6.9733E+01			
Th-234	<	8.3064E+00			
Tl-208	<	6.6314E-01			
U-235	<	5.6606E-01			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:25:17
 Curtis & Tompkins HPS Lab       Spectrum name: 7_20140108002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.3 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 8_20140106002_BG
Acquired: 1/6/2014 07:49:25
Detector: HPGE08 50-TP42229A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.90	1.69	1.76	1.87	2.04	2.11	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:59:33
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140106002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det8\8_20140106002_BG.An1

Acquisition information
       Start time:                 1/6/2014 07:49:25
       Live time:                600
       Real time:                601
       Dead time:                  0.09 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_QC.Clb
     HPGE08 S19585 8_20130407001_Energy


       Energy Calibration
            Created:               1/6/2014 07:47:05
            Zero offset:          -0.009 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.738E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/7/2013 12:02:30
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.00keV )
       Stop channel:           16336 (  2042.04keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:59:33
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140106002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 07:59:33
Curtis & Tompkins HPS Lab Spectrum name: 8_20140106002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.0766E+00			
Am-241	<	7.4888E-01			
Bi-212	<	6.1789E+00			
Bi-214	<	3.2277E+00			
Co-60	<	1.0656E+00			
Cs-137	<	7.7498E-01			
Eu-152	<	1.6331E+00			
Eu-154	<	3.2117E+00			
K-40	<	2.1236E+01			
Pa-234	<	5.8067E+00			
Pb-210	<	8.9087E+00			
Pb-212	<	1.9604E+00			
Pb-214	<	2.0747E+00			
Ra-226	<	1.9862E+01			
Th-230	<	7.3588E+01			
Th-234	<	5.0519E+00			
Tl-208	<	6.8051E-01			
U-235	<	1.3232E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 07:59:33
 Curtis & Tompkins HPS Lab       Spectrum name: 8_20140106002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2042.0 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 8_20140108003_BG
Acquired: 1/8/2014 07:42:10
Detector: HPGE08 50-TP42229A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.90	1.69	1.76	1.94	2.04	2.11	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:52:18
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108003_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det8\8_20140108003_BG.An1

Acquisition information
       Start time:                 1/8/2014 07:42:10
       Live time:                600
       Real time:                600
       Dead time:                  0.08 %
       Detector ID:                    8

Detector system
     HPGE08 50-TP42229A


Calibration
       Filename:                   8_QC.Clb
     HPGE08 S19585 8_20130407001_Energy


       Energy Calibration
            Created:               1/8/2014 07:40:12
            Zero offset:           0.000 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.420E-09 keV/channel^2

       Efficiency Calibration
            Created:               4/7/2013 12:02:30
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.01keV )
       Stop channel:           16336 (  2042.08keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:52:18
Curtis & Tompkins HPS Lab       Spectrum name: 8_20140108003_BG.An1

       Half lives decay limit:    12.000
       Activity range factor:      2.000
       Min. step backg. energy     0.000
       Multiplet shift channel     2.000

Corrections                          Status          Comments
       Decay correct to date:         NO
       Decay during acquisition:      NO
       Decay during collection:       NO
       True coincidence correction:   NO
       Peaked background correction:  NO
       Absorption (Internal):         NO
       Geometry correction:           NO
       Random summing:                NO


total peaks alloc.    0 cutoff: 5.00E+01 %

*****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
 Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
 Energy                             Factor    Energy   Ratio    DPS
_____________________________________________________________________________
  134.24        8.  42.46   0.24  1.302E-02
  152.99        9.  39.30   0.24  1.271E-02
  510.90       15.  25.82   0.19  7.292E-03


************ U N I D E N T I F I E D     P E A K    S U M M A R Y ************
  Peak Centroid  Background Net Area  Efficiency  Uncert   FWHM  Suspected
Channel   Energy   Counts     Counts   * Area    2 Sigma %  keV   Nuclide
_____________________________________________________________________________
 1073.65   134.24         1.         8. 5.913E+02   84.92   0.238  -      s
 1223.67   152.99         1.         9. 6.847E+02   78.60   0.243 PA-234  s
 4086.43   510.90         0.        15. 2.057E+03   51.64   0.188 TL-208  s

  s - Peak fails shape tests.
  D - Peak area deconvoluted.
  L - Peak written from unknown list.
  C - Area < Critical level.

-------------------------------------------------------------
This section based on library: GenericAnalysis.lib
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:52:18
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108003_BG.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity DPS	Peak Energy keV	Peak Activity DPS	Peak Code	Peak MDA Value DPS	COMMENTS

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:52:18
Curtis & Tompkins HPS Lab Spectrum name: 8_20140108003_BG.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity DPS (Time of Count)	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.0766E+00			
Am-241	<	1.4978E+00			
Bi-212	<	8.7383E+00			
Bi-214	<	1.3177E+00			
Co-60	<	1.0656E+00			
Cs-137	<	7.7498E-01			
Eu-152	<	1.6331E+00			
Eu-154	<	3.2117E+00			
K-40	<	1.7339E+01			
Pa-234	<	5.8067E+00			
Pb-210	<	6.2994E+00			
Pb-212	<	1.7896E+00			
Pb-214	<	3.9727E+00			
Ra-226	<	8.8824E+00			
Th-230	<	1.6455E+02			
Th-234	<	5.0519E+00			
Tl-208	<	1.1787E+00			
U-235	<	8.3685E-01			

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2042.1 keV) 0.000E+00 DPS

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 9_20140108002_BG
Acquired: 1/8/2014 07:31:08
Detector: HPGE09 50-TP42232A
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.66	1.73	1.87	2.02	2.09	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:41:16
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det9\9_20140108002_BG.An1

Acquisition information
       Start time:                 1/8/2014 07:31:08
       Live time:                600
       Real time:                600
       Dead time:                  0.04 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_QC.Clb
     HPGE09 S19587 9_20131229001_Energy


       Energy Calibration
            Created:               1/8/2014 07:26:14
            Zero offset:           0.095 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.675E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/29/2013 16:56:20
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.11keV )
       Stop channel:           16336 (  2041.83keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:41:16
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:41:16
Curtis & Tompkins HPS Lab Spectrum name: 9_20140108002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.0906E+00			
Am-241	<	7.4096E-01			
Bi-212	<	6.2591E+00			
Bi-214	<	1.3296E+00			
Co-60	<	1.0613E+00			
Cs-137	<	7.8318E-01			
Eu-152	<	1.6391E+00			
Eu-154	<	3.1919E+00			
K-40	<	1.2126E+01			
Pa-234	<	5.8473E+00			
Pb-210	<	6.2258E+00			
Pb-212	<	1.8067E+00			
Pb-214	<	1.2023E+00			
Ra-226	<	8.9050E+00			
Th-230	<	7.2862E+01			
Th-234	<	1.0027E+01			
Tl-208	<	6.8616E-01			
U-235	<	5.9322E-01			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:41:16
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140108002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2041.8 keV)     0.000E+00  DPS

 Analyzed by: ___________________________________________
                    Technician

 Reviewed by: ___________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 9_20140110002_BG
Acquired: 1/10/2014 06:31:51
Detector: HPGE09 50-TP42232A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.66	1.73	1.83	2.02	2.09	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:41:58
Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det9\9_20140110002_BG.An1

Acquisition information
       Start time:                 1/10/2014 06:31:51
       Live time:                600
       Real time:                600
       Dead time:                  0.04 %
       Detector ID:                    9

Detector system
     HPGE09 50-TP42232A


Calibration
       Filename:                   9_QC.Clb
     HPGE09 S19587 9_20131229001_Energy


       Energy Calibration
            Created:               1/10/2014 06:14:13
            Zero offset:           0.150 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -3.168E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/29/2013 16:56:20
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.16keV )
       Stop channel:           16336 (  2041.98keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:41:58
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 06:41:58
Curtis & Tompkins HPS Lab Spectrum name: 9_20140110002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	4.3707E+00			
Am-241	<	7.4096E-01			
Bi-212	<	6.2591E+00			
Bi-214	<	1.3296E+00			
Co-60	<	1.0613E+00			
Cs-137	<	7.8318E-01			
Eu-152	<	2.3180E+00			
Eu-154	<	3.1919E+00			
K-40	<	2.1002E+01			
Pa-234	<	5.8473E+00			
Pb-210	<	6.2258E+00			
Pb-212	<	8.0799E-01			
Pb-214	<	1.7003E+00			
Ra-226	<	8.9050E+00			
Th-230	<	7.2862E+01			
Th-234	<	5.0137E+00			
Tl-208	<	6.8616E-01			
U-235	<	1.1864E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 06:41:58
 Curtis & Tompkins HPS Lab       Spectrum name: 9_20140110002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.2 to  2042.0 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 10_20140108003_BG
Acquired: 1/8/2014 08:20:48
Detector: HPGE10 51-TP42231A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.69	1.75	1.88	2.00	2.07	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 08:30:56
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108003_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det10\10_20140108003_BG.An1

Acquisition information
       Start time:                 1/8/2014 08:20:48
       Live time:                600
       Real time:                600
       Dead time:                  0.06 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_QC.Clb
     HPGE10 S19587 10_20131230001_Energy


       Energy Calibration
            Created:               1/8/2014 07:52:53
            Zero offset:           0.022 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.220E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 15:43:50
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.73keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 08:30:56
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140108003_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
   511.51       17.  31.17   0.14  6.721E-03


 ************ U N I D E N T I F I E D     P E A K    S U M M A R Y ************
   Peak Centroid  Background Net Area  Efficiency  Uncert   FWHM  Suspected
 Channel   Energy   Counts     Counts   * Area    2 Sigma %  keV   Nuclide
 ____________________________________________________________________________
  4090.44   511.51         3.        17. 2.544E+03   62.34   0.140  -      s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   L - Peak written from unknown list.
   C - Area < Critical level.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K    S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 08:30:56
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108003_BG.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity DPS	Peak Energy keV	Peak Activity DPS	Peak Code	MDA Value DPS	COMMENTS

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 08:30:56
Curtis & Tompkins HPS Lab Spectrum name: 10_20140108003_BG.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty 2 Sigma Counting DPS	Total DPS	MDA
Ac-228	<	3.3620E+00			
Am-241	<	8.2729E-01			
Bi-212	<	6.8248E+00			
Bi-214	<	1.4387E+00			
Co-60	<	1.1567E+00			
Cs-137	<	8.5002E-01			
Eu-152	<	1.7555E+00			
Eu-154	<	3.4890E+00			
K-40	<	1.3344E+01			
Pa-234	<	6.3707E+00			
Pb-210	<	6.9664E+00			
Pb-212	<	8.6770E-01			
Pb-214	<	2.8799E+00			
Ra-226	<	9.6922E+00			
Th-230	<	8.1238E+01			
Th-234	<	5.5650E+00			
Tl-208	<	7.4144E-01			
U-235	<	6.4573E-01			

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2041.7 keV) 0.000E+00 DPS

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 10_20140110002_BG
Acquired: 1/10/2014 07:18:39
Detector: HPGE10 51-TP42231A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.88	1.69	1.75	1.90	2.00	2.07	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 07:28:46
Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det10\10_20140110002_BG.An1

Acquisition information
       Start time:                 1/10/2014 07:18:39
       Live time:                600
       Real time:                601
       Dead time:                  0.10 %
       Detector ID:                   10

Detector system
     HPGE10 51-TP42231A


Calibration
       Filename:                   10_QC.Clb
     HPGE10 S19587 10_20131230001_Energy


       Energy Calibration
            Created:               1/10/2014 06:53:23
            Zero offset:           0.031 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -5.401E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2013 15:43:50
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.04keV )
       Stop channel:           16336 (  2041.69keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 07:28:46
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 07:28:46
Curtis & Tompkins HPS Lab Spectrum name: 10_20140110002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.3620E+00			
Am-241	<	1.4329E+00			
Bi-212	<	6.8248E+00			
Bi-214	<	1.4387E+00			
Co-60	<	1.1567E+00			
Cs-137	<	8.5002E-01			
Eu-152	<	1.7555E+00			
Eu-154	<	3.4890E+00			
K-40	<	1.3344E+01			
Pa-234	<	6.3707E+00			
Pb-210	<	1.7064E+01			
Pb-212	<	1.5029E+00			
Pb-214	<	3.8638E+00			
Ra-226	<	9.6922E+00			
Th-230	<	8.1238E+01			
Th-234	<	5.5650E+00			
Tl-208	<	7.4144E-01			
U-235	<	6.4573E-01			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 07:28:46
 Curtis & Tompkins HPS Lab       Spectrum name: 10_20140110002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2041.7 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 11_20140107002_BG
Acquired: 1/7/2014 07:09:08
Detector: HPGE11 50-TP50818A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.84	1.67	1.72	1.91	1.96	2.01	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 07:19:15
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det11\11_20140107002_BG.An1

Acquisition information
       Start time:                 1/7/2014 07:09:08
       Live time:                600
       Real time:                600
       Dead time:                  0.04 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_QC.Clb
     HPGE11 S19586 11_20140102001_Energy


       Energy Calibration
            Created:               1/7/2014 07:07:34
            Zero offset:           0.117 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.072E-08 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 21:48:39
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.14keV )
       Stop channel:           16336 (  2041.22keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 07:19:15
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140107002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
    84.92        5.  44.72   0.19  1.133E-02


 ************ U N I D E N T I F I E D     P E A K    S U M M A R Y ************
   Peak Centroid  Background Net Area  Efficiency  Uncert   FWHM  Suspected
 Channel   Energy   Counts     Counts   * Area    2 Sigma %  keV   Nuclide
 ____________________________________________________________________________
   677.80    84.92         0.         5. 4.411E+02   89.44   0.188  -      s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   L - Peak written from unknown list.
   C - Area < Critical level.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K    S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 07:19:15
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107002_BG.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity DPS	Peak Energy keV	Peak Activity DPS	Peak Code	Peak MDA Value DPS	COMMENTS

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 07:19:15
Curtis & Tompkins HPS Lab Spectrum name: 11_20140107002_BG.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.3637E+00			
Am-241	<	1.3047E+00			
Bi-212	<	6.9319E+00			
Bi-214	<	1.4846E+00			
Co-60	<	1.1555E+00			
Cs-137	<	1.2327E+00			
Eu-152	<	1.8508E+00			
Eu-154	<	3.4879E+00			
K-40	<	1.8893E+01			
Pa-234	<	6.3823E+00			
Pb-210	<	1.1016E+01			
Pb-212	<	9.2401E-01			
Pb-214	<	1.3573E+00			
Ra-226	<	1.0482E+01			
Th-230	<	1.2789E+02			
Th-234	<	6.1610E+00			
Tl-208	<	7.6729E-01			
U-235	<	6.9844E-01			

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2041.2 keV) 0.000E+00 DPS

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 11_20140108002_BG
Acquired: 1/8/2014 07:32:31
Detector: HPGE11 50-TP50818A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.84	1.67	1.72	1.78	1.96	2.01	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:42:40
Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det11\11_20140108002_BG.An1

Acquisition information
       Start time:                 1/8/2014 07:32:31
       Live time:                600
       Real time:                600
       Dead time:                  0.04 %
       Detector ID:                   11

Detector system
     HPGE11 50-TP50818A


Calibration
       Filename:                   11_QC.Clb
     HPGE11 S19586 11_20140102001_Energy


       Energy Calibration
            Created:               1/8/2014 07:30:05
            Zero offset:           0.125 keV
            Gain:                  0.125 keV/channel
            Quadratic:            -1.054E-08 keV/channel^2

       Efficiency Calibration
            Created:               2/21/2013 21:48:39
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.15keV )
       Stop channel:           16336 (  2041.31keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 07:42:40
 Curtis & Tompkins HPS Lab       Spectrum name: 11_20140108002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
   292.33        5.  44.72   0.19  8.772E-03


 ************ U N I D E N T I F I E D     P E A K    S U M M A R Y ************
   Peak Centroid  Background Net Area  Efficiency  Uncert   FWHM  Suspected
 Channel   Energy   Counts     Counts   * Area    2 Sigma %  keV   Nuclide
 ____________________________________________________________________________
  2335.80   292.33         0.         5. 5.700E+02   89.44   0.188  -      s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   L - Peak written from unknown list.
   C - Area < Critical level.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K    S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:42:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108002_BG.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity DPS	Peak Energy keV	Peak Activity DPS	Peak Code	Peak MDA Value DPS	COMMENTS

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 07:42:40
Curtis & Tompkins HPS Lab Spectrum name: 11_20140108002_BG.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty 2 Sigma Counting DPS	Total DPS	MDA
Ac-228	<	4.7570E+00			
Am-241	<	9.2255E-01			
Bi-212	<	6.9319E+00			
Bi-214	<	1.4846E+00			
Co-60	<	1.1555E+00			
Cs-137	<	1.7433E+00			
Eu-152	<	1.8508E+00			
Eu-154	<	3.4879E+00			
K-40	<	1.3360E+01			
Pa-234	<	6.3823E+00			
Pb-210	<	7.7897E+00			
Pb-212	<	9.2401E-01			
Pb-214	<	1.3573E+00			
Ra-226	<	1.0482E+01			
Th-230	<	9.0435E+01			
Th-234	<	6.1610E+00			
Tl-208	<	7.6729E-01			
U-235	<	6.9844E-01			

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2041.3 keV) 0.000E+00 DPS

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 12_20140108003_BG
Acquired: 1/8/2014 07:57:38
Detector: HPGE12 50-TP32731A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.73	1.57	1.63	1.69	1.83	1.89	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 08:07:46
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108003_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det12\12_20140108003_BG.An1

Acquisition information
       Start time:                 1/8/2014 07:57:38
       Live time:                600
       Real time:                601
       Dead time:                  0.17 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_QC.Clb
     HPGE12 S19586 12_20140103001_Energy


       Energy Calibration
            Created:               1/8/2014 07:54:39
            Zero offset:           0.094 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.482E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 16:03:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.09keV )
       Stop channel:           16336 (  2042.47keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/8/2014 08:07:46
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140108003_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
   511.09       20.  22.36   0.50  6.312E-03


 ************ U N I D E N T I F I E D     P E A K    S U M M A R Y ************
   Peak Centroid  Background Net Area  Efficiency  Uncert   FWHM  Suspected
 Channel   Energy   Counts     Counts   * Area    2 Sigma %  keV   Nuclide
 ____________________________________________________________________________
  4088.60   511.09         0.        20. 3.169E+03   44.72   0.500 TL-208  s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   L - Peak written from unknown list.
   C - Area < Critical level.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K    S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 08:07:46
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108003_BG.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity DPS	Peak Energy keV	Peak Activity DPS	Peak Code	Peak MDA Value DPS	COMMENTS

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

ORTEC g v - i (1087) Env32 G53W4.26 1/8/2014 08:07:46
Curtis & Tompkins HPS Lab Spectrum name: 12_20140108003_BG.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Activity DPS	Time of Count Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.5279E+00			
Am-241	<	9.3002E-01			
Bi-212	<	7.1670E+00			
Bi-214	<	2.1559E+00			
Co-60	<	1.2323E+00			
Cs-137	<	8.9750E-01			
Eu-152	<	1.8827E+00			
Eu-154	<	5.2985E+00			
K-40	<	1.4590E+01			
Pa-234	<	6.6782E+00			
Pb-210	<	7.8570E+00			
Pb-212	<	9.2320E-01			
Pb-214	<	1.3809E+00			
Ra-226	<	1.0503E+01			
Th-230	<	9.1136E+01			
Th-234	<	1.3868E+01			
Tl-208	<	7.8691E-01			
U-235	<	6.9990E-01			

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2042.5 keV) 0.000E+00 DPS

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 12_20140110002_BG
Acquired: 1/10/2014 07:22:23
Detector: HPGE12 50-TP32731A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.73	1.57	1.63	1.78	1.83	1.89	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 07:32:31
Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det12\12_20140110002_BG.An1

Acquisition information
       Start time:                 1/10/2014 07:22:23
       Live time:                600
       Real time:                601
       Dead time:                  0.19 %
       Detector ID:                   12

Detector system
     HPGE12 50-TP32731A


Calibration
       Filename:                   12_QC.Clb
     HPGE12 S19586 12_20140103001_Energy


       Energy Calibration
            Created:               1/10/2014 06:54:40
            Zero offset:           0.076 keV
            Gain:                  0.125 keV/channel
            Quadratic:             3.351E-09 keV/channel^2

       Efficiency Calibration
            Created:               12/30/2012 16:03:28
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysis.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            200 (    25.07keV )
       Stop channel:           16336 (  2042.54keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 07:32:31
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysis.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/10/2014 07:32:31
Curtis & Tompkins HPS Lab Spectrum name: 12_20140110002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.5279E+00			
Am-241	<	9.3002E-01			
Bi-212	<	7.1670E+00			
Bi-214	<	1.5244E+00			
Co-60	<	1.2323E+00			
Cs-137	<	8.9750E-01			
Eu-152	<	3.2609E+00			
Eu-154	<	3.7466E+00			
K-40	<	1.4590E+01			
Pa-234	<	6.6782E+00			
Pb-210	<	1.1112E+01			
Pb-212	<	2.6112E+00			
Pb-214	<	2.7618E+00			
Ra-226	<	2.9708E+01			
Th-230	<	9.1136E+01			
Th-234	<	1.5192E+01			
Tl-208	<	7.8691E-01			
U-235	<	9.8981E-01			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/10/2014 07:32:31
 Curtis & Tompkins HPS Lab       Spectrum name: 12_20140110002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2042.5 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 251449
ANALYTICAL REPORT
Radiation Chemistry (Ingrowth)

Innovative Technical Solutions,Inc. 2730 Shadelands Drive Walnut Creek, CA 94598	Project : 07204.0004 Location : HPNS Parcel D-1 Level : IV Contract # : N62473-10-D0808

Sample ID	Lab ID	Sample ID	Lab ID
04-PD-D0034-01	251449-001	04-PD-D0034-13	251449-013
04-PD-D0034-02	251449-002	04-PD-D0034-14	251449-014
04-PD-D0034-03	251449-003	04-PD-D0034-15	251449-015
04-PD-D0034-04	251449-004	04-PD-D0034-16	251449-016
04-PD-D0034-05	251449-005	04-PD-D0034-17	251449-017
04-PD-D0034-06	251449-006	04-PD-D0034-18	251449-018
04-PD-D0034-07	251449-007	04-PD-D0034-19	251449-019
04-PD-D0034-08	251449-008	04-PD-D0034-20	251449-020
04-PD-D0034-09	251449-009	04-PD-D0034-21	251449-021
04-PD-D0034-10	251449-010	04-PD-D0034-22	251449-022
04-PD-D0034-11	251449-011	04-PD-D0034-23	251449-023
04-PD-D0034-12	251449-012	04-PD-D0034-24	251449-024

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: _____ Date: 02/05/2014

John Goyette
Senior Program Manager
goyette@ctberk.com
(510) 204-2233

NELAP # 01107CA

Curtis & Tompkins, Ltd.

CASE NARRATIVE
RADIATION CHEMISTRY (INGROWTH) (DOE HASL 300 4.5.2.3)

Laboratory number:	**251449**
Client:	**Innovative Technical Solutions,Inc.**
Project:	**07204.0004**
Location:	**HPNS Parcel D-1**
Request Date:	**12/09/13**
Samples Received:	**12/09/13**

This data package contains sample and QC results for twenty four soil samples, requested for the above referenced project on 12/09/13. See attached cooler receipt form for any sample receipt problems or discrepancies.

Radiation Chemistry (Ingrowth) (DOE HASL 300 4.5.2.3):
The ingrowth period for these samples was at least 21 days.

No analytical problems were encountered.

Chain of Custody

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

Gilbane

207004 PS 1/15/14

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag,

2514494 12-9-13 sealed 12/30/13 bin# 21

mgrowth bin# 21

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
1	04-PD-D0034-01 CA	SO	11/29/2013	1344	KLM	X	X	04-PD-D0034-01	N1	0.00	0.00
2	04-PD-D0034-02 CA	SO	11/29/2013	1346	KLM	X	X	04-PD-D0034-02	N1	0.00	0.00
3	04-PD-D0034-03 CA	SO	11/29/2013	1349	KLM	X	X	04-PD-D0034-03	N1	0.00	0.00
4	04-PD-D0034-04 CA	SO	11/29/2013	1351	KLM	X	X	04-PD-D0034-04	N1	0.00	0.00
5	04-PD-D0034-05 CA	SO	11/29/2013	1353	KLM	X	X	04-PD-D0034-05	N1	0.00	0.00
6	04-PD-D0034-06 CA	SO	11/29/2013	1355	KLM	X	X	04-PD-D0034-06	N1	0.00	0.00
7	04-PD-D0034-07 CA	SO	11/29/2013	1357	KLM	X	X	04-PD-D0034-07	N1	0.00	0.00
8	04-PD-D0034-08 CA	SO	11/29/2013	1359	KLM	X	X	04-PD-D0034-08	N1	0.00	0.00
9	04-PD-D0034-09 CA	SO	11/29/2013	1401	KLM	X	X	04-PD-D0034-09	N1	0.00	0.00
10	04-PD-D0034-10 CA	SO	11/29/2013	1403	KLM	X	X	04-PD-D0034-10	N1	0.00	0.00
Cooler # 8		**Turnaround Time: 0 Days**									

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Date	Time
[signature]	12-9-13	0800	[signature]	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

[signature] CT 12-9-13 0950 OK

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

207004 PS 1/15/14

Gilbane

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag.

251449 4 12-9-13

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.	E901.1 - Solid Ra-226 and CS-137	GS186 - Ra-226 and CS-137 Screening	Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
11	04-PD-D0034-11 CA	SO	11/29/2013	1406	KLM	X	X	04-PD-D0034-11	N1	0.00	0.00
12	04-PD-D0034-12 CA	SO	11/29/2013	1408	KLM	X	X	04-PD-D0034-12	N1	0.00	0.00
13	04-PD-D0034-13 CA	SO	11/29/2013	1411	KLM	X	X	04-PD-D0034-13	N1	0.00	0.00
14	04-PD-D0034-14 CA	SO	11/29/2013	1413	KLM	X	X	04-PD-D0034-14	N1	0.00	0.00
15	04-PD-D0034-15 CA	SO	11/29/2013	1415	KLM	X	X	04-PD-D0034-15	N1	0.00	0.00
16	04-PD-D0034-16 CA	SO	11/29/2013	1418	KLM	X	X	04-PD-D0034-16	N1	0.00	0.00
17	04-PD-D0034-17 CA	SO	11/29/2013	1420	KLM	X	X	04-PD-D0034-17	N1	0.00	0.00
18	04-PD-D0034-18 CA	SO	11/29/2013	1423	KLM	X	X	04-PD-D0034-18	N1	0.00	0.00
19	04-PD-D0034-19 CA	SO	11/29/2013	1425	KLM	X	X	04-PD-D0034-19	N1	0.00	0.00
20	04-PD-D0034-20 CA	SO	11/29/2013	1427	KLM	X	X	04-PD-D0034-20	N1	0.00	0.00
Cooler # 8		**Turnaround Time: 0 Days**									

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Date	Time
[signature]	12/9/13	0800	[signature]	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

C. Eldt @ 12-9-13 0950 OK

CHAIN-OF-CUSTODY RECORD

ITSI Gilbane
Ed Palser
Walnut Creek
(505) 400-4076 EXT: epalser@itsi.com

COC # HPSD1-0070

207008 PS 1/15/14

Gilbane

Project Name: HPSD1	Laboratory: Curtis & Tompkins, Berkeley, CA
Project Number: 07204.0004	Point of contact: Mike Dahlquist (510) 486-0900 mike.dahlquist@ctberk.com
WBS Code: 0058000	Ship to: 2323 5th St., Berkley, CA 94710

Comments:

Equipment:

Analytical Test Method: E901.1 - Solid Ra-226 and CS-137; GS186 - Ra-226 and CS-137 Screening

Code	Matrix
SO	SOIL

Code	Container/Preservative
	1* 1 Gallon Ziploc Bag,

251449 12-9-13

Event: Sewer Line Removal

	Sample ID	Matrix	Date	Time	Samp Init.			Location ID	Sample Type	Depth (ft bgs) Top	Depth (ft bgs) Bottom
21	04-PD-D0034-21	SO	12/8/2013	1026		X	X	04-PD-D0034-21	N1	0.00	0.00
22	04-PD-D0034-22	SO	12/8/2013	1029		X	X	04-PD-D0034-22	N1	0.00	0.00
23	04-PD-D0034-23	SO	12/8/2013	1032		X	X	04-PD-D0034-23	N1	0.00	0.00
24	04-PD-D0034-24	SO	12/8/2013	1035		X	X	04-PD-D0034-24	N1	0.00	0.00

Cooler # 8 **Turnaround Time: 0 Days**

Relinquished by: *(Signature)*	Date	Time
	12/9/13	0800

Received by: *(Signature)*	Date	Time
	12-09-13	0800

Shipping Date / Carrier / Airbill Number

Shipping Date: 12/9/2013

Recevied by Laboratory: *(Signature, Date, Time)* **& condition**

12-9-13 0950 OK

Results & QC Summary

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-01	Received:	12/09/13
Lab ID:	251449-001	Prepared:	12/30/13 16:45
Matrix:	Soil	Analyzed:	01/24/14 17:04
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	346.12 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:44		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0545 U	0.169	0.136	
Bismuth-212	0.236 U	0.351	0.264	
Bismuth-214	0.263	0.0709	0.0366	
Cesium-137	0.0109 U	0.0248	0.0192	0.07
Cobalt-60	-0.00660 U	0.0345	0.0277	
Europium-152	0.0297 U	0.0471	0.0504	
Europium-154	0.0901 U	0.186	0.143	
Lead-212	0.267	0.0628	0.0348	
Lead-214	0.282	0.0664	0.0377	
Potassium-40	18.3	1.30	0.206	
Protactinium-234	0.0309 U	0.0698	0.0794	
Radium-226 (By Bismuth-214)	0.263	0.0709	0.0366	0.2
Thallium-208	0.0932	0.0325	0.0172	
Thorium-232 (By Actinium-228)	0.392	0.0979	0.0558	
Thorium-234	0.373 U	0.291	1.19	
Uranium-235	0.0552 U	0.0319	0.144	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-02	Received:	12/09/13
Lab ID:	251449-002	Prepared:	12/30/13 16:47
Matrix:	Soil	Analyzed:	01/24/14 17:04
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	334.81 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:46		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0 U	0.136	0.154	
Bismuth-212	0.0892 U	0.248	0.248	
Bismuth-214	0.220	0.0762	0.0415	
Cesium-137	0.00540 U	0.0222	0.0176	0.07
Cobalt-60	0.00485 U	0.0223	0.0246	
Europium-152	0.0416 U	0.0803	0.0569	
Europium-154	0.0266 U	0.0456	0.165	
Lead-212	0.279	0.0623	0.0346	
Lead-214	0.332	0.0830	0.0447	
Potassium-40	21.4	1.44	0.237	
Protactinium-234	0.0530 U	0.0831	0.0857	
Radium-226 (By Bismuth-214)	0.220	0.0762	0.0415	0.2
Thallium-208	0.110	0.0379	0.0175	
Thorium-232 (By Actinium-228)	0.365	0.0965	0.0521	
Thorium-234	0.226 U	0.316	0.929	
Uranium-235	0.0213 U	0.0206	0.151	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-03	Received:	12/09/13
Lab ID:	251449-003	Prepared:	12/30/13 16:49
Matrix:	Soil	Analyzed:	01/24/14 17:05
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	363 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:49		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00430 U	0.180	0.148	
Bismuth-212	0.447	0.409	0.231	
Bismuth-214	0.181	0.0703	0.0478	
Cesium-137	-0.00290 U	0.0252	0.0205	0.07
Cobalt-60	0.0130 U	0.0310	0.0240	
Europium-152	0.0265 U	0.0586	0.0483	
Europium-154	-0.00590 U	0.0253	0.183	
Lead-212	0.265	0.0695	0.0410	
Lead-214	0.318	0.0819	0.0394	
Potassium-40	22.4	1.41	0.202	
Protactinium-234	0.0161 U	0.116	0.0909	
Radium-226 (By Bismuth-214)	0.181	0.0703	0.0478	0.2
Thallium-208	0.105	0.0356	0.0175	
Thorium-232 (By Actinium-228)	0.304	0.0915	0.0878	
Thorium-234	0.750 U	1.43	1.14	
Uranium-235	0.172	0.151	0.140	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-04	Received:	12/09/13
Lab ID:	251449-004	Prepared:	12/30/13 16:53
Matrix:	Soil	Analyzed:	01/24/14 17:02
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	333.35 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:51		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0481 U	0.162	0.131	
Bismuth-212	0.206 U	0.306	0.246	
Bismuth-214	0.366	0.0998	0.0470	
Cesium-137	-0.00557 U	0.0276	0.0222	0.07
Cobalt-60	-0.000946 U	0.0265	0.0217	
Europium-152	0.0374 U	0.0442	0.0456	
Europium-154	0.0180 U	0.0388	0.134	
Lead-212	0.296	0.0667	0.0373	
Lead-214	0.389	0.0865	0.0409	
Potassium-40	15.2	1.24	0.317	
Protactinium-234	-0.0589 U	0.112	0.0891	
Radium-226 (By Bismuth-214)	0.366	0.0998	0.0470	0.2
Thallium-208	0.140	0.0400	0.0195	
Thorium-232 (By Actinium-228)	0.377	0.102	0.0583	
Thorium-234	0.369 U	0.405	1.02	
Uranium-235	0.0358 U	0.0376	0.101	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-05	Received:	12/09/13
Lab ID:	251449-005	Prepared:	12/30/13 16:56
Matrix:	Soil	Analyzed:	01/24/14 17:01
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	323.67 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:53		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0233 U	0.151	0.123	
Bismuth-212	0.528	0.439	0.246	
Bismuth-214	0.371	0.0948	0.0451	
Cesium-137	0.00438 U	0.0257	0.0207	0.07
Cobalt-60	-0.0154 U	0.0378	0.0295	
Europium-152	0.0121 U	0.0233	0.0582	
Europium-154	0.0314 U	0.0605	0.147	
Lead-212	0.376	0.0700	0.0362	
Lead-214	0.418	0.0920	0.0465	
Potassium-40	16.5	1.27	0.246	
Protactinium-234	0.0565 U	0.118	0.0932	
Radium-226 (By Bismuth-214)	0.371	0.0948	0.0451	0.2
Thallium-208	0.0906	0.0305	0.0170	
Thorium-232 (By Actinium-228)	0.382	0.122	0.0605	
Thorium-234	0.743 U	1.22	0.959	
Uranium-235	0.0733 U	0.151	0.120	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-06	Received:	12/09/13
Lab ID:	251449-006	Prepared:	12/30/13 16:59
Matrix:	Soil	Analyzed:	01/24/14 17:53
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	340.92 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:55		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0836 U	0.160	0.127	
Bismuth-212	0.170 U	0.372	0.234	
Bismuth-214	0.285	0.0750	0.0384	
Cesium-137	0.000335 U	0.0276	0.0227	0.07
Cobalt-60	0.0120 U	0.0214	0.0177	
Europium-152	0.0118 U	0.0278	0.0558	
Europium-154	-0.0193 U	0.215	0.175	
Lead-212	0.271	0.0640	0.0356	
Lead-214	0.339	0.0798	0.0414	
Potassium-40	15.8	1.23	0.227	
Protactinium-234	0.0107 U	0.0506	0.0920	
Radium-226 (By Bismuth-214)	0.285	0.0750	0.0384	0.2
Thallium-208	0.0966	0.0335	0.0199	
Thorium-232 (By Actinium-228)	0.531	0.161	0.0640	
Thorium-234	0.162 U	0.516	1.17	
Uranium-235	0.0273 U	0.0272	0.109	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-07	Received:	12/09/13
Lab ID:	251449-007	Prepared:	12/30/13 17:01
Matrix:	Soil	Analyzed:	01/24/14 17:52
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	339.57 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:57		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0860 U	0.144	0.114	
Bismuth-212	0.361	0.397	0.284	
Bismuth-214	0.385	0.0848	0.0359	
Cesium-137	0.0346	0.0256	0.0171	0.07
Cobalt-60	0.00614 U	0.0312	0.0250	
Europium-152	-0.000532 U	0.00119	0.0678	
Europium-154	0.0465 U	0.0899	0.173	
Lead-212	0.361	0.0661	0.0346	
Lead-214	0.382	0.0884	0.0431	
Potassium-40	17.3	1.30	0.306	
Protactinium-234	0.0157 U	0.0232	0.0783	
Radium-226 (By Bismuth-214)	0.385	0.0848	0.0359	0.2
Thallium-208	0.137	0.0416	0.0214	
Thorium-232 (By Actinium-228)	0.469	0.118	0.0649	
Thorium-234	0.583 U	0.554	0.909	
Uranium-235	0.0648 U	0.0444	0.134	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-08	Received:	12/09/13
Lab ID:	251449-008	Prepared:	12/30/13 17:05
Matrix:	Soil	Analyzed:	01/24/14 17:52
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	330.01 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:59		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0374 U	0.137	0.111	
Bismuth-212	0.327	0.332	0.235	
Bismuth-214	0.361	0.0904	0.0442	
Cesium-137	-0.000588 U	0.0292	0.0240	0.07
Cobalt-60	0.00618 U	0.0238	0.0197	
Europium-152	0.0151 U	0.0371	0.0565	
Europium-154	0.0583 U	0.190	0.149	
Lead-212	0.365	0.0680	0.0337	
Lead-214	0.385	0.0855	0.0397	
Potassium-40	16.5	1.29	0.283	
Protactinium-234	0.0126 U	0.0274	0.0852	
Radium-226 (By Bismuth-214)	0.361	0.0904	0.0442	0.2
Thallium-208	0.153	0.0365	0.0144	
Thorium-232 (By Actinium-228)	0.330	0.108	0.0820	
Thorium-234	0.474 U	0.656	1.06	
Uranium-235	0.0992 U	0.182	0.145	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-09	Received:	12/09/13
Lab ID:	251449-009	Prepared:	12/30/13 17:09
Matrix:	Soil	Analyzed:	01/24/14 17:53
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	345.27 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:01		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0343 U	0.153	0.124	
Bismuth-212	0.390	0.402	0.239	
Bismuth-214	0.274	0.0729	0.0417	
Cesium-137	0.0172 U	0.0239	0.0177	0.07
Cobalt-60	0.00430 U	0.0158	0.0225	
Europium-152	0.0174 U	0.0897	0.0458	
Europium-154	-0.0531 U	0.200	0.159	
Lead-212	0.259	0.0634	0.0363	
Lead-214	0.312	0.0762	0.0393	
Potassium-40	19.9	1.36	0.226	
Protactinium-234	0.0496 U	0.0706	0.0766	
Radium-226 (By Bismuth-214)	0.274	0.0729	0.0417	0.2
Thallium-208	0.0853	0.0349	0.0194	
Thorium-232 (By Actinium-228)	0.398	0.123	0.0551	
Thorium-234	0.130 U	0.334	1.04	
Uranium-235	0.112 U	0.147	0.114	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-10	Received:	12/09/13
Lab ID:	251449-010	Prepared:	12/30/13 17:12
Matrix:	Soil	Analyzed:	01/24/14 18:44
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	327.83 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:03		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00612 U	0.164	0.135	
Bismuth-212	0.142 U	0.371	0.291	
Bismuth-214	0.323	0.0818	0.0382	
Cesium-137	0.00254 U	0.0232	0.0188	0.07
Cobalt-60	0.0102 U	0.0228	0.0235	
Europium-152	0.0175 U	0.0226	0.0664	
Europium-154	0.0103 U	0.0269	0.149	
Lead-212	0.343	0.0699	0.0379	
Lead-214	0.390	0.101	0.0481	
Potassium-40	16.9	1.34	0.354	
Protactinium-234	0.0251 U	0.0454	0.0962	
Radium-226 (By Bismuth-214)	0.323	0.0818	0.0382	0.2
Thallium-208	0.141	0.0426	0.0208	
Thorium-232 (By Actinium-228)	0.483	0.146	0.0593	
Thorium-234	0.590 U	1.22	0.969	
Uranium-235	0.0418 U	0.0395	0.125	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-11	Received:	12/09/13
Lab ID:	251449-011	Prepared:	12/30/13 17:14
Matrix:	Soil	Analyzed:	01/24/14 18:47
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	356.36 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:06		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.133 U	0.174	0.136	
Bismuth-212	0.446	0.350	0.215	
Bismuth-214	0.383	0.0973	0.0462	
Cesium-137	-0.00739 U	0.0221	0.0173	0.07
Cobalt-60	0.0107 U	0.0200	0.0228	
Europium-152	0.0333 U	0.0496	0.0496	
Europium-154	0.0127 U	0.0604	0.148	
Lead-212	0.313	0.0644	0.0349	
Lead-214	0.437	0.0816	0.0368	
Potassium-40	18.8	1.30	0.181	
Protactinium-234	-0.0573 U	0.111	0.0890	
Radium-226 (By Bismuth-214)	0.383	0.0973	0.0462	0.2
Thallium-208	0.126	0.0443	0.0205	
Thorium-232 (By Actinium-228)	0.331	0.106	0.0506	
Thorium-234	0.376 U	1.36	1.10	
Uranium-235	0.0394 U	0.0322	0.135	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-12	Received:	12/09/13
Lab ID:	251449-012	Prepared:	12/30/13 17:17
Matrix:	Soil	Analyzed:	01/24/14 18:47
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	343.45 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:08		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0414 U	0.155	0.125	
Bismuth-212	0.564	0.365	0.185	
Bismuth-214	0.290	0.0758	0.0386	
Cesium-137	-0.00497 U	0.0256	0.0206	0.07
Cobalt-60	0.000377 U	0.0267	0.0220	
Europium-152	0.0257 U	0.0386	0.0482	
Europium-154	0.0234 U	0.0598	0.197	
Lead-212	0.263	0.0683	0.0398	
Lead-214	0.364	0.0676	0.0370	
Potassium-40	16.6	1.24	0.207	
Protactinium-234	0.0529 U	0.0774	0.0767	
Radium-226 (By Bismuth-214)	0.290	0.0758	0.0386	0.2
Thallium-208	0.119	0.0328	0.0140	
Thorium-232 (By Actinium-228)	0.300	0.0965	0.0762	
Thorium-234	0.892 U	1.35	1.07	
Uranium-235	-0.0879 U	0.171	0.136	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-13	Received:	12/09/13
Lab ID:	251449-013	Prepared:	12/30/13 17:20
Matrix:	Soil	Analyzed:	01/24/14 18:46
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	334.92 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:11		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0440 U	0.188	0.152	
Bismuth-212	0.414	0.436	0.266	
Bismuth-214	0.279	0.0808	0.0439	
Cesium-137	0.00562 U	0.0220	0.0174	0.07
Cobalt-60	0.00137 U	0.0327	0.0268	
Europium-152	0.00566 U	0.00848	0.0722	
Europium-154	0.0131 U	0.0269	0.164	
Lead-212	0.294	0.0664	0.0372	
Lead-214	0.309	0.0885	0.0452	
Potassium-40	20.3	1.44	0.315	
Protactinium-234	0.0626 U	0.124	0.0865	
Radium-226 (By Bismuth-214)	0.279	0.0808	0.0439	0.2
Thallium-208	0.107	0.0328	0.0157	
Thorium-232 (By Actinium-228)	0.352	0.0908	0.0545	
Thorium-234	0.493 U	0.321	1.25	
Uranium-235	0.0317 U	0.0492	0.0921	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-14	Received:	12/09/13
Lab ID:	251449-014	Prepared:	12/30/13 17:22
Matrix:	Soil	Analyzed:	01/24/14 18:44
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	306.02 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:13		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0290 U	0.163	0.132	
Bismuth-212	0.369	0.477	0.299	
Bismuth-214	0.332	0.0900	0.0429	
Cesium-137	0.0146 U	0.0235	0.0175	0.07
Cobalt-60	0.00100 U	0.0315	0.0258	
Europium-152	0.0205 U	0.0496	0.0601	
Europium-154	0.0182 U	0.0392	0.183	
Lead-212	0.275	0.0593	0.0301	
Lead-214	0.311	0.0826	0.0442	
Potassium-40	18.0	1.39	0.288	
Protactinium-234	0.0478 U	0.102	0.0956	
Radium-226 (By Bismuth-214)	0.332	0.0900	0.0429	0.2
Thallium-208	0.0767	0.0359	0.0196	
Thorium-232 (By Actinium-228)	0.226	0.115	0.0843	
Thorium-234	1.08	1.21	0.933	
Uranium-235	0.0199 U	0.0292	0.119	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-15	Received:	12/09/13
Lab ID:	251449-015	Prepared:	12/30/13 17:25
Matrix:	Soil	Analyzed:	01/24/14 19:36
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	329.98 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:15		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0165 U	0.185	0.152	
Bismuth-212	0.383	0.333	0.227	
Bismuth-214	0.289	0.0737	0.0379	
Cesium-137	-0.00640 U	0.0247	0.0197	0.07
Cobalt-60	0.0101 U	0.0302	0.0236	
Europium-152	0.00544 U	0.0659	0.0538	
Europium-154	-0.00869 U	0.0338	0.175	
Lead-212	0.286	0.0694	0.0388	
Lead-214	0.422	0.0996	0.0450	
Potassium-40	17.5	1.33	0.262	
Protactinium-234	-0.0488 U	0.119	0.0957	
Radium-226 (By Bismuth-214)	0.289	0.0737	0.0379	0.2
Thallium-208	0.124	0.0355	0.0158	
Thorium-232 (By Actinium-228)	0.438	0.108	0.0652	
Thorium-234	0.534 U	0.652	1.16	
Uranium-235	0.168	0.154	0.129	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-16	Received:	12/09/13
Lab ID:	251449-016	Prepared:	12/30/13 17:28
Matrix:	Soil	Analyzed:	01/24/14 19:35
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	306.6 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:18		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0555 U	0.178	0.144	
Bismuth-212	0.346	0.447	0.271	
Bismuth-214	0.360	0.0937	0.0456	
Cesium-137	-0.000375 U	0.0276	0.0227	0.07
Cobalt-60	0.000361 U	0.0339	0.0279	
Europium-152	0.0205 U	0.0534	0.0534	
Europium-154	0.0125 U	0.0365	0.172	
Lead-212	0.302	0.0675	0.0372	
Lead-214	0.375	0.0880	0.0478	
Potassium-40	16.0	1.32	0.290	
Protactinium-234	0.0519 U	0.0836	0.0784	
Radium-226 (By Bismuth-214)	0.360	0.0937	0.0456	0.2
Thallium-208	0.106	0.0352	0.0166	
Thorium-232 (By Actinium-228)	0.363	0.104	0.0492	
Thorium-234	0.223 U	1.31	1.07	
Uranium-235	0.0343 U	0.0287	0.158	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-17	Received:	12/09/13
Lab ID:	251449-017	Prepared:	12/30/13 17:31
Matrix:	Soil	Analyzed:	01/24/14 19:37
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	352.28 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:20		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0852 U	0.186	0.149	
Bismuth-212	0.395	0.353	0.249	
Bismuth-214	0.312	0.0858	0.0442	
Cesium-137	-0.00951 U	0.0267	0.0210	0.07
Cobalt-60	-0.00206 U	0.0288	0.0235	
Europium-152	0.0335 U	0.0511	0.0412	
Europium-154	0.00657 U	0.0156	0.173	
Lead-212	0.300	0.0664	0.0366	
Lead-214	0.340	0.0779	0.0399	
Potassium-40	19.1	1.33	0.208	
Protactinium-234	-0.0593 U	0.117	0.0938	
Radium-226 (By Bismuth-214)	0.312	0.0858	0.0442	0.2
Thallium-208	0.121	0.0347	0.0156	
Thorium-232 (By Actinium-228)	0.362	0.113	0.0752	
Thorium-234	0.514 U	0.462	1.28	
Uranium-235	0.103 U	0.161	0.127	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-18	Received:	12/09/13
Lab ID:	251449-018	Prepared:	12/30/13 17:34
Matrix:	Soil	Analyzed:	01/24/14 19:37
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	343.7 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:23		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.174	0.148	0.110	
Bismuth-212	0.234 U	0.435	0.300	
Bismuth-214	0.326	0.0878	0.0444	
Cesium-137	0.00578 U	0.0253	0.0203	0.07
Cobalt-60	0.0121 U	0.0230	0.0204	
Europium-152	0.0369 U	0.0337	0.0576	
Europium-154	-0.00665 U	0.0209	0.163	
Lead-212	0.271	0.0567	0.0303	
Lead-214	0.356	0.0775	0.0379	
Potassium-40	15.9	1.22	0.214	
Protactinium-234	-0.00910 U	0.104	0.0854	
Radium-226 (By Bismuth-214)	0.326	0.0878	0.0444	0.2
Thallium-208	0.0926	0.0322	0.0188	
Thorium-232 (By Actinium-228)	0.429	0.130	0.0502	
Thorium-234	-0.349 U	1.37	1.11	
Uranium-235	0.0369 U	0.0312	0.129	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-19	Received:	12/09/13
Lab ID:	251449-019	Prepared:	12/30/13 17:36
Matrix:	Soil	Analyzed:	01/24/14 20:27
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.76 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:25		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.000351 U	0.159	0.131	
Bismuth-212	0.361	0.410	0.237	
Bismuth-214	0.246	0.0739	0.0460	
Cesium-137	-0.000156 U	0.0235	0.0194	0.07
Cobalt-60	-0.000102 U	0.0325	0.0267	
Europium-152	0.0404 U	0.0665	0.0492	
Europium-154	0.0383 U	0.0955	0.143	
Lead-212	0.330	0.0606	0.0315	
Lead-214	0.334	0.0715	0.0369	
Potassium-40	17.6	1.36	0.304	
Protactinium-234	0.0245 U	0.0434	0.101	
Radium-226 (By Bismuth-214)	0.246	0.0739	0.0460	0.2
Thallium-208	0.119	0.0377	0.0181	
Thorium-232 (By Actinium-228)	0.457	0.120	0.0321	
Thorium-234	0.874	0.611	0.847	
Uranium-235	0.0391 U	0.0290	0.130	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-20	Received:	12/09/13
Lab ID:	251449-020	Prepared:	12/30/13 17:38
Matrix:	Soil	Analyzed:	01/24/14 20:28
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.16 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:27		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0171 U	0.136	0.111	
Bismuth-212	0.339	0.429	0.267	
Bismuth-214	0.415	0.0861	0.0362	
Cesium-137	-0.00723 U	0.0289	0.0231	0.07
Cobalt-60	-0.0124 U	0.0326	0.0254	
Europium-152	0.0360 U	0.0644	0.0578	
Europium-154	0.0297 U	0.0331	0.179	
Lead-212	0.457	0.0741	0.0377	
Lead-214	0.500	0.0983	0.0455	
Potassium-40	14.7	1.25	0.369	
Protactinium-234	0.0780	0.0985	0.0686	
Radium-226 (By Bismuth-214)	0.415	0.0861	0.0362	0.2
Thallium-208	0.110	0.0381	0.0209	
Thorium-232 (By Actinium-228)	0.409	0.128	0.0796	
Thorium-234	0.200 U	0.433	1.12	
Uranium-235	0.0429 U	0.0352	0.151	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-21	Received:	12/09/13
Lab ID:	251449-021	Prepared:	12/30/13 17:41
Matrix:	Soil	Analyzed:	01/24/14 20:26
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.96 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:26		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0138 U	0.209	0.172	
Bismuth-212	0.801	0.313	0.107	
Bismuth-214	0.250	0.0685	0.0355	
Cesium-137	0.00624 U	0.0278	0.0223	0.07
Cobalt-60	-0.00457 U	0.0349	0.0282	
Europium-152	0.0174 U	0.0375	0.0636	
Europium-154	0.0336 U	0.0559	0.159	
Lead-212	0.293	0.0675	0.0367	
Lead-214	0.286	0.0775	0.0428	
Potassium-40	23.3	1.50	0.219	
Protactinium-234	0.0567 U	0.0665	0.0966	
Radium-226 (By Bismuth-214)	0.250	0.0685	0.0355	0.2
Thallium-208	0.0925	0.0333	0.0201	
Thorium-232 (By Actinium-228)	0.239	0.118	0.0901	
Thorium-234	0 U	0.637	1.34	
Uranium-235	0.0411 U	0.0504	0.140	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-22	Received:	12/09/13
Lab ID:	251449-022	Prepared:	12/30/13 17:47
Matrix:	Soil	Analyzed:	01/24/14 20:26
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	339.12 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:29		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0000919 U	0.180	0.148	
Bismuth-212	0 U	0.346	0.231	
Bismuth-214	0.247	0.0889	0.0481	
Cesium-137	0.000768 U	0.0234	0.0192	0.07
Cobalt-60	-0.00856 U	0.0304	0.0239	
Europium-152	0.0204 U	0.0741	0.0482	
Europium-154	0.0181 U	0.0406	0.146	
Lead-212	0.311	0.0683	0.0368	
Lead-214	0.313	0.0852	0.0418	
Potassium-40	22.1	1.45	0.239	
Protactinium-234	0.0314 U	0.0584	0.0867	
Radium-226 (By Bismuth-214)	0.247	0.0889	0.0481	0.2
Thallium-208	0.0987	0.0423	0.0232	
Thorium-232 (By Actinium-228)	0.287	0.109	0.0846	
Thorium-234	0.0428 U	0.213	1.16	
Uranium-235	0.0423 U	0.0296	0.129	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-23	Received:	12/09/13
Lab ID:	251449-023	Prepared:	12/30/13 17:50
Matrix:	Soil	Analyzed:	01/24/14 20:28
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	301.52 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:32		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0290 U	0.116	0.0930	
Bismuth-212	0.266 U	0.467	0.314	
Bismuth-214	0.387	0.0830	0.0342	
Cesium-137	-0.00439 U	0.0220	0.0175	0.07
Cobalt-60	0.00403 U	0.0191	0.0258	
Europium-152	0.0139 U	0.0389	0.0611	
Europium-154	0.00184 U	0.0351	0.168	
Lead-212	0.338	0.0739	0.0392	
Lead-214	0.413	0.0881	0.0415	
Potassium-40	14.5	1.25	0.280	
Protactinium-234	-0.0963 U	0.132	0.104	
Radium-226 (By Bismuth-214)	0.387	0.0830	0.0342	0.2
Thallium-208	0.0993	0.0372	0.0199	
Thorium-232 (By Actinium-228)	0.424	0.116	0.0743	
Thorium-234	0.789 U	1.33	1.05	
Uranium-235	0.0632 U	0.0339	0.161	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-24	Received:	12/09/13
Lab ID:	251449-024	Prepared:	12/30/13 17:55
Matrix:	Soil	Analyzed:	01/24/14 21:18
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	354.56 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:35		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0723 U	0.169	0.135	
Bismuth-212	0.403	0.353	0.255	
Bismuth-214	0.445	0.0937	0.0457	
Cesium-137	-0.00417 U	0.0259	0.0210	0.07
Cobalt-60	0.00788 U	0.0230	0.0177	
Europium-152	0.0557	0.0762	0.0502	
Europium-154	0 U	0.176	0.209	
Lead-212	0.417	0.0768	0.0412	
Lead-214	0.574	0.0868	0.0440	
Potassium-40	17.2	1.24	0.203	
Protactinium-234	0.0325 U	0.0738	0.0911	
Radium-226 (By Bismuth-214)	0.445	0.0937	0.0457	0.2
Thallium-208	0.172	0.0428	0.0210	
Thorium-232 (By Actinium-228)	0.590	0.120	0.0726	
Thorium-234	0.533 U	0.710	1.23	
Uranium-235	0.0772 U	0.0324	0.134	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Type:	BLANK	Prepared:	12/30/13 14:40
Lab ID:	QC723787	Analyzed:	01/24/14 11:49
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	323.66 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00118 U	0.0988	0.0813	
Bismuth-212	0.000310 U	0.241	0.198	
Bismuth-214	-0.0112 U	0.0640	0.0381	
Cesium-137	0.00476 U	0.0133	0.00993	0.07
Cobalt-60	0.00155 U	0.0166	0.0133	
Europium-152	0.0202 U	0.0363	0.0261	
Europium-154	0.0192 U	0.108	0.0843	
Lead-212	-0.00751 U	0.195	0.0221	
Lead-214	-0.0252 U	0.473	0.0390	
Potassium-40	-0.0685 U	0.389	0.256	
Protactinium-234	0.00662 U	0.0512	0.0380	
Radium-226 (By Bismuth-214)	-0.0112 U	0.0640	0.0381	0.2
Thallium-208	-0.00422 U	0.0333	0.0163	
Thorium-232 (By Actinium-228)	0.0202 U	0.0655	0.0504	
Thorium-234	0 U	0.629	0.680	
Uranium-235	0.0620 U	0.101	0.0775	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Analyte:	Radium-226 (By Bismuth-214)	Prepared:	12/30/13 14:35
Type:	LCS	Analyzed:	01/24/14 14:28
Lab ID:	QC723788	Duration (sec):	2,700
Matrix:	Soil	Sample Amount:	330.03 g
Units:	pCi/g	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207004		

Spiked	Result	Uncert	%REC	Limits
13.00	11.91	0.4090	92	75-125

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-07	Sampled:	11/29/13 13:57
Type:	IDUP	Received:	12/09/13
MSS Lab ID:	251449-007	Prepared:	12/30/13 17:01
Lab ID:	QC723789	Analyzed:	01/24/14 19:35
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	339.57 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207004		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	0.08599 U	0.1445	0.004416 U	0.1359	0.1117		NC	40	NC	1
Bismuth-212	0.3612	0.3970	0.06201 U	0.3130	0.2748		NC	40	NC	1
Bismuth-214	0.3854	0.08694	0.3253	0.08241	0.04163		17	40	0.355	1
Cesium-137	0.03459	0.02569	0.01683 U	0.02593	0.01952	0.07	NC	40	NC	1
Cobalt-60	0.006142 U	0.03122	0.0009373 U	0.02375	0.01942		NC	40	NC	1
Europium-152	-0.0005315 U	0.001189	0.01826 U	0.05569	0.05214		NC	40	NC	1
Europium-154	0.04646 U	0.08996	-0.004395 U	0.01247	0.1595		NC	40	NC	1
Lead-212	0.3606	0.07116	0.3876	0.07464	0.03532		7	40	0.185	1
Lead-214	0.3824	0.09048	0.4559	0.09700	0.04196		18	40	0.392	1
Potassium-40	17.34	1.566	17.30	1.568	0.3165		0	40	0.011	1
Protactinium-234	0.01568 U	0.02349	0.004751 U	0.08445	0.06927		NC	40	NC	1
Radium-226 (By Bismuth-214)	0.3854	0.08694	0.3253	0.08241	0.04163	0.2	17	20	0.355	1
Thallium-208	0.1367	0.04260	0.1545	0.04035	0.01760		12	40	0.215	1
Thorium-232 (By Actinium-228)	0.4692	0.1227	0.3432	0.1132	0.08242		31	40	0.534	1
Thorium-234	0.5834 U	0.5567	0.8338 U	0.5018	0.8599		NC	40	NC	1
Uranium-235	0.06481 U	0.04458	0.01795 U	0.02481	0.1404		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Type:	BLANK	Prepared:	12/30/13 14:40
Lab ID:	QC723801	Analyzed:	01/24/14 15:21
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	323.66 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0217 U	0.0855	0.0679	
Bismuth-212	0.100 U	0.180	0.144	
Bismuth-214	-0.0144 U	0.0774	0.0393	
Cesium-137	0 U	0.00333	0.0138	0.07
Cobalt-60	0.000975 U	0.0167	0.0136	
Europium-152	0.00723 U	0.0313	0.0453	
Europium-154	0.00321 U	0.0408	0.114	
Lead-212	-0.00760 U	0.110	0.0242	
Lead-214	0.00745 U	0.0376	0.0334	
Potassium-40	-0.0864 U	0.444	0.260	
Protactinium-234	0.00297 U	0.0130	0.0533	
Radium-226 (By Bismuth-214)	-0.0144 U	0.0774	0.0393	0.2
Thallium-208	-0.00747 U	0.149	0.0157	
Thorium-232 (By Actinium-228)	0.0237 U	0.0305	0.0463	
Thorium-234	0.242 U	0.653	0.509	
Uranium-235	0.0626	0.0799	0.0609	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Analyte:	Radium-226 (By Bismuth-214)	Prepared:	12/30/13 14:35
Type:	LCS	Analyzed:	01/24/14 10:56
Lab ID:	QC723802	Duration (sec):	2,700
Matrix:	Soil	Sample Amount:	330.03 g
Units:	pCi/g	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207008		

Spiked	Result	Uncert	%REC	Limits
13.00	11.28	0.3906	87	75-125

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0039-21	Sampled:	12/07/13 09:30
Type:	IDUP	Received:	12/09/13
MSS Lab ID:	251445-021	Prepared:	12/30/13 16:30
Lab ID:	QC723803	Analyzed:	01/24/14 17:54
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	372.95 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207008		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.03894 U	0.1931	-0.02823 U	0.1927	0.1574		NC	40	NC	1
Bismuth-212	0.3559	0.4154	0.3295	0.4371	0.2576		8	40	0.031	1
Bismuth-214	0.4186	0.08173	0.3309	0.08251	0.03892		23	40	0.534	1
Cesium-137	0.01149 U	0.02438	-0.002224 U	0.02514	0.02050	0.07	NC	40	NC	1
Cobalt-60	-0.001389 U	0.02383	0.005488 U	0.01642	0.01894		NC	40	NC	1
Europium-152	0.04649 U	0.06302	-0.001255 U	0.002634	0.05823		NC	40	NC	1
Europium-154	-0.06683 U	0.2055	-0.05958 U	0.2050	0.1627		NC	40	NC	1
Lead-212	0.3655	0.07947	0.3206	0.07461	0.03934		13	40	0.291	1
Lead-214	0.4609	0.07936	0.3879	0.08356	0.04190		17	40	0.448	1
Potassium-40	14.61	1.338	14.87	1.353	0.1724		2	40	0.094	1
Protactinium-234	0.03312 U	0.07586	-0.002414 U	0.1097	0.09027		NC	40	NC	1
Radium-226 (By Bismuth-214)	0.4186	0.08173	0.3309	0.08251	0.03892	0.2	23	20	0.534	1
Thallium-208	0.1028	0.03195	0.1372	0.03802	0.01791		29	40	0.491	1
Thorium-232 (By Actinium-228)	0.4068	0.1137	0.4452	0.1171	0.05183		9	40	0.166	1
Thorium-234	1.277	1.559	0.1156 U	0.1016	1.342		NC	40	NC	1
Uranium-235	0.03961 U	0.03483	0.07305 U	0.04235	0.1426		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Calibration Data from file: 1_Soil 250ml TunaCan_06-19-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:26:40
Efficiency Calibration Date: 6/19/2013 Time: 18:43:28

Calibration Description:
HPGE01 S22147 1_20130619002_EffCal RA226

Energy Calibration Fit
Energy = -0.0004 +0.250115*Channel -2.16189e-008*Channel**2
FWHM (ch) = 3.0904 +0.001116*Channel -4.89856e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
487.04	121.78	121.81	-0.02%	0.90	0.91	-0.89%
978.23	244.70	244.65	0.02%	1.05	1.03	1.90%
1376.68	344.28	344.29	-0.00%	1.12	1.13	-0.93%
3115.17	778.90	778.94	-0.00%	1.51	1.52	-0.72%
3855.73	964.08	964.05	0.00%	1.68	1.67	0.66%
5632.22	1408.01	1408.01	-0.00%	1.95	1.95	-0.09%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3817 %
Coefficients:
-0.396420 -4.062121 0.406738 -0.047391 0.002018 -0.000039

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	4.3971E-003	4.3896E-003	0.17%
59.54	1.5942E-002	1.6035E-002	-0.59%
88.03	3.8766E-002	3.7758E-002	2.60%
122.06	4.8209E-002	4.8639E-002	-0.89%
165.86	4.8734E-002	4.9439E-002	-1.45%
279.20	3.8981E-002	3.9259E-002	-0.71%
391.70	3.1390E-002	3.1557E-002	-0.53%
514.00	2.7261E-002	2.6262E-002	3.67%
661.66	2.2917E-002	2.2122E-002	3.47%
898.04	1.7275E-002	1.7931E-002	-3.80%
1173.23	1.4414E-002	1.4791E-002	-2.61%
1332.49	1.3034E-002	1.3421E-002	-2.97%
1836.05	1.0588E-002	1.0233E-002	3.35%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14132.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1111.90	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	14837.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.51	2.72E+002	340.90	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1016.20	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	874.56	568.20	3.90%	1/1/2013 09:00:00
Sr-85	514.00	98.50	6.48E+001	1061.90	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	443.82	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1480.30	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	702.25	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	701.42	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1481.10	1471.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 2_Soil 250ml TunaCan_01-06-2014.Clb
Energy Calibration Date: 1/24/2014 Time: 06:52:16
Efficiency Calibration Date: 1/7/2014 Time: 11:47:58

Calibration Description:
HPGE02 S23325 2_20140106002_EffCal RA226

Energy Calibration Fit
Energy = 0.0262 +0.250315*Channel -5.2385e-008*Channel**2
FWHM (ch) = 3.0438 +0.001102*Channel -5.60292e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
486.85	121.78	121.88	-0.08%	0.88	0.89	-1.82%
977.50	244.70	244.66	0.02%	1.05	1.02	2.83%
1375.17	344.28	344.15	0.04%	1.10	1.11	-1.39%
3113.96	778.90	778.99	-0.01%	1.51	1.48	1.48%
3854.46	964.08	964.08	0.00%	1.59	1.61	-1.65%
5631.42	1408.01	1408.00	0.00%	1.87	1.87	0.30%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.7336 %
Coefficients:
-0.360765 -4.056690 0.335194 -0.029735 0.000757 -0.000011

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	4.4606E-003	4.4507E-003	0.22%
59.54	1.6152E-002	1.6287E-002	-0.83%
88.03	4.3356E-002	4.1188E-002	5.00%
122.06	4.8149E-002	5.0630E-002	-5.15%
165.86	4.8765E-002	4.8560E-002	0.42%
279.20	3.8025E-002	3.6688E-002	3.52%
391.70	2.8614E-002	2.9483E-002	-3.04%
661.66	2.1785E-002	2.1191E-002	2.72%
898.04	1.7355E-002	1.7540E-002	-1.06%
1173.23	1.4601E-002	1.4767E-002	-1.13%
1332.49	1.3385E-002	1.3538E-002	-1.14%
1836.05	1.0755E-002	1.0618E-002	1.28%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14214.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1137.20	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	15378.00	557.60	4.70%	7/1/2013 09:00:00
Co-122	122.06	85.51	2.72E+002	352.36	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1095.70	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	908.42	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	447.94	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1519.70	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	705.86	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	705.12	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1520.30	1510.00	4.00%	7/1/2013 09:00:00

Calibration Data from file: 3_Soil 250ml TunaCan_04-28-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:28:35
Efficiency Calibration Date: 4/29/2013 Time: 08:26:15

Calibration Description:
HPGE03 S22147 3_20130428002_EffCal RA226

Energy Calibration Fit
Energy = -0.1412 +0.250224*Channel -3.78401e-008*Channel**2
FWHM (ch) = 3.2488 +0.000854*Channel -2.80059e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
487.18	121.78	121.75	0.02%	0.90	0.92	-1.61%
978.61	244.70	244.69	0.00%	1.04	1.02	1.43%
1376.94	344.28	344.33	-0.02%	1.12	1.11	1.04%
3114.78	778.90	778.88	0.00%	1.43	1.47	-2.54%
3855.64	964.08	964.07	0.00%	1.65	1.62	1.65%
5632.40	1408.01	1408.02	-0.00%	1.99	1.99	-0.13%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.2731 %
Coefficients:
-0.381561 -4.120787 0.430562 -0.052380 0.002340 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.0672E-003	3.0621E-003	0.16%
59.54	1.3375E-002	1.3450E-002	-0.56%
88.03	3.5336E-002	3.4452E-002	2.50%
122.06	4.5653E-002	4.6015E-002	-0.79%
165.86	4.7017E-002	4.7791E-002	-1.65%
279.20	3.8377E-002	3.8493E-002	-0.30%
391.70	3.1054E-002	3.0947E-002	0.34%
514.00	2.6250E-002	2.5708E-002	2.07%
661.66	2.2460E-002	2.1616E-002	3.76%
898.04	1.6884E-002	1.7496E-002	-3.63%
1173.23	1.4141E-002	1.4435E-002	-2.08%
1332.49	1.2786E-002	1.3107E-002	-2.51%
1836.05	1.0328E-002	1.0032E-002	2.87%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14132.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1111.90	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	14837.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.51	2.72E+002	340.90	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1016.20	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	874.56	568.20	3.90%	1/1/2013 09:00:00
Sr-85	514.00	98.50	6.48E+001	1061.90	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	443.82	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1480.30	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	702.25	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	701.42	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1481.10	1471.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 4_Soil 250ml TunaCan_03-04-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:44:12
Efficiency Calibration Date: 3/5/2013 Time: 18:53:13

Calibration Description:
HPGE04 S21603 4_20130304002_EffCal RA226

Energy Calibration Fit
Energy = -0.0594 +0.250210*Channel -3.14569e-008*Channel**2
FWHM (ch) = 3.0035 +0.000983*Channel -1.88958e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
486.92	121.78	121.77	0.01%	0.86	0.87	-1.30%
978.55	244.70	244.75	-0.02%	0.98	0.99	-0.42%
1376.25	344.28	344.23	0.01%	1.11	1.08	2.36%
3114.58	778.90	778.93	-0.00%	1.46	1.47	-0.99%
3855.10	964.08	964.06	0.00%	1.63	1.63	0.06%
5631.57	1408.01	1408.02	-0.00%	1.99	1.98	0.13%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3486 %
Coefficients:
-0.377104 -4.127613 0.443802 -0.053447 0.002385 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.2391E-003	3.2326E-003	0.20%
59.54	1.4205E-002	1.4302E-002	-0.68%
88.03	3.7629E-002	3.6515E-002	2.96%
122.06	4.8153E-002	4.8445E-002	-0.61%
165.86	4.8618E-002	4.9924E-002	-2.69%
279.20	3.9819E-002	3.9668E-002	0.38%
391.70	3.1925E-002	3.1651E-002	0.86%
514.00	2.6599E-002	2.6162E-002	1.64%
661.66	2.2836E-002	2.1917E-002	4.02%
898.04	1.7055E-002	1.7683E-002	-3.69%
1173.23	1.4151E-002	1.4565E-002	-2.92%
1332.49	1.2935E-002	1.3218E-002	-2.19%
1836.05	1.0438E-002	1.0115E-002	3.09%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	15094.00	641.50	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1187.50	426.30	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15909.00	574.30	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	363.55	311.20	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	544.93	435.40	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1084.50	883.90	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	947.66	606.50	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1166.10	1116.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	473.09	402.60	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1583.80	1484.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	748.72	748.50	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	748.77	748.70	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1583.70	1571.00	4.00%	1/1/2013 09:00:00

Calibration Data from file: 5_Soil 250ml TunaCan_06-28-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:29:37
Efficiency Calibration Date: 6/29/2013 Time: 15:59:06

Calibration Description:
HPGE05 S22147 5_20130628003_EffCal RA226

Energy Calibration Fit
Energy = -0.0643 +0.250185*Channel -3.68782e-008*Channel**2
FWHM (ch) = 3.6856 +0.000831*Channel +5.71594e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
487.18	121.78	121.81	-0.02%	1.00	1.02	-1.96%
978.52	244.70	244.71	-0.01%	1.14	1.13	1.52%
1376.32	344.28	344.20	0.02%	1.22	1.21	1.18%
3115.27	778.90	778.97	-0.01%	1.56	1.58	-1.59%
3855.79	964.08	964.05	0.00%	1.75	1.74	0.66%
5632.81	1408.01	1408.01	0.00%	2.14	2.14	0.04%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.2951 %
Coefficients:
-0.372021 -4.149771 0.439762 -0.053337 0.002389 -0.000048

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.8733E-003	2.8678E-003	0.19%
59.54	1.3157E-002	1.3245E-002	-0.66%
88.03	3.5636E-002	3.4563E-002	3.01%
122.06	4.5688E-002	4.6223E-002	-1.17%
165.86	4.7117E-002	4.7904E-002	-1.67%
279.20	3.8169E-002	3.8355E-002	-0.49%
391.70	3.0827E-002	3.0724E-002	0.33%
514.00	2.6259E-002	2.5466E-002	3.02%
661.66	2.2082E-002	2.1384E-002	3.16%
898.04	1.6691E-002	1.7300E-002	-3.64%
1173.23	1.3826E-002	1.4283E-002	-3.31%
1332.49	1.2748E-002	1.2978E-002	-1.81%
1836.05	1.0278E-002	9.9643E-003	3.05%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14132.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1111.90	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	14837.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.51	2.72E+002	340.90	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1016.20	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	874.56	568.20	3.90%	1/1/2013 09:00:00
Sr-85	514.00	98.50	6.48E+001	1061.90	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	443.82	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1480.30	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	702.25	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	701.42	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1481.10	1471.00	4.00%	1/1/2013 09:00:00

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE01
Seqnum : 1504034935001
Cal : 24-JAN-2014 06:26:40,19-JUN-2013 14:52:15

Run Name : QUALITY CONTROL CHEC
File : 1_20140124_001
Caldate : 24-JAN-2014, 19-JUN-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:15
Dead Time : 4.6 %

Standards: S19582

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9962	uCi	.0074859	487.04	486.00 - 488.00	121.81	121.58 - 121.98	0.90	0.81 - 0.99	-0.38	5	
QA-779	1.000	0.9983	uCi	.020726					1.51	1.35 - 1.65	-0.17	5	
QA-1408	1.000	0.9915	uCi	.017756	5632.12	5629.00 - 5635.00	1407.99	1407.58 - 1408.58	1.96	1.80 - 2.20	-0.85	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514010795001
Cal : 07-JAN-2014 12:17:05,06-JAN-2014 18:36:56

Run Name : QUALITY CONTROL CHEC
File : 2_20140107_001
Caldate : 07-JAN-2014, 06-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 07-JAN-2014 11:55
Dead Time : 4.26 %

Standards: S19582

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.003	uCi	.0052944	487.00	486.00 - 488.00	121.88	121.58 - 121.98	0.88	0.79 - 0.97	0.33	5	
QA-779	1.000	1.002	uCi	.01499					1.47	1.37 - 1.67	0.17	5	
QA-1408	1.000	0.9855	uCi	.012375	5631.76	5629.00 - 5635.00	1407.96	1407.58 - 1408.58	1.91	1.74 - 2.12	-1.45	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514034951001
Cal : 24-JAN-2014 06:52:16,06-JAN-2014 18:36:56

Run Name : QUALITY CONTROL CHEC
File : 2_20140124_001
Caldate : 24-JAN-2014, 06-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 24-JAN-2014 06:31
Dead Time : 4.2 %

Standards: S19582

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9913	uCi	.0052619	486.85	486.00 - 488.00	121.88	121.58 - 121.98	0.88	0.79 - 0.97	-0.87	5	
QA-779	1.000	0.9917	uCi	.014632					1.51	1.37 - 1.67	-0.83	5	
QA-1408	1.000	0.9969	uCi	.012628	5631.25	5629.00 - 5635.00	1407.95	1407.58 - 1408.58	1.88	1.74 - 2.12	-0.31	5	

FWHM=Full Width Half Max

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 3_20130429001_QCAsLeft
Acquired: 4/29/2013 08:49:37
Detector: HPGE03 51-TP42227A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1408 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	487.00	485.00	485.67	486.90	488.33	489.00	PASS
Energy	121.78	121.28	121.45	121.75	122.11	122.28	PASS
FWHM	0.87	0.77	0.80	0.89	0.94	0.97	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.11	5.00	7.00	PASS
QA-779							
FWHM	1.43	1.26	1.32	1.49	1.54	1.60	PASS
ActivityDiff	1.00	-7.00	-5.00	1.32	5.00	7.00	PASS
QA-1408							
Channel	5632.00	5630.00	5630.67	5631.50	5633.33	5634.00	PASS
Energy	1408.08	1407.58	1407.75	1407.99	1408.41	1408.58	PASS
FWHM	1.96	1.73	1.80	1.87	2.12	2.19	PASS
ActivityDiff	1.00	-7.00	-5.00	0.65	5.00	7.00	PASS

Analyst: Chris Fluty Reviewer:

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE03
Seqnum : 1524034937001
Cal : 24-JAN-2014 06:28:35,28-APR-2013 14:09:55

Run Name : QUALITY CONTROL CHEC
File : 3_20140124_001
Caldate : 24-JAN-2014, 28-APR-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:17
Dead Time : 4.43 %

Standards: S19583

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.019	uCi	.0077928	487.18	486.00 - 488.00	121.75	121.58 - 121.98	0.90	0.77 - 0.95	1.92	5	
QA-779	1.000	1.043	uCi	.021927					1.44	1.32 - 1.62	4.26	5	
QA-1408	1.000	1.000	uCi	.01815	5632.27	5629.00 - 5635.00	1407.99	1407.58 - 1408.58	1.99	1.72 - 2.10	0.02	5	

FWHM=Full Width Half Max

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952001
Cal : 24-JAN-2014 06:44:12,04-MAR-2013 19:32:03

Run Name : QUALITY CONTROL CHEC
File : 4_20140124_001
Caldate : 24-JAN-2014, 04-MAR-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:32
Dead Time : 11.8 %

Standards: S19583

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.026	uCi	.0078612	486.92	486.00 - 488.00	121.76	121.58 - 121.98	0.86	0.77 - 0.94	2.60	5	
QA-779	1.000	1.027	uCi	.022473					1.46	1.35 - 1.65	2.70	5	
QA-1408	1.000	1.021	uCi	.018656	5631.53	5629.00 - 5635.00	1408.00	1407.58 - 1408.58	1.99	1.80 - 2.20	2.05	5	

FWHM=Full Width Half Max

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 5_20130630001_QCAsLeft
Acquired: 6/30/2013 10:46:09
Detector: HPGE05 51-TP42242A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1836 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	487.00	485.00	485.67	487.10	488.33	489.00	PASS
Energy	121.78	121.28	121.45	121.81	122.11	122.28	PASS
FWHM	0.95	0.84	0.88	0.94	1.03	1.07	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.60	5.00	7.00	PASS
QA-779							
FWHM	1.53	1.34	1.40	1.54	1.65	1.71	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.90	5.00	7.00	PASS
QA-1408							
Channel	5632.00	5630.00	5630.67	5632.00	5633.33	5634.00	PASS
Energy	1408.01	1407.51	1407.68	1408.01	1408.34	1408.51	PASS
FWHM	2.07	1.82	1.91	2.09	2.24	2.32	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.04	5.00	7.00	PASS

Analyst: Philip Smith Reviewer:

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE05
Seqnum : 1544034938001
Cal : 24-JAN-2014 06:29:37,28-JUN-2013 18:54:44

Run Name : QUALITY CONTROL CHEC
File : 5_20140124_001
Caldate : 24-JAN-2014, 28-JUN-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:18
Dead Time : 4.36 %

Standards: S19584

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9865	uCi	.0078334	487.17	486.00 - 488.00	121.81	121.58 - 121.98	1.00	0.86 - 1.05	-1.35	5	
QA-779	1.000	0.9908	uCi	.021416					1.56	1.38 - 1.68	-0.92	5	
QA-1408	1.000	0.9814	uCi	.018137	5632.82	5629.00 - 5635.00	1408.01	1407.58 - 1408.58	2.14	1.86 - 2.28	-1.86	5	

FWHM=Full Width Half Max

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 1_20140124002_BG
Acquired: 1/24/2014 06:30:37
Detector: HPGE01 50-TP42236A
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.07	1.87	1.94	2.16	2.21	2.28	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 2_20140124002_BG
Acquired: 1/24/2014 06:57:19
Detector: HPGE02 50-TP42234A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.02	1.83	1.89	2.11	2.16	2.22	PASS

Analyst: Robin Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 3_20140124002_BG
Acquired: 1/24/2014 06:32:07
Detector: HPGE03 51-TP42227A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.01	1.81	1.88	1.93	2.14	2.20	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 4_20140124002_BG
Acquired: 1/24/2014 06:47:28
Detector: HPGE04 51-TP32733A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.97	1.78	1.84	1.97	2.10	2.17	PASS

Analyst: Chris Fluty Reviewer:

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 5_20140124002_BG
Acquired: 1/24/2014 06:33:35
Detector: HPGE05 51-TP42242A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.85	1.64	1.71	1.92	1.99	2.06	PASS

Analyst: Chris Fluty Reviewer:

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1503245723

Instrument : HPGE01 Begun : 06/19/13 14:27
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	1_20130619_001	RICAL	POINT SOURCE			06/19/13 14:27	1.0	1	
002	1_20130619_002	RICAL	TUNACAN			06/19/13 15:23	1.0	2	
003	1_20130619_003	RICV	EFF VERIFICATION			06/19/13 19:14	1.0	3	

Standards used: 1=S19582 2=S22147 3=S20633

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1504034935

Instrument : HPGE01 Begun : 01/24/14 06:15
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	1_20140124_001	RCCV	QUALITY CONTROL CHEC			01/24/14 06:15	1.0	1
002	1_20140124_002	RIB	BACKGROUND CONTAMINA			01/24/14 06:30	1.0	
003	1_20140124_003	MSS	251444-008	Soil	207000	01/24/14 06:48	1.0	
004	1_20140124_004	SAMPLE	251444-021	Soil	207001	01/24/14 07:35	1.0	
005	1_20140124_005	IDUP	QC723777	Soil	207000	01/24/14 08:38	1.0	
006	1_20140124_006	SAMPLE	251446-004	Soil	207002	01/24/14 09:56	1.0	
007	1_20140124_007	SAMPLE	251445-003	Soil	207003	01/24/14 10:50	1.0	
008	1_20140124_008	SAMPLE	251445-005	Soil	207003	01/24/14 11:45	1.0	
009	1_20140124_009	SAMPLE	251445-008	Soil	207003	01/24/14 12:45	1.0	
010	1_20140124_010	LCS	QC723785	Soil	207003	01/24/14 13:39	1.0	2
011	1_20140124_011	BLANK	QC723798	Soil	207007	01/24/14 14:26	1.0	
012	1_20140124_012	SAMPLE	251445-018	Soil	207003	01/24/14 15:18	1.0	
013	1_20140124_013	SAMPLE	251445-024	Soil	207008	01/24/14 16:04	1.0	
014	1_20140124_014	SAMPLE	251449-005	Soil	207004	01/24/14 17:01	1.0	
015	1_20140124_015	SAMPLE	251449-008	Soil	207004	01/24/14 17:52	1.0	
016	1_20140124_016	SAMPLE	251449-014	Soil	207004	01/24/14 18:44	1.0	
017	1_20140124_017	SAMPLE	251449-016	Soil	207004	01/24/14 19:35	1.0	
018	1_20140124_018	SAMPLE	251449-023	Soil	207008	01/24/14 20:28	1.0	
019	1_20140124_019	SAMPLE	251491-002	Soil	207006	01/24/14 21:19	1.0	

Standards used: 1=S19582 2=S19706

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1514009717

Instrument : HPGE02 Begun : 01/06/14 17:57
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	2_20140106_001	RICAL	POINT SOURCE			01/06/14 17:57	1.0	1	
002	2_20140106_002	RICAL	TUNACAN			01/06/14 18:46	1.0	2	

Standards used: 1=S19582 2=S23325

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1514010795

Instrument : HPGE02 Begun : 01/07/14 11:55
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	2_20140107_001	RCCV	QUALITY CONTROL CHEC			01/07/14 11:55	1.0	1	
002	2_20140107_002	RICV	EFF VERIFICATION			01/07/14 12:56	1.0	2	
003	2_20140107_003	X	RBSC			01/07/14 17:17	1.0		

Standards used: 1=S19582 2=S22147

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1514034951

Instrument : HPGE02 Begun : 01/24/14 06:31
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	2_20140124_001	RCCV	QUALITY CONTROL CHEC			01/24/14 06:31	1.0	1
002	2_20140124_002	RIB	BACKGROUND CONTAMINA			01/24/14 06:57	1.0	
003	2_20140124_003	SAMPLE	251444-020	Soil	207000	01/24/14 07:09	1.0	
004	2_20140124_004	MSS	251444-025	Soil	207001	01/24/14 07:56	1.0	
005	2_20140124_005	SAMPLE	251444-026	Soil	207001	01/24/14 08:49	1.0	
006	2_20140124_006	BLANK	QC722413	Soil	206637	01/24/14 09:59	1.0	
007	2_20140124_007	SAMPLE	251445-004	Soil	207003	01/24/14 10:51	1.0	
008	2_20140124_008	MSS	251445-006	Soil	207003	01/24/14 11:46	1.0	
009	2_20140124_009	SAMPLE	251445-009	Soil	207003	01/24/14 12:46	1.0	
010	2_20140124_010	IDUP	QC723786	Soil	207003	01/24/14 13:40	1.0	
011	2_20140124_011	LCS	QC723788	Soil	207004	01/24/14 14:28	1.0	2
012	2_20140124_012	IDUP	QC723780	Soil	207001	01/24/14 15:17	1.0	
013	2_20140124_013	SAMPLE	251445-022	Soil	207008	01/24/14 16:05	1.0	
014	2_20140124_014	SAMPLE	251449-004	Soil	207004	01/24/14 17:02	1.0	
015	2_20140124_015	MSS	251449-007	Soil	207004	01/24/14 17:52	1.0	
016	2_20140124_016	SAMPLE	251449-010	Soil	207004	01/24/14 18:44	1.0	
017	2_20140124_017	IDUP	QC723789	Soil	207004	01/24/14 19:35	1.0	
018	2_20140124_018	SAMPLE	251449-020	Soil	207004	01/24/14 20:28	1.0	
019	2_20140124_019	SAMPLE	251491-004	Soil	207006	01/24/14 21:19	1.0	

Standards used: 1=S19582 2=S19706

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1523170739

Instrument : HPGE03 Begun : 04/28/13 13:39
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	3_20130428_001	RICAL	POINT SOURCE			04/28/13 13:39	1.0	1	
002	3_20130428_002	RICAL	TUNACAN			04/28/13 14:17	1.0	2	

Standards used: 1=S19583 2=S22147

Page 1 of 1

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1523171889

Instrument : HPGE03 Begun : 04/29/13 08:49
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	3_20130429_001	RCCV	QUALITY CONTROL CHEC			04/29/13 08:49	1.0	1	
002	3_20130429_002	RICV	EFF VERIFICATION			04/29/13 11:15	1.0	2	
003	3_20130429_003	X	RBSC			04/29/13 15:04	1.0		

Standards used: 1=S19582 2=S20633

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1524034937

Instrument : HPGE03 Begun : 01/24/14 06:17
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	3_20140124_001	RCCV	QUALITY CONTROL CHEC			01/24/14 06:17	1.0	1
002	3_20140124_002	RIB	BACKGROUND CONTAMINA			01/24/14 06:32	1.0	
003	3_20140124_003	SAMPLE	251444-018	Soil	207000	01/24/14 06:56	1.0	
004	3_20140124_004	SAMPLE	251444-022	Soil	207001	01/24/14 07:43	1.0	
005	3_20140124_005	SAMPLE	251446-002	Soil	207002	01/24/14 08:37	1.0	
006	3_20140124_006	LCS	QC722414	Soil	206637	01/24/14 09:56	1.0	2
007	3_20140124_007	BLANK	QC723784	Soil	207003	01/24/14 10:54	1.0	
008	3_20140124_008	SAMPLE	251445-007	Soil	207003	01/24/14 11:47	1.0	
009	3_20140124_009	SAMPLE	251445-010	Soil	207003	01/24/14 12:49	1.0	
010	3_20140124_010	SAMPLE	251445-012	Soil	207003	01/24/14 13:43	1.0	
011	3_20140124_011	SAMPLE	251445-016	Soil	207003	01/24/14 14:31	1.0	
012	3_20140124_012	SAMPLE	251445-019	Soil	207003	01/24/14 15:24	1.0	
013	3_20140124_013	SAMPLE	251445-023	Soil	207008	01/24/14 16:10	1.0	
014	3_20140124_014	SAMPLE	251449-002	Soil	207004	01/24/14 17:04	1.0	
015	3_20140124_015	SAMPLE	251449-006	Soil	207004	01/24/14 17:53	1.0	
016	3_20140124_016	SAMPLE	251449-013	Soil	207004	01/24/14 18:46	1.0	
017	3_20140124_017	SAMPLE	251449-015	Soil	207004	01/24/14 19:36	1.0	
018	3_20140124_018	SAMPLE	251449-019	Soil	207004	01/24/14 20:27	1.0	
019	3_20140124_019	SAMPLE	251491-003	Soil	207006	01/24/14 21:18	1.0	

Standards used: 1=S19583 2=S19706

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1533091878

Instrument : HPGE04 Begun : 03/04/13 19:18
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	4_20130304_001	RICAL	POINT SOURCE			03/04/13 19:18	1.0	1	
002	4_20130304_002	RICAL	TUNACAN			03/04/13 19:42	1.0	2	

Standards used: 1=S19583 2=S21603

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1533092942

Instrument : HPGE04 Begun : 03/05/13 13:02
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186, Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	4_20130305_001	RCCV	QUALITY CONTROL CHEC			03/05/13 13:02	1.0	1	
002	4_20130305_002	RICV	EFFICIENCY VERIFICAT			03/05/13 13:26	1.0	2	
003	4_20130305_003	X	RBSC			03/05/13 19:04	1.0		

Standards used: 1=S19583 2=S20633

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1534034952

Instrument : HPGE04 Begun : 01/24/14 06:32
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	4_20140124_001	RCCV	QUALITY CONTROL CHEC			01/24/14 06:32	1.0	1
002	4_20140124_002	RIB	BACKGROUND CONTAMINA			01/24/14 06:47	1.0	
003	4_20140124_003	SAMPLE	251444-019	Soil	207000	01/24/14 07:00	1.0	
004	4_20140124_004	SAMPLE	251444-024	Soil	207001	01/24/14 07:51	1.0	
005	4_20140124_005	SAMPLE	251446-001	Soil	207002	01/24/14 08:38	1.0	
006	4_20140124_006	SAMPLE	251445-001	Soil	207003	01/24/14 09:57	1.0	
007	4_20140124_007	LCS	QC723802	Soil	207008	01/24/14 10:56	1.0	2
008	4_20140124_008	BLANK	QC723787	Soil	207004	01/24/14 11:49	1.0	
009	4_20140124_009	SAMPLE	251445-011	Soil	207003	01/24/14 12:51	1.0	
010	4_20140124_010	SAMPLE	251445-013	Soil	207003	01/24/14 13:44	1.0	
011	4_20140124_011	SAMPLE	251445-015	Soil	207003	01/24/14 14:32	1.0	
012	4_20140124_012	BLANK	QC723801	Soil	207008	01/24/14 15:21	1.0	
013	4_20140124_013	SAMPLE	251445-020	Soil	207003	01/24/14 16:11	1.0	
014	4_20140124_014	SAMPLE	251449-001	Soil	207004	01/24/14 17:04	1.0	
015	4_20140124_015	SAMPLE	251449-009	Soil	207004	01/24/14 17:53	1.0	
016	4_20140124_016	SAMPLE	251449-012	Soil	207004	01/24/14 18:47	1.0	
017	4_20140124_017	SAMPLE	251449-018	Soil	207004	01/24/14 19:37	1.0	
018	4_20140124_018	SAMPLE	251449-022	Soil	207008	01/24/14 20:26	1.0	
019	4_20140124_019	SAMPLE	251449-024	Soil	207008	01/24/14 21:18	1.0	

Standards used: 1=S19583 2=S19706

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1543258214

Instrument : HPGE05 Begun : 06/28/13 07:34
Method : DOE HASL 300 4.5.2.3 SOP Version : Gamma GS186, Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	5_20130628_001	RCCV	QUALITY CONTROL CHEC			06/28/13 07:34	1.0	1	
002	5_20130628_002	RICAL	POINT SOURCE			06/28/13 18:19	1.0	1	
003	5_20130628_003	RICAL	TUNACAN			06/28/13 20:22	1.0	2	

Standards used: 1=S19584 2=S22147

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1543261286

Instrument : HPGE05 Begun : 06/30/13 10:46
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used	
001	5_20130630_001	RCCV	QUALITY CONTROL CHEC			06/30/13 10:46	1.0	1	
002	5_20130630_002	RICV	EFF VERIFICATION			06/30/13 11:01	1.0	2	
003	5_20130630_003	X	RBSC			06/30/13 14:06	1.0		

Standards used: 1=S19584 2=S20633

CURTIS & TOMPKINS SEQUENCE SUMMARY FOR 1544034938

Instrument : HPGE05 Begun : 01/24/14 06:18
Method : DOE HASL 300 4.5.2.3 SOP Version : Ra226

#	File	Type	Sample ID	Matrix	Batch	Analyzed	IDF	Stds Used
001	5_20140124_001	RCCV	QUALITY CONTROL CHEC			01/24/14 06:18	1.0	1
002	5_20140124_002	RIB	BACKGROUND CONTAMINA			01/24/14 06:33	1.0	
003	5_20140124_003	SAMPLE	251444-017	Soil	207000	01/24/14 06:53	1.0	
004	5_20140124_004	SAMPLE	251444-023	Soil	207001	01/24/14 07:45	1.0	
005	5_20140124_005	MSS	251446-003	Soil	207002	01/24/14 08:39	1.0	
006	5_20140124_006	SAMPLE	251445-002	Soil	207003	01/24/14 09:58	1.0	
007	5_20140124_007	IDUP	QC723783	Soil	207002	01/24/14 10:49	1.0	
008	5_20140124_008	LCS	QC723799	Soil	207007	01/24/14 11:51	1.0	2
009	5_20140124_009	BLANK	QC723794	Soil	207006	01/24/14 12:54	1.0	
010	5_20140124_010	SAMPLE	251445-014	Soil	207003	01/24/14 13:45	1.0	
011	5_20140124_011	SAMPLE	251445-017	Soil	207003	01/24/14 14:33	1.0	
012	5_20140124_012	LCS	QC723795	Soil	207006	01/24/14 15:22	1.0	2
013	5_20140124_013	MSS	251445-021	Soil	207008	01/24/14 16:11	1.0	
014	5_20140124_014	SAMPLE	251449-003	Soil	207004	01/24/14 17:05	1.0	
015	5_20140124_015	IDUP	QC723803	Soil	207008	01/24/14 17:54	1.0	
016	5_20140124_016	SAMPLE	251449-011	Soil	207004	01/24/14 18:47	1.0	
017	5_20140124_017	SAMPLE	251449-017	Soil	207004	01/24/14 19:37	1.0	
018	5_20140124_018	SAMPLE	251449-021	Soil	207008	01/24/14 20:26	1.0	
019	5_20140124_019	SAMPLE	251491-001	Soil	207006	01/24/14 21:17	1.0	

Standards used: 1=S19584 2=S19706

Gamma Sample Preparation Summary
as of 05-FEB-2014 13:54

Batch Number : 207004
Matrix : Soil
Date Started : 29-DEC-2013 13:50

Analysis : RA226
Dose Rate : <5 uR/hr
Started by : CA

Tray Num	Sample	QC Type	Weight (g)	Oven In Date	Oven Out Date	Sealed Date	Comments
25	251449-001		346.12	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:45	
26	251449-002		334.81	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:47	
27	251449-003		363	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:49	
28	251449-004		333.35	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:53	
29	251449-005		323.67	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:56	
30	251449-006		340.92	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:59	
31	251449-007		339.57	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:01	
32	251449-008		330.01	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:05	
33	251449-009		345.27	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:09	
34	251449-010		327.83	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:12	
35	251449-011		356.36	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:14	
36	251449-012		343.45	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:17	
37	251449-013		334.92	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:20	
38	251449-014		306.02	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:22	
39	251449-015		329.98	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:25	
40	251449-016		306.6	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:28	
41	251449-017		352.28	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:31	
42	251449-018		343.7	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:34	
43	251449-019		335.76	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:36	
44	251449-020		335.16	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:38	
QC1	QC723787	BLANK	323.66	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:40	
QC2	QC723788	LCS	330.03	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:35	
31	QC723789	IDUP of 251449-007	339.57	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:01	

Gamma Sample Preparation Summary
as of 05-FEB-2014 13:54

Batch Number : 207008
Matrix : Soil
Date Started : 29-DEC-2013 13:50

Analysis : RA226
Dose Rate : <5 uR/hr
Started by : CA

Tray Num	Sample	QC Type	Weight (g)	Oven In Date	Oven Out Date	Sealed Date	Comments
21	251445-021		372.95	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:30	
22	251445-022		316.5	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:34	
23	251445-023		330.83	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:39	
24	251445-024		314	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:42	
45	251449-021		335.96	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:41	
46	251449-022		339.12	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:47	
47	251449-023		301.52	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:50	
48	251449-024		354.56	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 17:55	
69	251491-021		359.01	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 20:13	
QC1	QC723801	BLANK	323.66	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:40	
QC2	QC723802	LCS	330.03	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 14:35	
	QC723803	IDUP of 251445-021	372.95	29-DEC-2013 13:57	30-DEC-2013 10:15	30-DEC-2013 16:30	

Sample Raw Data

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952014
File : 4_20140124_014
Cal : 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13
IDF : 1.0
PDF : 1.0

Lab ID : 251449-001
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 05-MAR-2013
Sample Amount : 346.12 g

Client ID : 04-PD-D0034-01
Acct : ITSI (JG)
Time : 24-JAN-2014 17:04
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.29 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0545	0.136		.16891	.16895	-0.0012	u
Bismuth-212	0.236	0.264		.35063	.35084	0.00031	u
Bismuth-214	0.263	0.0366		.070925	.071903	-0.011	u
Cesium-137	0.0109	0.0192	0.07	.024769	.024774	0.0048	u
Cobalt-60	-0.00660	0.0277		.034527	.034529	0.0015	u
Europium-152	0.0297	0.0504		.04714	.047161	0.020	u
Europium-154	0.0901	0.143		.18632	.18638	0.019	u
Lead-212	0.267	0.0348		.062844	.065745	-0.0075	u
Lead-214	0.282	0.0377		.066356	.067651	-0.025	u
Potassium-40	18.3	0.206		1.2974	1.5906	-0.068	u
Protactinium-234	0.0309	0.0794		.069758	.070179	0.0066	u
Radium-226 (By Bismuth-214)	0.263	0.0366	0.2	.070925	.071903	-0.011	u
Thallium-208	0.0932	0.0172		.032547	.033089	-0.0042	u
Thorium-232 (By Actinium-228)	0.392	0.0558		.097918	.10193	0.020	u
Thorium-234	0.373	1.19		.29114	.29326	0	u
Uranium-235	0.0552	0.144		.031858	.032034	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-01
Sample Description: 251449-001, 207004

Detector: HPGE04 51-TP32733A
Spectrum ID: 4_20140124_014
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 13:44
Live Time: 2700 sec
Acquisition Time: 1/24/2014 17:04:40
Real Time: 2708 sec
Analysis Time: 1/24/2014 17:49
Dead Time: 0.29 %
Analysis Quantity: 3.461E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.916E-01	9.792E-02	1.019E-01	5.577E-02
Am-241	#AB	5.452E-02	1.689E-01	1.690E-01	1.361E-01
Bi-212	#AB	2.358E-01	3.506E-01	3.508E-01	2.643E-01
Bi-214		2.629E-01	7.093E-02	7.190E-02	3.664E-02
Co-60	#AB	-6.605E-03	3.453E-02	3.453E-02	2.773E-02
Cs-137	#AB	1.094E-02	2.477E-02	2.477E-02	1.924E-02
Eu-152	#AB	2.967E-02	4.714E-02	4.716E-02	5.036E-02
Eu-154	#AB	9.011E-02	1.863E-01	1.864E-01	1.425E-01
K-40		1.834E+01	1.297E+00	1.591E+00	2.058E-01
Pa-234	#AB	3.088E-02	6.976E-02	7.018E-02	7.943E-02
Pb-212		2.669E-01	6.284E-02	6.574E-02	3.484E-02
Pb-214		2.817E-01	6.636E-02	6.765E-02	3.766E-02
Ra-226	#	8.132E-01	5.097E-01	5.118E-01	3.732E-01
Th-234	#AB	3.729E-01	2.911E-01	2.933E-01	1.191E+00
Tl-208		9.321E-02	3.255E-02	3.309E-02	1.721E-02
U-235	#AB	5.518E-02	3.186E-02	3.203E-02	1.441E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.133E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:49:55
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_014.An1

Sample description
     251449-001, 207004


Spectrum Filename: C:\User\SPC\Det4\4_20140124_014.An1

Acquisition information
       Start time:                1/24/2014 17:04:40
       Live time:              2700
       Real time:              2708
       Dead time:                 0.29 %
       Detector ID:                   4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                  4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:44:12
            Zero offset:         -0.059 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:              3/5/2013 18:53:13
            Type:                 Polynomial
            Uncertainty:          1.349 %
            Coefficients:        -0.377104  -4.127613   0.443802
                                 -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.96keV )
       Stop channel:           8144 (  2035.56keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.4612E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.4612E+02) =
                                  7.8086E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:55
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:44:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1296

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.02	10.	154.90	0.81	1.430E-02	59.54	35.920	PBC<MDA	Am241
74.75	57.	27.98	0.82	2.747E-02				
77.11	56.	27.07	0.83	2.926E-02				
93.00	41.	38.19	0.84	3.937E-02	92.59	4.343	6.926E-01	Th234
					93.35	4.100	7.265E-01	Ac228
					93.35	5.760	5.171E-01	U235
					92.59	4.343	6.926E-01	Th234
					93.35	5.760	5.171E-01	U235
93.01	46.	30.26	1.08	3.937E-02	92.59	4.343	7.806E-01	Th234
					93.35	4.100	8.188E-01	Ac228
					93.35	5.760	5.828E-01	U235
93.03	41.	39.04	0.84	3.899E-02	92.59	4.343	6.948E-01	Th234
					93.35	4.100	7.288E-01	Ac228
					93.35	5.760	5.188E-01	U235
121.84	15.	93.50	0.87	4.840E-02	121.78	28.410	PBC<MDA	Eu152
132.45	3.	488.83	0.88	4.962E-02	131.30	18.200	PBC<MDA	Pa234
143.80	11.	152.01	0.89	5.033E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	5.868E-02	U235
186.11	51.	28.87	0.93	4.855E-02	185.72	57.000	5.327E-02	U235
					186.21	3.555	8.549E-01	Ra226
					185.72	57.000	5.327E-02	U235
186.16	48.	31.34	0.93	4.851E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	8.132E-01	Ra226
205.27	6.	214.24	0.95	4.677E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	6.927E-02	U235
238.69	181.	11.38	0.96	4.347E-02	238.63	43.600	2.669E-01	Pb212
241.75	54.	26.18	0.40	4.315E-02	242.00	7.268	5.015E-01	Pb214

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:55
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
277.37	8.	140.62	1.02	3.983E-02	277.37	6.600	PBC<MDA	Tl208
295.25	74.	17.79	1.02	3.829E-02	295.22	18.414	2.729E-01	Pb214
299.73	0.	574.44	1.04	3.789E-02	300.09	3.180	PBC<MDA	Pb212
338.24	51.	26.36	0.42	3.500E-02	338.32	11.400	3.726E-01	Ac228
351.92	132.	11.45	0.60	3.408E-02	351.93	35.600	2.862E-01	Pb214
568.66	6.	112.94	1.29	2.435E-02	569.50	9.300	PBC<MDA	Pa234
583.28	66.	15.98	1.04	2.394E-02	583.19	85.000	9.376E-02	Tl208
609.42	111.	11.63	0.85	2.322E-02	609.31	45.490	2.629E-01	Bi214
661.65	7.	113.21	1.37	2.192E-02	661.66	84.990	PBC<MDA	Cs137
727.34	11.	74.34	1.43	2.051E-02	727.33	6.650	PBC<MDA	Bi212
860.15	3.	327.18	1.54	1.823E-02	860.53	12.400	PBC<MDA	Tl208
872.90	7.	103.38	1.55	1.804E-02	873.18	12.170	PBC<MDA	Eu154
911.63	58.	17.92	0.50	1.750E-02	911.20	26.200	3.633E-01	Ac228
968.81	42.	19.77	0.82	1.675E-02	968.96	15.900	4.517E-01	Ac228
1120.58	41.	17.96	0.88	1.507E-02	1120.29	14.910	5.293E-01	Bi214
1409.46	6.	79.43	1.98	1.266E-02	1408.01	20.850	PBC<MDA	Eu152
1460.82	835.	3.48	2.00	1.229E-02	1460.82	10.550	1.834E+01	K40
1764.96	10.	43.53	2.25	1.048E-02	1764.49	15.310	1.734E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
298.76	74.69	99.	57.	2.075E+03	56.03	0.505	- s
308.18	77.05	95.	57.	1.955E+03	57.00	0.928	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	236.11	59.02	108.	10.	0.004	309.80	0.810s
Th-234	372.08	93.03	106.	41.	0.015	78.08	0.842s
Ac-228	373.35	93.35	69.	46.	0.017	60.52	1.077D
U-235	373.35	93.35	100.	41.	0.015	76.39	0.843D
Eu-152	487.21	121.84	93.	15.	0.006	187.00	0.870s
Pa-234	529.62	132.45	113.	3.	0.001	977.65	0.879s
U-235	575.01	143.80	139.	11.	0.004	304.02	0.891s
U-235	655.89	164.04	107.	-4.	-0.002	661.00	0.910s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:55
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	744.13	186.11	83.	51.	0.019	57.73	0.931s
Ra-226	744.33	186.16	91.	48.	0.018	62.68	0.932s
U-235	820.71	205.27	70.	6.	0.002	428.49	0.950
Pb-212	954.30	238.69	96.	175.	0.065	22.77	0.960
Pb-214	966.55	241.75	79.	54.	0.020	52.35	0.401s
Tl-208	1108.93	277.37	60.	8.	0.003	281.24	1.018
Pb-214	1180.44	295.25	48.	67.	0.025	35.59	1.021
Ac-228	1352.31	338.24	46.	51.	0.019	52.73	0.422s
Pb-214	1407.00	351.92	46.	120.	0.044	22.89	0.597s
Pa-234	2273.62	568.66	17.	6.	0.002	225.87	1.286s
Tl-208	2332.07	583.28	27.	66.	0.024	31.96	1.043
Bi-214	2436.61	609.42	33.	96.	0.036	23.25	0.855s
Cs-137	2645.50	661.65	28.	7.	0.003	226.41	1.368s
Eu-154	2892.54	723.42	37.	-3.	-0.001	592.58	1.422s
Bi-212	2908.23	727.34	29.	11.	0.004	148.67	1.426s
Eu-152	3117.21	779.59	33.	-3.	-0.001	563.25	1.471s
Tl-208	3439.45	860.15	36.	3.	0.001	654.36	1.541s
Eu-154	3490.46	872.90	21.	7.	0.003	206.77	1.551s
Pa-234	3530.06	882.80	20.	-2.	-0.001	556.04	1.560s
Ac-228	3645.38	911.63	14.	58.	0.021	35.84	0.496s
Pa-234	3789.60	947.68	44.	-10.	-0.004	196.24	1.613s
Eu-152	3864.42	966.39	41.	-10.	-0.004	188.59	1.628s
Ac-228	3874.12	968.81	8.	42.	0.015	39.54	0.821s
Eu-152	4444.56	1111.39	36.	-4.	-0.002	410.06	1.750s
Bi-214	4481.34	1120.58	11.	41.	0.015	35.91	0.876s
Eu-154	5098.52	1274.82	31.	-4.	-0.001	412.25	1.880s
Co-60	5332.88	1333.38	28.	-3.	-0.001	522.79	1.926s
Eu-152	5637.34	1409.46	8.	6.	0.002	158.86	1.984s
K-40	5842.92	1460.82	16.	822.	0.305	6.96	1.995
Bi-212	6481.95	1620.46	12.	-2.	-0.001	463.04	2.144s
Bi-214	7060.44	1764.96	15.	10.	0.004	87.05	2.248s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	3.9155E-01					5.12E+12
			911.20	3.633E-01	(	5.577E-02 1.79E+01 2.62E+01	G
			968.96	4.517E-01	(	7.333E-02 1.98E+01 1.59E+01	G
			338.32	3.726E-01	(	1.140E-01 2.64E+01 1.14E+01	G
							Energy duplication
			93.35	8.188E-01	+	3.475E-01 3.03E+01 4.10E+00	XA

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:55
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_014.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I 5.4521E-02					1.58E+05	
		59.54	5.452E-02	&(	1.361E-01	1.55E+02	3.59E+01 G
Bi-212	N 2.3584E-01					5.12E+12	
		727.33	2.358E-01	?(	2.643E-01	7.43E+01	6.65E+00 G
		785.37	7.386E-02	%	1.439E+00	1.19E+03	1.11E+00 G
		1620.74	-3.682E-01	-	1.343E+00	2.32E+02	1.51E+00 G
Bi-214	N 2.6294E-01					5.84E+05	
		609.31	2.629E-01	@(P	3.664E-02	1.16E+01	4.55E+01 G
		1120.29	5.293E-01	+ P	9.886E-02	1.80E+01	1.49E+01 G
		1764.49	1.734E-01	- P	1.620E-01	4.35E+01	1.53E+01 G
Co-60	T -6.6045E-03					1.93E+03	
		1332.49	-6.604E-03	?(	2.773E-02	2.61E+02	1.00E+02 G
		1173.23	1.442E-03	%	2.367E-02	1.00E+03	9.98E+01 G
Cs-137	I 1.0940E-02					1.10E+04	
		661.66	1.094E-02	?(	1.924E-02	1.13E+02	8.50E+01 G
Eu-152	I 2.9674E-02					4.94E+03	
		344.28	4.207E-05	%(	5.036E-02	7.27E+04	2.66E+01 G
		121.78	3.212E-02	(	4.758E-02	9.35E+01	2.84E+01 G
		778.90	-3.384E-02	+	1.536E-01	2.82E+02	1.30E+01 G
		964.08	-1.216E-01	+	1.782E-01	9.43E+01	1.45E+01 G
		1112.08	-6.117E-02	&	2.008E-01	2.05E+02	1.34E+01 G
		1408.01	6.412E-02	&(	7.155E-02	7.94E+01	2.09E+01 G
Eu-154	I 9.0112E-02					3.14E+03	
		873.18	9.011E-02	?(	1.425E-01	1.03E+02	1.22E+01 G
		123.07	-8.075E-04	%	3.502E-02	2.64E+03	4.04E+01 G
		1274.43	-2.433E-02	-	8.015E-02	2.06E+02	3.49E+01 G
		723.30	-2.109E-02	&	1.010E-01	2.96E+02	2.00E+01 G
		1004.72	0.000E+00	-	1.041E-01	1.00E+03	1.79E+01 G
		996.25	-1.344E-04	%	1.970E-01	8.90E+04	1.05E+01 G
K-40	N 1.8342E+01					4.57E+11	
		1460.82	1.834E+01	(P	2.058E-01	3.48E+00	1.06E+01 G
Pa-234	N 3.0884E-02					1.63E+12	
		131.30	9.930E-03	?(	7.943E-02	4.89E+02	1.82E+01 G
		569.50	7.189E-02	&(	1.241E-01	1.13E+02	9.30E+00 G
		946.00	-1.273E-01	+	1.949E-01	9.81E+01	1.35E+01 G
		880.52	3.158E-03	&	1.456E-01	2.81E+03	1.05E+01 G
		883.24	-3.941E-02	+	1.755E-01	2.78E+02	9.70E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:49:55
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   2.6694E-01                                     5.12E+12
                           238.63 2.669E-01  (P 3.484E-02 1.14E+01 4.36E+01 G
                           300.09 4.523E-04 % P 3.540E-01 5.74E+02 3.18E+00 G

Pb-214   N   2.8168E-01                                     5.84E+05
                           351.93 2.862E-01  (P 3.766E-02 1.14E+01 3.56E+01 G
                           295.22 2.729E-01  (P 6.653E-02 1.78E+01 1.84E+01 G
                           242.00 5.015E-01 + P 1.906E-01 2.62E+01 7.27E+00 G

Ra-226   N   8.1322E-01                                     5.84E+05
                           186.21 8.132E-01 @(  3.732E-01 3.13E+01 3.56E+00 G

Th-234   N   3.7286E-01                                     1.63E+12
                            63.30 0.000E+00  (  1.191E+00 1.00E+03 3.75E+00 G
                            92.59 6.948E-01  (  4.093E-01 3.90E+01 4.34E+00 G

Tl-208   N   9.3208E-02                                     5.12E+12
                           583.19 9.376E-02  (P 1.721E-02 1.60E+01 8.50E+01 G
                           277.37 8.606E-02  (P 1.988E-01 1.41E+02 6.60E+00 G
                           860.53 3.375E-02 -   1.787E-01 3.27E+02 1.24E+01 G

U-235    N   5.5180E-02                                     2.57E+11
                           143.77 5.868E-02  (  1.441E-01 1.52E+02 1.09E+01 G
                           205.32 6.927E-02 &(  2.397E-01 2.14E+02 5.02E+00 G
                           163.36-5.091E-02 +   2.744E-01 3.30E+02 5.08E+00 G
                           185.72 5.327E-02 *(  2.215E-02 2.89E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 5.171E-01     2.966E-01 3.82E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:55
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_014.An1

T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.02	108.	10.	0.004	309.80	5.452E-02
Th-234	93.03	106.	41.	0.015	78.08	6.948E-01
U-235	93.35	100.	41.	0.015	76.39	5.171E-01
Eu-152	121.84	93.	15.	0.006	187.00	3.212E-02
Pa-234	132.45	113.	3.	0.001	977.65	9.930E-03
U-235	143.80	139.	11.	0.004	304.02	5.868E-02
U-235	164.04	107.	-4.	-0.002	661.00	-5.091E-02
U-235	186.11	83.	51.	0.019	57.73	5.327E-02
Ra-226	186.16	91.	48.	0.018	62.68	8.132E-01
U-235	205.27	70.	6.	0.002	428.49	6.927E-02
Pa-234	568.66	17.	6.	0.002	225.87	7.189E-02
Cs-137	661.65	28.	7.	0.003	226.41	1.094E-02
Eu-154	723.42	37.	-3.	-0.001	592.58	-2.109E-02
Bi-212	727.34	29.	11.	0.004	148.67	2.358E-01
Eu-152	779.59	33.	-3.	-0.001	563.25	-3.384E-02
Eu-154	872.90	21.	7.	0.003	206.77	9.011E-02
Pa-234	882.80	20.	-2.	-0.001	556.04	-3.941E-02
Pa-234	947.68	44.	-10.	-0.004	196.24	-1.273E-01
Eu-152	966.39	41.	-10.	-0.004	188.59	-1.216E-01
Eu-152	1111.39	36.	-4.	-0.002	410.06	-6.117E-02
Eu-154	1274.82	31.	-4.	-0.001	412.25	-2.433E-02
Co-60	1333.38	28.	-3.	-0.001	522.79	-6.604E-03
Eu-152	1409.46	8.	6.	0.002	158.86	6.412E-02
Bi-212	1620.46	12.	-2.	-0.001	463.04	-3.682E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.9155E-01	3.9155E-01	9.7918E-02	1.0193E-01	5.577E-02
Am-241 #A	5.4507E-02	5.4521E-02	1.6891E-01	1.6895E-01	1.361E-01
Bi-212 #A	2.3584E-01	2.3584E-01	3.5063E-01	3.5084E-01	2.643E-01
Bi-214	2.6293E-01	2.6294E-01	7.0925E-02	7.1903E-02	3.664E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:55
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_014.An1

Co-60	#A	-6.4723E-03	-6.6045E-03	3.4527E-02	3.4529E-02	2.773E-02
Cs-137	#A	1.0901E-02	1.0940E-02	2.4769E-02	2.4774E-02	1.924E-02
Eu-152	#A	2.9441E-02	2.9674E-02	4.7140E-02	4.7161E-02	5.036E-02
Eu-154	#A	8.9003E-02	9.0112E-02	1.8632E-01	1.8638E-01	1.425E-01
K-40		1.8342E+01	1.8342E+01	1.2974E+00	1.5906E+00	2.058E-01
Pa-234	#A	3.0884E-02	3.0884E-02	6.9758E-02	7.0179E-02	7.943E-02
Pb-212		2.6694E-01	2.6694E-01	6.2844E-02	6.5745E-02	3.484E-02
Pb-214		2.8166E-01	2.8168E-01	6.6356E-02	6.7651E-02	3.766E-02
Ra-226	#	8.1316E-01	8.1322E-01	5.0969E-01	5.1180E-01	3.732E-01
Th-234	#A	3.7286E-01	3.7286E-01	2.9114E-01	2.9326E-01	1.191E+00
Tl-208		9.3208E-02	9.3208E-02	3.2547E-02	3.3089E-02	1.721E-02
U-235	#A	5.5180E-02	5.5180E-02	3.1858E-02	3.2034E-02	1.441E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.6 keV) 1.964E+01 pCi/g
Total Decayed Activity (25.0 to 2035.6 keV) 1.9638563E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE03
Seqnum : 1524034937014
File : 3_20140124_014
Cal : 24-JAN-2014 06:28:35,29-APR-2013 08:26:15
IDF : 1.0
PDF : 1.0

Lab ID : 251449-002
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-APR-2013
Sample Amount : 334.81 g

Client ID : 04-PD-D0034-02
Acct : ITSI (JG)
Time : 24-JAN-2014 17:04
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.1 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0	0.154		.13561	.13561	-0.0012	u
Bismuth-212	0.0892	0.248		.24767	.24771	0.00031	u
Bismuth-214	0.220	0.0415		.076222	.076858	-0.011	u
Cesium-137	0.00540	0.0176	0.07	.022183	.022184	0.0048	u
Cobalt-60	0.00485	0.0246		.022348	.022349	0.0015	u
Europium-152	0.0416	0.0569		.080289	.080314	0.020	u
Europium-154	0.0266	0.165		.045597	.045618	0.019	u
Lead-212	0.279	0.0346		.062287	.065484	-0.0075	u
Lead-214	0.332	0.0447		.082975	.084413	-0.025	u
Potassium-40	21.4	0.237		1.4382	1.7943	-0.068	u
Protactinium-234	0.0530	0.0857		.083085	.084122	0.0066	u
Radium-226 (By Bismuth-214)	0.220	0.0415	0.2	.076222	.076858	-0.011	u
Thallium-208	0.110	0.0175		.037922	.038572	-0.0042	u
Thorium-232 (By Actinium-228)	0.365	0.0521		.096464	.10002	0.020	u
Thorium-234	0.226	0.929		.31614	.31686	0	u
Uranium-235	0.0213	0.151		.02063	.02067	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-02
Sample Description: 251449-002, 207004

Detector: HPGE03 51-TP42227A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:46
Acquisition Time: 1/24/2014 17:04:10
Analysis Time: 1/24/2014 17:49
Analysis Quantity: 3.348E+02 g

Spectrum ID: 3_20140124_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.10 %

Efficiency: HPGE03 S22147 3_20130428002_EffCal RA226
Efficiency Cal Date: 4/29/2013 08:26
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.654E-01	9.646E-02	1.000E-01	5.206E-02
Am-241	#AB	0.000E+00	1.356E-01	1.356E-01	1.539E-01
Bi-212	#AB	8.920E-02	2.477E-01	2.477E-01	2.478E-01
Bi-214		2.195E-01	7.622E-02	7.686E-02	4.147E-02
Co-60	#AB	4.855E-03	2.235E-02	2.235E-02	2.456E-02
Cs-137	#AB	5.399E-03	2.218E-02	2.218E-02	1.761E-02
Eu-152	#AB	4.156E-02	8.029E-02	8.031E-02	5.693E-02
Eu-154	#AB	2.657E-02	4.560E-02	4.562E-02	1.654E-01
K-40		2.139E+01	1.438E+00	1.794E+00	2.366E-01
Pa-234	#AB	5.300E-02	8.308E-02	8.412E-02	8.572E-02
Pb-212		2.793E-01	6.229E-02	6.548E-02	3.460E-02
Pb-214		3.318E-01	8.297E-02	8.441E-02	4.467E-02
Ra-226	#	5.223E-01	5.161E-01	5.170E-01	3.939E-01
Th-234	#AB	2.264E-01	3.161E-01	3.169E-01	9.287E-01
Tl-208		1.102E-01	3.792E-02	3.857E-02	1.751E-02
U-235	AB	2.125E-02	2.063E-02	2.067E-02	1.506E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.368E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:49:19
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_014.An1

Sample description
     251449-002, 207004


Spectrum Filename: C:\User\SPC\Det3\3_20140124_014.An1

Acquisition information
       Start time:                 1/24/2014 17:04:10
       Live time:               2700
       Real time:               2703
       Dead time:                  0.10 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:28:35
            Zero offset:          -0.141 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/29/2013 08:26:15
            Type:                  Polynomial
            Uncertainty:           1.273 %
            Coefficients:         -0.381561  -4.120787   0.430562
                                  -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.88keV )
       Stop channel:            8144 (  2035.17keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3481E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3481E+02) =
                                   8.0723E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:19
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:46:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	3_2013-12-28_0934.PBC 12/28/2013 09:34:58
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1187

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.73	55.	28.99	0.88	2.588E-02				
77.11	74.	21.28	0.88	2.760E-02				
92.97	2.	48.66	0.89	3.718E-02	92.59	4.343	PBC<MDA	Th234
					93.35	4.100	2.986E-02	Ac228
					93.35	5.760	2.125E-02	U235
93.02	25.	69.81	0.89	3.682E-02	92.59	4.343	PBC<MDA	Th234
					93.35	4.100	4.984E-01	Ac228
					93.35	5.760	3.548E-01	U235
123.46	19.	85.82	0.92	4.618E-02	123.07	40.400	PBC<MDA	Eu154
131.66	20.	78.38	0.92	4.722E-02	131.30	18.200	PBC<MDA	Pa234
185.92	29.	49.41	0.97	4.658E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	5.223E-01	Ra226
185.94	29.	48.53	0.97	4.662E-02	185.72	57.000	3.305E-02	U235
					186.21	3.555	5.304E-01	Ra226
205.33	5.	263.19	0.99	4.503E-02	205.32	5.020	PBC<MDA	U235
238.56	180.	10.57	1.02	4.203E-02	238.63	43.600	2.793E-01	Pb212
241.71	72.	22.06	0.48	4.172E-02	242.00	7.268	7.120E-01	Pb214
295.45	75.	19.95	1.18	3.721E-02	295.22	18.414	3.263E-01	Pb214
300.29	21.	57.01	1.07	3.683E-02	300.09	3.180	5.372E-01	Pb212
307.47	8.	116.33	0.63	3.628E-02				
338.10	52.	23.85	0.80	3.412E-02	338.32	11.400	3.967E-01	Ac228
352.06	143.	11.56	1.07	3.324E-02	351.93	35.600	3.346E-01	Pb214
583.12	70.	16.40	0.84	2.357E-02	583.19	85.000	1.039E-01	Tl208
609.18	73.	14.49	1.45	2.287E-02	609.31	45.490	2.087E-01	Bi214
662.18	3.	205.42	1.37	2.162E-02	661.66	84.990	PBC<MDA	Cs137
723.26	5.	139.58	1.42	2.033E-02	723.30	20.050	PBC<MDA	Eu154
726.55	1.	686.23	1.43	2.025E-02	727.33	6.650	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:19
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
860.17	12.	54.34	0.30	1.803E-02	860.53	12.400	1.538E-01	Tl208
882.79	1.	699.32	1.56	1.770E-02	883.24	9.700	PBC<MDA	Pa234
911.39	56.	17.42	0.68	1.732E-02	911.20	26.200	3.657E-01	Ac228
946.27	2.	285.91	1.61	1.687E-02	946.00	13.500	PBC<MDA	Pa234
963.66	10.	96.59	1.62	1.664E-02	964.08	14.500	PBC<MDA	Eu152
969.19	30.	26.38	0.87	1.658E-02	968.96	15.900	3.425E-01	Ac228
1120.30	19.	38.20	1.75	1.494E-02	1120.29	14.910	2.525E-01	Bi214
1175.43	1.	620.42	1.80	1.444E-02	1173.23	99.850	PBC<MDA	Co60
1332.19	3.	230.16	1.93	1.311E-02	1332.49	99.983	PBC<MDA	Co60
1460.92	920.	3.31	2.16	1.219E-02	1460.82	10.550	2.139E+01	K40
1622.17	2.	138.82	2.16	1.119E-02	1620.74	1.510	PBC<MDA	Bi212

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
299.22	74.73	108.	33.	1.283E+03	97.06	0.525	-	s
308.73	77.11	110.	60.	2.192E+03	58.64	0.744	-	
1229.59	307.47	29.	8.	2.095E+02	232.65	0.632	-	c

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Th-234	258.99	64.66	70.	-1.	0.000	1833.91	0.867s
Th-234	372.31	93.02	145.	25.	0.009	139.62	0.892s
U-235	373.66	93.35	124.	2.	0.001	97.32	0.893D
Eu-152	487.96	121.95	131.	-12.	-0.004	287.53	0.917s
Eu-154	494.01	123.46	118.	19.	0.007	171.63	0.918
Pa-234	526.78	131.66	112.	20.	0.007	156.75	0.925s
U-235	575.46	143.84	129.	-11.	-0.004	292.97	0.935s
U-235	651.68	162.91	117.	-19.	-0.007	168.02	0.952s
U-235	743.74	185.94	87.	29.	0.011	97.06	0.971
Ra-226	743.66	185.92	88.	29.	0.011	98.82	0.971s
U-235	821.27	205.33	101.	5.	0.002	526.38	0.988s
Pb-212	954.09	238.56	83.	171.	0.063	21.15	1.017
Pb-214	966.68	241.71	65.	72.	0.027	44.12	0.475s
Pb-214	1181.51	295.45	69.	75.	0.028	39.90	1.179

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:19
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	1200.88	300.29	61.	21.	0.008	114.03	1.068
Ac-228	1352.05	338.10	38.	52.	0.019	47.70	0.799s
Pb-214	1407.84	352.06	58.	132.	0.049	23.13	1.068
Tl-208	2331.79	583.12	25.	70.	0.026	32.81	0.837s
Bi-214	2436.00	609.18	38.	73.	0.027	28.99	1.453
Cs-137	2647.98	662.18	21.	3.	0.001	410.85	1.372s
Eu-154	2892.27	723.26	20.	5.	0.002	279.15	1.424s
Bi-212	2905.43	726.55	23.	1.	0.000	1372.45	1.427s
Eu-152	3114.66	778.85	28.	-4.	-0.002	349.80	1.470s
Tl-208	3439.96	860.17	10.	12.	0.004	108.68	0.300s
Pa-234	3522.02	880.68	27.	-3.	-0.001	512.61	1.555s
Pa-234	3530.43	882.79	24.	1.	0.000	1398.64	1.557s
Ac-228	3644.88	911.39	12.	56.	0.021	34.84	0.677s
Pa-234	3784.44	946.27	22.	2.	0.001	571.83	1.610s
Eu-152	3854.02	963.66	38.	10.	0.004	193.19	1.625s
Ac-228	3876.12	969.19	13.	30.	0.011	52.76	0.865s
Eu-154	4018.17	1004.69	22.	-3.	-0.001	476.15	1.658s
Eu-152	4460.24	1115.16	31.	-8.	-0.003	213.16	1.747s
Bi-214	4480.77	1120.30	26.	19.	0.007	76.40	1.754s
Co-60	4701.41	1175.43	38.	1.	0.001	1240.85	1.798s
Eu-154	5097.25	1274.33	35.	-2.	-0.001	1114.58	1.881s
Co-60	5328.83	1332.19	21.	3.	0.001	460.32	1.929s
Eu-152	5625.91	1406.40	12.	-3.	-0.001	381.97	1.991s
K-40	5844.19	1460.92	19.	920.	0.341	6.62	2.158
Bi-212	6489.82	1622.17	3.	2.	0.001	277.65	2.165s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	3.6539E-01					5.12E+12	
			911.20	3.657E-01	(	5.206E-02	1.74E+01	2.62E+01 G
			968.96	3.425E-01	(	9.453E-02	2.64E+01	1.59E+01 G
			338.32	3.967E-01	(	1.110E-01	2.38E+01	1.14E+01 G
								Energy duplication
			93.35	0.000E+00	}	5.093E-01	1.63E+03	4.10E+00 XA
Bi-212	N	8.9203E-02					5.12E+12	
			727.33	2.216E-02	&(	2.478E-01	6.86E+02	6.65E+00 G
			785.37	0.000E+00	&	2.316E+00	1.00E+03	1.11E+00 G
			1620.74	3.845E-01	?(	7.672E-01	1.39E+02	1.51E+00 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:19
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_014.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	2.1950E-01					5.84E+05	
			609.31	2.087E-01	(P	4.147E-02	1.45E+01	4.55E+01 G
			1120.29	2.525E-01	?(P	1.602E-01	3.82E+01	1.49E+01 G
			1764.49	-7.914E-02	% P	8.985E-02	1.00E+03	1.53E+01 G
Co-60	T	4.8548E-03					1.93E+03	
			1332.49	6.701E-03	&(	2.456E-02	2.30E+02	1.00E+02 G
			1173.23	3.007E-03	?(	3.045E-02	6.20E+02	9.98E+01 G
Cs-137	I	5.3992E-03					1.10E+04	
			661.66	5.399E-03	?(	1.761E-02	2.05E+02	8.50E+01 G
Eu-152	I	4.1560E-02					4.94E+03	
			344.28	-8.023E-04	&(	5.693E-02	4.31E+03	2.66E+01 G
			121.78	-2.658E-02	+	6.162E-02	1.44E+02	2.84E+01 G
			778.90	-5.315E-02	+	1.474E-01	1.75E+02	1.30E+01 G
			964.08	1.192E-01	?(	1.788E-01	9.66E+01	1.45E+01 G
			1112.08	-1.168E-01	+	1.932E-01	1.07E+02	1.34E+01 G
			1408.01	-3.093E-02	+	9.223E-02	1.91E+02	2.09E+01 G
Eu-154	I	2.6566E-02					3.14E+03	
			873.18	-5.100E-04	&(	1.654E-01	1.97E+04	1.22E+01 G
			123.07	3.014E-02	&(	4.102E-02	8.58E+01	4.04E+01 G
			1274.43	-9.662E-03	+	8.776E-02	5.57E+02	3.49E+01 G
			723.30	3.581E-02	?(	7.784E-02	1.40E+02	2.00E+01 G
			1004.72	-3.006E-02	&	1.142E-01	2.38E+02	1.79E+01 G
			996.25	-6.461E-04	%	1.966E-01	1.85E+04	1.05E+01 G
K-40	N	2.1388E+01					4.57E+11	
			1460.82	2.139E+01	(P	2.366E-01	3.31E+00	1.06E+01 G
Pa-234	N	5.3003E-02					1.63E+12	
			131.30	6.928E-02	?(	8.572E-02	7.84E+01	1.82E+01 G
			569.50	-6.432E-03	%	1.582E-01	1.50E+03	9.30E+00 G
			946.00	3.106E-02	?(	1.425E-01	2.86E+02	1.35E+01 G
			880.52	-4.756E-02	-	1.956E-01	2.56E+02	1.05E+01 G
			883.24	1.733E-02	&	1.976E-01	6.99E+02	9.70E+00 G
Pb-212	N	2.7934E-01					5.12E+12	
			238.63	2.793E-01	(P	3.460E-02	1.06E+01	4.36E+01 G
			300.09	5.372E-01	+	4.663E-01	5.70E+01	3.18E+00 G
Pb-214	N	3.3176E-01					5.84E+05	
			351.93	3.346E-01	(P	4.467E-02	1.16E+01	3.56E+01 G
			295.22	3.263E-01	(P	8.459E-02	2.00E+01	1.84E+01 G
			242.00	7.120E-01	+	1.850E-01	2.21E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:49:19
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   5.2232E-01                                     5.84E+05
                           186.21 5.223E-01 ?(  3.939E-01 4.94E+01 3.56E+00 G

Th-234   N   2.2643E-01                                     1.63E+12
                            63.30-6.176E-02 &(  9.287E-01 9.17E+02 3.75E+00 G
                            92.59 4.753E-01 &(  5.241E-01 6.98E+01 4.34E+00 G

Tl-208   N   1.1024E-01                                     5.12E+12
                           583.19 1.039E-01  (P 1.751E-02 1.64E+01 8.50E+01 G
                           277.37-2.972E-02 % P 1.977E-01 4.06E+03 6.60E+00 G
                           860.53 1.538E-01  (  9.606E-02 5.43E+01 1.24E+01 G

U-235    N   2.1254E-02                                     2.57E+11
                           143.77-6.373E-02 ?(  1.506E-01 1.46E+02 1.09E+01 G
                           205.32 7.250E-02 ?(  3.102E-01 2.63E+02 5.02E+00 G
                           163.36-2.322E-01 +   3.091E-01 8.40E+01 5.08E+00 G
                           185.72 3.305E-02  (  2.444E-02 4.85E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 2.125E-02 }   3.625E-01 4.87E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:49:19
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_014.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	64.66	70.	-1.	0.000	1833.91	-6.176E-02
Th-234	93.02	145.	25.	0.009	139.62	4.753E-01
Eu-154	123.46	118.	19.	0.007	171.63	3.014E-02
Pa-234	131.66	112.	20.	0.007	156.75	6.928E-02
Ra-226	185.92	88.	29.	0.011	98.82	5.223E-01
Eu-154	723.26	20.	5.	0.002	279.15	3.581E-02
Bi-212	726.55	23.	1.	0.000	1372.45	2.216E-02
Pa-234	880.68	27.	-3.	-0.001	512.61	-4.756E-02
Pa-234	882.79	24.	1.	0.000	1398.64	1.733E-02
Pa-234	946.27	22.	2.	0.001	571.83	3.106E-02
Eu-154	1004.69	22.	-3.	-0.001	476.15	-3.006E-02
Co-60	1175.43	38.	1.	0.001	1240.85	3.007E-03
Eu-154	1274.33	35.	-2.	-0.001	1114.58	-9.662E-03
Co-60	1332.19	21.	3.	0.001	460.32	6.701E-03
Bi-212	1622.17	3.	2.	0.001	277.65	3.845E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.6539E-01	3.6539E-01	9.6464E-02	1.0002E-01	5.206E-02
Am-241 #A	0.0000E+00	0.0000E+00	1.3561E-01	1.3561E-01	1.539E-01
Bi-212 #A	8.9203E-02	8.9203E-02	2.4767E-01	2.4771E-01	2.478E-01
Bi-214	2.1949E-01	2.1950E-01	7.6222E-02	7.6858E-02	4.147E-02
Co-60 #A	4.7577E-03	4.8548E-03	2.2348E-02	2.2349E-02	2.456E-02
Cs-137 #A	5.3801E-03	5.3992E-03	2.2183E-02	2.2184E-02	1.761E-02
Eu-152 #A	4.1234E-02	4.1560E-02	8.0289E-02	8.0314E-02	5.693E-02
Eu-154 #A	2.6239E-02	2.6566E-02	4.5597E-02	4.5618E-02	1.654E-01
K-40	2.1388E+01	2.1388E+01	1.4382E+00	1.7943E+00	2.366E-01
Pa-234 #A	5.3003E-02	5.3003E-02	8.3085E-02	8.4122E-02	8.572E-02
Pb-212	2.7934E-01	2.7934E-01	6.2287E-02	6.5484E-02	3.460E-02
Pb-214	3.3174E-01	3.3176E-01	8.2975E-02	8.4413E-02	4.467E-02
Ra-226 #	5.2228E-01	5.2232E-01	5.1614E-01	5.1700E-01	3.939E-01
Th-234 #A	2.2643E-01	2.2643E-01	3.1614E-01	3.1686E-01	9.287E-01
Tl-208	1.1024E-01	1.1024E-01	3.7922E-02	3.8572E-02	1.751E-02
U-235 A	2.1254E-02	2.1254E-02	2.0630E-02	2.0670E-02	1.506E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:49:19
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_014.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   24.9 to  2035.2 keV)     2.269E+01  pCi/g
 Total Decayed Activity (   24.9 to  2035.2 keV) 2.2694656E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE05
Seqnum : 1544034938014
File : 5_20140124_014
Cal : 24-JAN-2014 06:29:37,29-JUN-2013 15:59:06
IDF : 1.0
PDF : 1.0

Lab ID : 251449-003
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-JUN-2013
Sample Amount : 363 g

Client ID : 04-PD-D0034-03
Acct : ITSI (JG)
Time : 24-JAN-2014 17:05
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.08 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.00430	0.148		.18012	.18012	-0.0012	u
Bismuth-212	0.447	0.231		.40945	.41009	0.00031	u
Bismuth-214	0.181	0.0478		.070324	.070793	-0.011	u
Cesium-137	-0.00290	0.0205	0.07	.025236	.025237	0.0048	u
Cobalt-60	0.0130	0.0240		.031041	.031046	0.0015	u
Europium-152	0.0265	0.0483		.058581	.058595	0.020	u
Europium-154	-0.00590	0.183		.025279	.02528	0.019	u
Lead-212	0.265	0.0410		.069526	.072124	-0.0075	u
Lead-214	0.318	0.0394		.081913	.083251	-0.025	u
Potassium-40	22.4	0.202		1.4137	1.8072	-0.068	u
Protactinium-234	0.0161	0.0909		.11646	.11653	0.0066	u
Radium-226 (By Bismuth-214)	0.181	0.0478	0.2	.070324	.070793	-0.011	u
Thallium-208	0.105	0.0175		.035583	.036211	-0.0042	u
Thorium-232 (By Actinium-228)	0.304	0.0878		.091464	.094075	0.020	u
Thorium-234	0.750	1.14		1.4334	1.4352	0	u
Uranium-235	0.172	0.140		.15116	.15152	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-03
Sample Description: 251449-003, 207004

Detector: HPGE05 51-TP42242A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:49
Acquisition Time: 1/24/2014 17:05:37
Analysis Time: 1/24/2014 17:50
Analysis Quantity: 3.630E+02 g

Spectrum ID: 5_20140124_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.08 %

Efficiency: HPGE05 S22147 5_20130628003_EffCal RA226
Efficiency Cal Date: 6/29/2013 15:59
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.043E-01	9.146E-02	9.408E-02	8.779E-02
Am-241	#AB	-4.304E-03	1.801E-01	1.801E-01	1.482E-01
Bi-212	#	4.465E-01	4.095E-01	4.101E-01	2.312E-01
Bi-214	#	1.810E-01	7.032E-02	7.079E-02	4.778E-02
Co-60	#AB	1.302E-02	3.104E-02	3.105E-02	2.403E-02
Cs-137	#AB	-2.905E-03	2.524E-02	2.524E-02	2.050E-02
Eu-152	#AB	2.651E-02	5.858E-02	5.860E-02	4.826E-02
Eu-154	#AB	-5.902E-03	2.528E-02	2.528E-02	1.830E-01
K-40		2.244E+01	1.414E+00	1.807E+00	2.020E-01
Pa-234	#AB	1.613E-02	1.165E-01	1.165E-01	9.089E-02
Pb-212		2.651E-01	6.953E-02	7.212E-02	4.099E-02
Pb-214		3.180E-01	8.191E-02	8.325E-02	3.943E-02
Ra-226	#AB	3.507E-01	5.235E-01	5.239E-01	4.125E-01
Th-234	#AB	7.502E-01	1.433E+00	1.435E+00	1.142E+00
Tl-208		1.049E-01	3.558E-02	3.621E-02	1.746E-02
U-235	#	1.720E-01	1.512E-01	1.515E-01	1.401E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.539E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:50:45
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_014.An1

Sample description
     251449-003, 207004


Spectrum Filename: C:\User\SPC\Det5\5_20140124_014.An1

Acquisition information
       Start time:                1/24/2014 17:05:37
       Live time:              2700
       Real time:              2702
       Dead time:                 0.08 %
       Detector ID:                   5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                  5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:29:37
            Zero offset:         -0.064 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/29/2013 15:59:06
            Type:                 Polynomial
            Uncertainty:          1.295 %
            Coefficients:        -0.372021  -4.149771   0.439762
                                 -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.95keV )
       Stop channel:           8144 (  2035.00keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.6300E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.6300E+02) =
                                  7.4455E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:50:45
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:49:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2013-12-28_0935.PBC 12/28/2013 09:35:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 10 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1089

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
64.03	17.	95.54	0.97	1.655E-02	63.30	3.750	PBC<MDA	Th234
122.58	2.	697.30	1.02	4.618E-02	121.78	28.410	PBC<MDA	Eu152
131.57	3.	604.74	1.03	4.742E-02	131.30	18.200	PBC<MDA	Pa234
144.62	20.	85.67	1.04	4.817E-02	143.77	10.940	PBC<MDA	U235
163.62	22.	75.36	1.06	4.801E-02	163.36	5.080	PBC<MDA	U235
185.65	22.	71.85	1.08	4.667E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	3.699E-01	Ra226
186.14	21.	74.64	1.08	4.663E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	3.507E-01	Ra226
205.33	20.	66.03	1.09	4.503E-02	205.32	5.020	PBC<MDA	U235
238.68	183.	12.61	1.02	4.195E-02	238.63	43.600	2.651E-01	Pb212
241.81	44.	38.30	0.98	4.164E-02	242.00	7.268	4.010E-01	Pb214
276.92	10.	116.24	1.15	3.851E-02	277.37	6.600	PBC<MDA	Tl208
295.24	88.	16.79	0.95	3.705E-02	295.22	18.414	3.247E-01	Pb214
299.81	28.	40.65	1.17	3.667E-02	300.09	3.180	6.511E-01	Pb212
338.32	45.	25.58	0.44	3.392E-02	338.32	11.400	3.195E-01	Ac228
344.58	5.	213.00	1.21	3.353E-02	344.28	26.590	PBC<MDA	Eu152
351.87	137.	11.93	1.04	3.304E-02	351.93	35.600	2.975E-01	Pb214
583.30	75.	15.89	1.24	2.333E-02	583.19	85.000	1.042E-01	Tl208
609.21	68.	16.40	1.44	2.264E-02	609.31	45.490	1.810E-01	Bi214
723.34	2.	338.87	1.53	2.011E-02	723.30	20.050	PBC<MDA	Eu154
727.25	9.	78.68	1.54	2.003E-02	727.33	6.650	PBC<MDA	Bi212
779.01	6.	110.51	1.58	1.910E-02	778.90	12.970	PBC<MDA	Eu152
785.97	15.	47.10	1.59	1.899E-02	785.37	1.110	1.948E+00	Bi212
883.17	2.	394.38	1.67	1.750E-02	883.24	9.700	PBC<MDA	Pa234
911.05	38.	25.49	1.70	1.712E-02	911.20	26.200	2.364E-01	Ac228
969.39	38.	21.67	0.81	1.640E-02	968.96	15.900	4.053E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:50:45
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1111.64	4.	208.28	1.87	1.485E-02	1112.08	13.410	PBC<MDA	Eu152
1120.59	6.	81.40	1.88	1.477E-02	1120.29	14.910	PBC<MDA	Bi214
1333.38	6.	119.23	2.07	1.298E-02	1332.49	99.983	PBC<MDA	Co60
					1332.49	99.983	1.302E-02	Co60
1460.86	1049.	3.11	1.90	1.208E-02	1460.82	10.550	2.244E+01	K40

No unknown peaks passed sensitivity test.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Th-234	256.21	64.03	122.	17.	0.006	191.08	0.975s
Eu-152	490.26	122.58	125.	2.	0.001	1394.59	1.024s
Eu-154	496.34	124.10	116.	-4.	-0.001	788.61	1.025s
Pa-234	526.18	131.57	149.	3.	0.001	1209.47	1.031s
U-235	578.35	144.62	132.	20.	0.007	171.33	1.042s
U-235	654.31	163.62	132.	22.	0.008	150.72	1.058
U-235	742.41	185.65	117.	22.	0.008	143.71	1.077s
Ra-226	744.33	186.14	113.	21.	0.008	149.27	1.077s
U-235	821.07	205.33	74.	20.	0.007	132.06	1.094s
Pb-212	954.40	238.68	136.	176.	0.065	25.23	1.025
Pb-214	966.93	241.81	96.	44.	0.016	76.60	0.983
Tl-208	1107.29	276.92	69.	10.	0.004	232.48	1.154
Pb-214	1180.54	295.24	55.	80.	0.030	33.58	0.954
Pb-212	1198.81	299.81	57.	28.	0.010	81.30	1.173
Ac-228	1352.81	338.32	41.	45.	0.017	51.15	0.441s
Eu-152	1377.83	344.58	44.	5.	0.002	426.01	1.211s
Pb-214	1406.99	351.87	52.	127.	0.047	23.86	1.038s
Tl-208	2332.55	583.30	29.	75.	0.028	31.78	1.236
Bi-214	2436.19	609.21	59.	68.	0.025	32.81	1.436
Cs-137	2646.36	661.76	33.	-2.	-0.001	868.81	1.481s
Eu-154	2892.71	723.34	33.	2.	0.001	677.74	1.534s
Bi-212	2908.36	727.25	23.	9.	0.004	157.35	1.538s
Eu-152	3115.44	779.01	19.	6.	0.002	221.02	1.582s
Bi-212	3143.28	785.97	17.	15.	0.006	94.19	1.588s
Eu-154	3496.52	874.26	36.	-3.	-0.001	523.86	1.664s
Pa-234	3532.17	883.17	24.	2.	0.001	788.75	1.673s
Ac-228	3643.71	911.05	38.	38.	0.014	50.98	1.697
Pa-234	3794.41	948.71	38.	-7.	-0.003	255.65	1.727s
Ac-228	3877.17	969.39	16.	38.	0.014	43.33	0.815s
Eu-154	3989.95	997.58	33.	-3.	-0.001	655.89	1.771s
Eu-154	4008.90	1002.31	27.	-3.	-0.001	461.54	1.779s
Eu-152	4446.44	1111.64	35.	4.	0.002	416.56	1.873s
Bi-214	4482.27	1120.59	39.	6.	0.002	162.80	1.880s

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:50:45
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_014.An1

 Nuclide  Channel   Energy  Background  Net area  Cnts/sec   Uncert   FWHM
 Co-60    5334.03  1333.38        23.         6.     0.002   238.45   2.068s
 K-40     5844.41  1460.86        16.      1037.     0.384     6.23   1.901
 Bi-212   6483.72  1620.52         7.        -2.    -0.001   456.75   2.326s

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             pCi/g         keV     pCi/g         pCi/g          COMMENTS
 ____________________________________________________________________________

Ac-228   N   3.0432E-01                                     5.12E+12
                           911.20 2.364E-01 ?(P 8.779E-02 2.55E+01 2.62E+01 G
                           968.96 4.053E-01  (P 9.759E-02 2.17E+01 1.59E+01 G
                           338.32 3.195E-01  (P 1.066E-01 2.56E+01 1.14E+01 G
                                                          Energy duplication
                            93.35-5.448E-02 % P 5.001E-01 1.12E+03 4.10E+00 XA

Am-241   I  -4.3036E-03                                     1.58E+05
                            59.54-4.304E-03 %(  1.482E-01 2.09E+03 3.59E+01 G

Bi-212   N   4.4654E-01                                     5.12E+12
                           727.33 1.958E-01 ?(  2.312E-01 7.87E+01 6.65E+00 G
                           785.37 1.948E+00 &(  1.263E+00 4.71E+01 1.11E+00 G
                          1620.74-2.845E-01 -   1.009E+00 2.28E+02 1.51E+00 G

Bi-214   N   1.8097E-01                                     5.84E+05
                           609.31 1.810E-01 ?(P 4.778E-02 1.64E+01 4.55E+01 G
                          1120.29 7.438E-02 - P 1.826E-01 8.14E+01 1.49E+01 G
                          1764.49-6.567E-02 % P 2.072E-01 1.00E+03 1.53E+01 G

Co-60    T   1.3018E-02                                     1.93E+03
                          1332.49 1.302E-02 &(  2.403E-02 1.19E+02 1.00E+02 G
                          1173.23 1.092E-04 %   2.640E-02 1.47E+04 9.98E+01 G

Cs-137   I  -2.9047E-03                                     1.10E+04
                           661.66-2.905E-03 ?(  2.050E-02 4.34E+02 8.50E+01 G

Eu-152   I   2.6506E-02                                     4.94E+03
                           344.28 1.410E-02 ?(  4.826E-02 2.13E+02 2.66E+01 G
                           121.78 4.817E-03 &(  5.508E-02 6.97E+02 2.84E+01 G
                           778.90 6.681E-02 ?(  1.130E-01 1.11E+02 1.30E+01 G
                           964.08 0.000E+00 &   1.244E-01 1.00E+03 1.45E+01 G
                          1112.08 5.808E-02 &(  1.937E-01 2.08E+02 1.34E+01 G
                          1408.01 0.000E+00 -   2.498E-02 1.00E+03 2.09E+01 G
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:50:45
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_014.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Eu-154	I	-5.9021E-03					3.14E+03	
			873.18	-4.336E-02	?(	1.830E-01	2.62E+02	1.22E+01 G
			123.07	-5.809E-03	&	3.743E-02	3.94E+02	4.04E+01 G
			1274.43	-3.067E-04	%	8.622E-02	1.71E+04	3.49E+01 G
			723.30	1.683E-02	?(	9.229E-02	3.39E+02	2.00E+01 G
			1004.72	-3.207E-02	+	1.184E-01	2.31E+02	1.79E+01 G
			996.25	-4.157E-02	+	2.204E-01	3.28E+02	1.05E+01 G
K-40	N	2.2442E+01					4.57E+11	
			1460.82	2.244E+01	(P	2.020E-01	3.11E+00	1.06E+01 G
Pa-234	N	1.6132E-02					1.63E+12	
			131.30	9.166E-03	?(	9.089E-02	6.05E+02	1.82E+01 G
			569.50	0.000E+00	&	2.275E-01	1.00E+03	9.30E+00 G
			946.00	-8.789E-02	&	1.770E-01	1.28E+02	1.35E+01 G
			880.52	-8.191E-03	%	1.953E-01	1.45E+03	1.05E+01 G
			883.24	2.920E-02	&(	1.863E-01	3.94E+02	9.70E+00 G
Pb-212	N	2.6513E-01					5.12E+12	
			238.63	2.651E-01	(P	4.099E-02	1.26E+01	4.36E+01 G
			300.09	6.511E-01	+ P	4.153E-01	4.06E+01	3.18E+00 G
Pb-214	N	3.1796E-01					5.84E+05	
			351.93	2.975E-01	*(P	3.943E-02	1.19E+01	3.56E+01 G
			295.22	3.247E-01	(P	6.964E-02	1.68E+01	1.84E+01 G
			242.00	4.010E-01	(	2.080E-01	3.83E+01	7.27E+00 G
Ra-226	N	3.5070E-01					5.84E+05	
			186.21	3.507E-01	(	4.125E-01	7.46E+01	3.56E+00 G
Th-234	N	7.5017E-01					1.63E+12	
			63.30	7.502E-01	?(	1.142E+00	9.55E+01	3.75E+00 G
			92.59	0.000E+00	-	5.839E-01	1.00E+03	4.34E+00 G
Tl-208	N	1.0490E-01					5.12E+12	
			583.19	1.042E-01	(P	1.746E-02	1.59E+01	8.50E+01 G
			277.37	1.138E-01	(	2.101E-01	1.16E+02	6.60E+00 G
			860.53	9.772E-04	%	1.454E-01	9.04E+03	1.24E+01 G
U-235	N	1.7201E-01					2.57E+11	
			143.77	1.029E-01	&(	1.401E-01	8.57E+01	1.09E+01 G
			205.32	2.394E-01	*(	2.448E-01	6.60E+01	5.02E+00 G
			163.36	2.542E-01	?(	3.030E-01	7.54E+01	5.08E+00 G
			185.72	2.305E-02	-	2.607E-02	7.19E+01	5.70E+01 G
								Energy duplication
			93.35	-1.930E-02	&	3.541E-01	1.12E+03	5.76E+00 X

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:50:45
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_014.An1

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	64.03	122.	17.	0.006	191.08	7.502E-01
Eu-152	122.58	125.	2.	0.001	1394.59	4.817E-03
Eu-154	124.10	116.	-4.	-0.001	788.61	-5.809E-03
Pa-234	131.57	149.	3.	0.001	1209.47	9.166E-03
U-235	144.62	132.	20.	0.007	171.33	1.029E-01
U-235	163.62	132.	22.	0.008	150.72	2.542E-01
U-235	185.65	117.	22.	0.008	143.71	2.305E-02
Ra-226	186.14	113.	21.	0.008	149.27	3.507E-01
U-235	205.33	74.	20.	0.007	132.06	2.394E-01
Eu-152	344.58	44.	5.	0.002	426.01	1.410E-02
Cs-137	661.76	33.	-2.	-0.001	868.81	-2.905E-03
Eu-154	723.34	33.	2.	0.001	677.74	1.683E-02
Bi-212	727.25	23.	9.	0.004	157.35	1.958E-01
Eu-152	779.01	19.	6.	0.002	221.02	6.681E-02
Bi-212	785.97	17.	15.	0.006	94.19	1.948E+00
Eu-154	874.26	36.	-3.	-0.001	523.86	-4.336E-02
Pa-234	883.17	24.	2.	0.001	788.75	2.920E-02
Pa-234	948.71	38.	-7.	-0.003	255.65	-8.789E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:50:45
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Eu-154	997.58	33.	-3.	-0.001	655.89	-4.157E-02	
Eu-154	1002.31	27.	-3.	-0.001	461.54	-3.207E-02	
Eu-152	1111.64	35.	4.	0.002	416.56	5.808E-02	
Co-60	1333.38	23.	6.	0.002	238.45	1.302E-02	
Bi-212	1620.52	7.	-2.	-0.001	456.75	-2.845E-01	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.0432E-01	3.0432E-01	9.1464E-02	9.4075E-02	8.779E-02
Am-241 #A	-4.3026E-03	-4.3036E-03	1.8012E-01	1.8012E-01	1.482E-01
Bi-212 #C	4.4654E-01	4.4654E-01	4.0945E-01	4.1009E-01	2.312E-01
Bi-214 #	1.8095E-01	1.8097E-01	7.0324E-02	7.0793E-02	4.778E-02
Co-60 #A	1.2757E-02	1.3018E-02	3.1041E-02	3.1046E-02	2.403E-02
Cs-137 #A	-2.8944E-03	-2.9047E-03	2.5236E-02	2.5237E-02	2.050E-02
Eu-152 #A	2.6298E-02	2.6506E-02	5.8581E-02	5.8595E-02	4.826E-02
Eu-154 #A	-5.8294E-03	-5.9021E-03	2.5279E-02	2.5280E-02	1.830E-01
K-40	2.2442E+01	2.2442E+01	1.4137E+00	1.8072E+00	2.020E-01
Pa-234 #A	1.6132E-02	1.6132E-02	1.1646E-01	1.1653E-01	9.089E-02
Pb-212	2.6513E-01	2.6513E-01	6.9526E-02	7.2124E-02	4.099E-02
Pb-214	3.1793E-01	3.1796E-01	8.1913E-02	8.3251E-02	3.943E-02
Ra-226 #A	3.5067E-01	3.5070E-01	5.2349E-01	5.2388E-01	4.125E-01
Th-234 #A	7.5017E-01	7.5017E-01	1.4334E+00	1.4352E+00	1.142E+00
Tl-208	1.0490E-01	1.0490E-01	3.5583E-02	3.6211E-02	1.746E-02
U-235 #C	1.7201E-01	1.7201E-01	1.5116E-01	1.5152E-01	1.401E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.0 keV) 2.362E+01 pCi/g
Total Decayed Activity (25.0 to 2035.0 keV) 2.3615520E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514034951014
File : 2_20140124_014
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58
IDF : 1.0
PDF : 1.0

Lab ID : 251449-004
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 07-JAN-2014
Sample Amount : 333.35 g

Client ID : 04-PD-D0034-04
Acct : ITSI (JG)
Time : 24-JAN-2014 17:02
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.11 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0481	0.131		.16162	.16166	-0.0012	u
Bismuth-212	0.206	0.246		.30552	.30574	0.00031	u
Bismuth-214	0.366	0.0470		.099796	.10146	-0.011	u
Cesium-137	-0.00557	0.0222	0.07	.027587	.027588	0.0048	u
Cobalt-60	-0.000946	0.0217		.02647	.02647	0.0015	u
Europium-152	0.0374	0.0456		.044208	.04425	0.020	u
Europium-154	0.0180	0.134		.038803	.038816	0.019	u
Lead-212	0.296	0.0373		.066704	.070124	-0.0075	u
Lead-214	0.389	0.0409		.086541	.088705	-0.025	u
Potassium-40	15.2	0.317		1.2381	1.4543	-0.068	u
Protactinium-234	-0.0589	0.0891		.11162	.11257	0.0066	u
Radium-226 (By Bismuth-214)	0.366	0.0470	0.2	.099796	.10146	-0.011	u
Thallium-208	0.140	0.0195		.040015	.041119	-0.0042	u
Thorium-232 (By Actinium-228)	0.377	0.0583		.10176	.10556	0.020	u
Thorium-234	0.369	1.02		.40462	.40613	0	u
Uranium-235	0.0358	0.101		.037587	.03765	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-04
Sample Description: 251449-004, 207004

Detector: HPGE02 50-TP42234A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:51
Acquisition Time: 1/24/2014 17:02:26
Analysis Time: 1/24/2014 17:47
Analysis Quantity: 3.334E+02 g

Spectrum ID: 2_20140124_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.11 %

Efficiency: HPGE02 S23325 2_20140106002_EffCal RA226
Efficiency Cal Date: 1/7/2014 11:47
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.770E-01	1.018E-01	1.056E-01	5.833E-02
Am-241	#AB	-4.814E-02	1.616E-01	1.617E-01	1.306E-01
Bi-212	#AB	2.065E-01	3.055E-01	3.057E-01	2.464E-01
Bi-214		3.655E-01	9.980E-02	1.015E-01	4.698E-02
Co-60	#AB	-9.465E-04	2.647E-02	2.647E-02	2.167E-02
Cs-137	#AB	-5.569E-03	2.759E-02	2.759E-02	2.216E-02
Eu-152	#AB	3.745E-02	4.421E-02	4.425E-02	4.558E-02
Eu-154	#AB	1.799E-02	3.880E-02	3.882E-02	1.341E-01
K-40		1.521E+01	1.238E+00	1.454E+00	3.172E-01
Pa-234	#AB	-5.893E-02	1.116E-01	1.126E-01	8.908E-02
Pb-212		2.960E-01	6.670E-02	7.012E-02	3.727E-02
Pb-214		3.887E-01	8.654E-02	8.870E-02	4.094E-02
Ra-226	#	4.319E-01	4.603E-01	4.610E-01	3.498E-01
Th-234	#AB	3.693E-01	4.046E-01	4.061E-01	1.015E+00
Tl-208	#	1.398E-01	4.002E-02	4.112E-02	1.945E-02
U-235	AB	3.578E-02	3.759E-02	3.765E-02	1.014E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.787E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:47:35
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_014.An1

Sample description
     251449-004, 207004


Spectrum Filename: C:\User\SPC\Det2\2_20140124_014.An1

Acquisition information
       Start time:                1/24/2014 17:02:26
       Live time:              2700
       Real time:              2703
       Dead time:                 0.11 %
       Detector ID:                   2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                  2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:52:16
            Zero offset:          0.026 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:              1/7/2014 11:47:58
            Type:                 Polynomial
            Uncertainty:          1.734 %
            Coefficients:        -0.360765  -4.056690   0.335194
                                 -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.06keV )
       Stop channel:           8144 (  2035.12keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3335E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3335E+02) =
                                  8.1077E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:35
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:51:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	2_2014-01-08_0518.PBC 1/8/2014 05:18:15
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0720

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.57	7.	241.89	0.83	2.025E-02	63.30	3.750	PBC<MDA	Th234
					63.30	3.750	2.580E-01	Th234
75.00	71.	20.45	0.84	3.170E-02				
77.29	102.	15.33	0.85	3.366E-02				
92.75	29.	54.79	0.86	4.359E-02	92.59	4.343	4.653E-01	Th234
					92.59	4.343	4.653E-01	Th234
121.51	18.	84.25	0.89	5.061E-02	121.78	28.410	PBC<MDA	Eu152
					123.07	40.400	2.668E-02	Eu154
121.54	12.	107.84	0.89	5.069E-02	121.78	28.410	PBC<MDA	Eu152
					123.07	40.400	1.828E-02	Eu154
163.63	10.	138.43	0.94	4.882E-02	163.36	5.080	PBC<MDA	U235
185.77	24.	52.52	0.96	4.633E-02	185.72	57.000	2.777E-02	U235
					186.21	3.555	4.459E-01	Ra226
186.04	24.	53.28	0.96	4.628E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	4.319E-01	Ra226
205.32	10.	116.67	0.98	4.406E-02	205.32	5.020	PBC<MDA	U235
238.65	181.	10.82	0.91	4.044E-02	238.63	43.600	2.960E-01	Pb212
241.76	49.	26.94	0.44	4.010E-02	242.00	7.268	5.090E-01	Pb214
295.33	93.	18.34	1.29	3.540E-02	295.22	18.414	4.297E-01	Pb214
300.26	4.	258.04	1.07	3.503E-02	300.09	3.180	PBC<MDA	Pb212
338.35	52.	30.07	0.84	3.242E-02	338.32	11.400	4.225E-01	Ac228
344.79	10.	83.42	1.11	3.205E-02	344.28	26.590	PBC<MDA	Eu152
351.85	145.	10.97	1.04	3.160E-02	351.93	35.600	3.676E-01	Pb214
569.29	4.	186.83	1.32	2.325E-02	569.50	9.300	PBC<MDA	Pa234
583.36	91.	13.24	1.26	2.291E-02	583.19	85.000	1.398E-01	Tl208
609.34	126.	12.69	1.14	2.230E-02	609.31	45.490	3.482E-01	Bi214
727.83	10.	73.99	1.44	1.999E-02	727.33	6.650	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:35
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
860.71	6.	116.28	1.54	1.801E-02	860.53	12.400	PBC<MDA	Tl208
873.46	1.	486.78	1.55	1.785E-02	873.18	12.170	PBC<MDA	Eu154
883.10	2.	318.78	1.56	1.772E-02	883.24	9.700	PBC<MDA	Pa234
911.29	54.	17.57	0.58	1.738E-02	911.20	26.200	3.534E-01	Ac228
946.44	1.	662.26	1.60	1.698E-02	946.00	13.500	PBC<MDA	Pa234
968.96	42.	19.77	0.94	1.672E-02	968.96	15.900	4.699E-01	Ac228
1112.12	1.	916.74	1.71	1.530E-02	1112.08	13.410	PBC<MDA	Eu152
1120.44	32.	26.42	0.34	1.523E-02	1120.29	14.910	4.185E-01	Bi214
1408.37	4.	131.53	1.87	1.302E-02	1408.01	20.850	PBC<MDA	Eu152
1460.83	700.	3.94	1.85	1.268E-02	1460.82	10.550	1.521E+01	K40
1621.03	1.	525.45	1.96	1.173E-02	1620.74	1.510	PBC<MDA	Bi212
1764.14	11.	40.95	2.00	1.097E-02	1764.49	15.310	1.931E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
299.47	74.98	97.	51.	1.602E+03	64.05	0.763	- s
308.64	77.28	87.	80.	2.380E+03	40.46	0.620	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.93	59.58	119.	-9.	-0.003	335.75	0.827s
Th-234	253.87	63.57	121.	7.	0.002	483.77	0.831s
Th-234	370.45	92.75	114.	29.	0.011	109.58	0.862
Eu-152	485.36	121.51	106.	18.	0.007	168.50	0.893s
Eu-154	485.50	121.54	82.	12.	0.005	215.69	0.894s
Pa-234	523.44	131.04	139.	-18.	-0.007	189.40	0.903s
U-235	564.62	141.34	64.	-2.	-0.001	1005.33	0.915s
U-235	653.69	163.63	100.	10.	0.004	276.85	0.936s
U-235	742.15	185.77	70.	24.	0.009	105.04	0.959
Ra-226	743.23	186.04	68.	24.	0.009	106.56	0.959s
U-235	820.28	205.32	67.	10.	0.004	233.34	0.978s
Pb-212	953.50	238.65	88.	174.	0.064	21.64	0.906
Pb-214	965.92	241.76	60.	49.	0.018	53.87	0.435s
Tl-208	1110.78	278.01	67.	-6.	-0.002	379.42	1.050

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:35
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-214	1180.03	295.33	72.	93.	0.035	36.67	1.293s
Pb-212	1199.73	300.26	60.	4.	0.002	516.08	1.072s
Ac-228	1351.97	338.35	44.	37.	0.014	60.39	1.109
Eu-152	1377.72	344.79	30.	10.	0.004	166.85	1.114s
Pb-214	1405.94	351.85	43.	138.	0.051	21.94	1.043
Pa-234	2275.26	569.29	25.	4.	0.001	373.65	1.316s
Tl-208	2331.54	583.36	29.	91.	0.034	26.48	1.263s
Bi-214	2435.44	609.34	46.	118.	0.044	25.38	1.142
Cs-137	2642.75	661.18	32.	-3.	-0.001	495.37	1.392s
Eu-154	2893.86	723.96	29.	-5.	-0.002	312.41	1.440s
Bi-212	2909.30	727.83	22.	10.	0.004	147.98	1.444s
Tl-208	3440.89	860.71	21.	6.	0.002	232.56	1.543s
Eu-154	3491.88	873.46	17.	1.	0.000	973.55	1.552s
Pa-234	3519.44	880.35	21.	-2.	-0.001	539.70	1.557s
Pa-234	3530.44	883.10	21.	2.	0.001	637.56	1.559s
Ac-228	3643.25	911.29	14.	54.	0.020	35.14	0.577s
Pa-234	3783.89	946.44	27.	1.	0.000	1324.52	1.602s
Ac-228	3873.98	968.96	8.	42.	0.015	39.54	0.937s
Eu-152	4446.89	1112.12	28.	1.	0.000	1833.48	1.708s
Bi-214	4480.20	1120.44	17.	32.	0.012	52.84	0.337s
Co-60	4693.03	1173.61	30.	-1.	0.000	1821.42	1.744s
Eu-152	5632.91	1408.37	9.	4.	0.001	263.06	1.866s
K-40	5843.01	1460.83	37.	677.	0.251	7.87	1.850
Bi-212	6484.64	1621.03	8.	1.	0.000	1050.90	1.956s
Bi-214	7057.98	1764.14	14.	11.	0.004	81.89	2.004s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	3.7695E-01					5.12E+12
			911.20	3.534E-01	(P	5.833E-02 1.76E+01	2.62E+01 G
			968.96	4.699E-01	@(	7.628E-02 1.98E+01	1.59E+01 G
			338.32	3.015E-01	?(	1.259E-01 3.02E+01	1.14E+01 G
							Energy duplication
			93.35	9.239E-04	} P	4.484E-01 1.36E+03	4.10E+00 XA
Am-241	I	-4.8138E-02					1.58E+05
			59.54	-4.814E-02	?(	1.306E-01 1.68E+02	3.59E+01 G
Bi-212	N	2.0646E-01					5.12E+12
			727.33	2.238E-01	?(	2.464E-01 7.40E+01	6.65E+00 G
			785.37	0.000E+00	&	2.161E+00 1.00E+03	1.11E+00 G
			1620.74	1.301E-01	&(	1.100E+00 5.25E+02	1.51E+00 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:35
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_014.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	3.6552E-01					5.84E+05	
			609.31	3.482E-01	(P	4.698E-02	1.27E+01	4.55E+01 G
			1120.29	4.185E-01	(P	1.285E-01	2.64E+01	1.49E+01 G
			1764.49	1.931E-01	- P	1.542E-01	4.09E+01	1.53E+01 G
Co-60	T	-9.4649E-04					1.93E+03	
			1332.49	-9.465E-04	%(	2.167E-02	1.40E+03	1.00E+02 G
			1173.23	-1.779E-03	+	2.651E-02	9.11E+02	9.98E+01 G
Cs-137	I	-5.5690E-03					1.10E+04	
			661.66	-5.569E-03	?(	2.216E-02	2.48E+02	8.50E+01 G
Eu-152	I	3.7448E-02					4.94E+03	
			344.28	3.581E-02	?(	4.558E-02	8.34E+01	2.66E+01 G
			121.78	3.782E-02	(	5.040E-02	8.42E+01	2.84E+01 G
			778.90	2.959E-03	%	1.391E-01	2.86E+03	1.30E+01 G
			964.08	5.085E-03	&	1.784E-01	2.14E+03	1.45E+01 G
			1112.08	1.214E-02	&	1.821E-01	9.17E+02	1.34E+01 G
			1408.01	3.903E-02	?(	7.728E-02	1.32E+02	2.09E+01 G
Eu-154	I	1.7991E-02					3.14E+03	
			873.18	1.701E-02	&(	1.341E-01	4.87E+02	1.22E+01 G
			123.07	1.828E-02	?(	3.133E-02	1.08E+02	4.04E+01 G
			1274.43	0.000E+00	-	9.693E-02	1.00E+03	3.49E+01 G
			723.30	-3.842E-02	+	9.480E-02	1.56E+02	2.00E+01 G
			1004.72	9.275E-04	%	9.492E-02	6.22E+03	1.79E+01 G
			996.25	3.654E-03	%	1.821E-01	3.03E+03	1.05E+01 G
K-40	N	1.5205E+01					4.57E+11	
			1460.82	1.521E+01	(P	3.172E-01	3.94E+00	1.06E+01 G
Pa-234	N	-5.8931E-02					1.63E+12	
			131.30	-5.893E-02	?(	8.908E-02	9.47E+01	1.82E+01 G
			569.50	5.475E-02	+	1.623E-01	1.87E+02	9.30E+00 G
			946.00	1.465E-02	+	1.582E-01	6.62E+02	1.35E+01 G
			880.52	-4.014E-02	+	1.735E-01	2.70E+02	1.05E+01 G
			883.24	3.644E-02	&	1.868E-01	3.19E+02	9.70E+00 G
Pb-212	N	2.9600E-01					5.12E+12	
			238.63	2.960E-01	(P	3.727E-02	1.08E+01	4.36E+01 G
			300.09	1.160E-01	-	4.845E-01	2.58E+02	3.18E+00 G
Pb-214	N	3.8873E-01					5.84E+05	
			351.93	3.676E-01	(P	4.094E-02	1.10E+01	3.56E+01 G
			295.22	4.297E-01	@(P	9.091E-02	1.83E+01	1.84E+01 G
			242.00	5.090E-01	+ P	1.853E-01	2.69E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:47:35
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   4.3194E-01                                     5.84E+05
                           186.21 4.319E-01  (  3.498E-01 5.33E+01 3.56E+00 G

Th-234   N   3.6925E-01                                     1.63E+12
                            63.30 2.580E-01 ?(  1.015E+00 2.42E+02 3.75E+00 G
                            92.59 4.653E-01 ?(  3.955E-01 5.48E+01 4.34E+00 G

Tl-208   N   1.3982E-01                                     5.12E+12
                           583.19 1.398E-01 @(P 1.945E-02 1.32E+01 8.50E+01 G
                           277.37-7.726E-02 -   2.361E-01 1.90E+02 6.60E+00 G
                           860.53 7.942E-02 -   1.423E-01 1.16E+02 1.24E+01 G

U-235    N   3.5784E-02                                     2.57E+11
                           143.77-1.235E-02 ?(  1.014E-01 5.03E+02 1.09E+01 G
                           205.32 1.397E-01 ?(  2.587E-01 1.17E+02 5.02E+00 G
                           163.36 1.267E-01 ?(  2.816E-01 1.38E+02 5.08E+00 G
                           185.72 2.777E-02  (  2.218E-02 5.25E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 6.442E-04 }   3.158E-01 1.36E+03 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:35
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_014.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.58	119.	-9.	-0.003	335.75	-4.814E-02
Th-234	63.57	121.	7.	0.002	483.77	2.580E-01
Th-234	92.75	114.	29.	0.011	109.58	4.653E-01
Eu-152	121.51	106.	18.	0.007	168.50	3.782E-02
Eu-154	121.54	82.	12.	0.005	215.69	1.828E-02
Pa-234	131.04	139.	-18.	-0.007	189.40	-5.893E-02
Ra-226	186.04	68.	24.	0.009	106.56	4.319E-01
Eu-152	344.79	30.	10.	0.004	166.85	3.581E-02
Pa-234	569.29	25.	4.	0.001	373.65	5.475E-02
Cs-137	661.18	32.	-3.	-0.001	495.37	-5.569E-03
Eu-154	723.96	29.	-5.	-0.002	312.41	-3.842E-02
Bi-212	727.83	22.	10.	0.004	147.98	2.238E-01
Eu-154	873.46	17.	1.	0.000	973.55	1.701E-02
Pa-234	880.35	21.	-2.	-0.001	539.70	-4.014E-02
Pa-234	883.10	21.	2.	0.001	637.56	3.644E-02
Pa-234	946.44	27.	1.	0.000	1324.52	1.465E-02
Eu-152	1112.12	28.	1.	0.000	1833.48	1.214E-02
Co-60	1173.61	30.	-1.	0.000	1821.42	-1.779E-03
Eu-152	1408.37	9.	4.	0.001	263.06	3.903E-02
Bi-212	1621.03	8.	1.	0.000	1050.90	1.301E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.7695E-01	3.7695E-01	1.0176E-01	1.0556E-01	5.833E-02
Am-241 #A	-4.8127E-02	-4.8138E-02	1.6162E-01	1.6166E-01	1.306E-01
Bi-212 #A	2.0646E-01	2.0646E-01	3.0552E-01	3.0574E-01	2.464E-01
Bi-214	3.6550E-01	3.6552E-01	9.9796E-02	1.0146E-01	4.698E-02
Co-60 #A	-9.2755E-04	-9.4649E-04	2.6470E-02	2.6470E-02	2.167E-02
Cs-137 #A	-5.5493E-03	-5.5690E-03	2.7587E-02	2.7588E-02	2.216E-02
Eu-152 #A	3.7154E-02	3.7448E-02	4.4208E-02	4.4250E-02	4.558E-02
Eu-154 #A	1.7769E-02	1.7991E-02	3.8803E-02	3.8816E-02	1.341E-01
K-40	1.5205E+01	1.5205E+01	1.2381E+00	1.4543E+00	3.172E-01
Pa-234 #A	-5.8931E-02	-5.8931E-02	1.1162E-01	1.1257E-01	8.908E-02
Pb-212	2.9600E-01	2.9600E-01	6.6704E-02	7.0124E-02	3.727E-02
Pb-214	3.8871E-01	3.8873E-01	8.6541E-02	8.8705E-02	4.094E-02
Ra-226 #	4.3192E-01	4.3194E-01	4.6030E-01	4.6097E-01	3.498E-01
Th-234 #A	3.6925E-01	3.6925E-01	4.0462E-01	4.0613E-01	1.015E+00
Tl-208 #	1.3982E-01	1.3982E-01	4.0015E-02	4.1119E-02	1.945E-02
U-235 A	3.5784E-02	3.5784E-02	3.7587E-02	3.7650E-02	1.014E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:47:35
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_014.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2035.1 keV)     1.677E+01  pCi/g
 Total Decayed Activity (   25.1 to  2035.1 keV) 1.6772064E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE01	Lab ID	: 251449-005	Client ID	: 04-PD-D0034-05
Seqnum	: 1504034935014	Matrix	: Soil	Acct	: ITSI (JG)
File	: 1_20140124_014	Batch	: 207004	Time	: 24-JAN-2014 17:01
Cal	: 24-JAN-2014 06:26:40,19-JUN-2013 18:43:28	Caldate	: 24-JAN-2014, 19-JUN-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 323.67 g	Live Time	: 2700 sec
				Dead Time	: 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0233	0.123		.15148	.15149	-0.0012	u
Bismuth-212	0.528	0.246		.43892	.43975	0.00031	u
Bismuth-214	0.371	0.0451		.094802	.096258	-0.011	u
Cesium-137	0.00438	0.0207	0.07	.025741	.025742	0.0048	u
Cobalt-60	-0.0154	0.0295		.03781	.037816	0.0015	u
Europium-152	0.0121	0.0582		.023292	.023299	0.020	u
Europium-154	0.0314	0.147		.060539	.060561	0.019	u
Lead-212	0.376	0.0362		.069982	.075078	-0.0075	u
Lead-214	0.418	0.0465		.091969	.094025	-0.025	u
Potassium-40	16.5	0.246		1.2745	1.5196	-0.068	u
Protactinium-234	0.0565	0.0932		.118	.11884	0.0066	u
Radium-226 (By Bismuth-214)	0.371	0.0451	0.2	.094802	.096258	-0.011	u
Thallium-208	0.0906	0.0170		.030454	.031	-0.0042	u
Thorium-232 (By Actinium-228)	0.382	0.0605		.12209	.12518	0.020	u
Thorium-234	0.743	0.959		1.2171	1.2192	0	u
Uranium-235	0.0733	0.120		.15108	.15115	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-05
Sample Description: 251449-005, 207004

Detector: HPGE01 50-TP42236A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:53
Acquisition Time: 1/24/2014 17:01:55
Analysis Time: 1/24/2014 17:47
Analysis Quantity: 3.237E+02 g

Spectrum ID: 1_20140124_014
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE01 S22147 1_20130619002_EffCal RA226
Efficiency Cal Date: 6/19/2013 18:43
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.824E-01	1.221E-01	1.252E-01	6.051E-02
Am-241	#AB	2.334E-02	1.515E-01	1.515E-01	1.234E-01
Bi-212	#	5.280E-01	4.389E-01	4.398E-01	2.455E-01
Bi-214		3.711E-01	9.480E-02	9.626E-02	4.506E-02
Co-60	#AB	-1.543E-02	3.781E-02	3.782E-02	2.952E-02
Cs-137	#AB	4.377E-03	2.574E-02	2.574E-02	2.074E-02
Eu-152	#AB	1.211E-02	2.329E-02	2.330E-02	5.819E-02
Eu-154	#AB	3.144E-02	6.054E-02	6.056E-02	1.474E-01
K-40		1.650E+01	1.275E+00	1.520E+00	2.459E-01
Pa-234	#AB	5.650E-02	1.180E-01	1.188E-01	9.318E-02
Pb-212		3.758E-01	6.998E-02	7.508E-02	3.621E-02
Pb-214		4.182E-01	9.197E-02	9.403E-02	4.646E-02
Ra-226	#AB	2.603E-01	5.757E-01	5.759E-01	4.605E-01
Th-234	#AB	7.427E-01	1.217E+00	1.219E+00	9.592E-01
Tl-208		9.056E-02	3.045E-02	3.100E-02	1.698E-02
U-235	#AB	7.333E-02	1.511E-01	1.511E-01	1.199E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.987E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:47:04
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_014.An1

Sample description
     251449-005, 207004


Spectrum Filename: C:\User\SPC\Det1\1_20140124_014.An1

Acquisition information
       Start time:                1/24/2014 17:01:55
       Live time:              2700
       Real time:              2702
       Dead time:                 0.06 %
       Detector ID:                   1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                  1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:26:40
            Zero offset:          0.000 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/19/2013 18:43:28
            Type:                 Polynomial
            Uncertainty:          1.382 %
            Coefficients:        -0.396420  -4.062121   0.406738
                                 -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.01keV )
       Stop channel:           8144 (  2035.50keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.2367E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.2367E+02) =
                                  8.3502E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:04
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_014.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:53:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	1_2013-12-28_0933.PBC 12/28/2013 09:33:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 14 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1527

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.31	4.	324.46	0.84	1.604E-02	59.54	35.920	PBC<MDA	Am241
63.70	18.	81.94	0.84	1.951E-02	63.30	3.750	PBC<MDA	Th234
77.25	74.	22.81	0.82	3.095E-02				
93.14	37.	46.04	0.88	4.044E-02	93.35	5.760	4.912E-01	U235
					93.35	4.100	6.901E-01	Ac228
					93.35	5.760	4.912E-01	U235
93.14	37.	46.04	0.88	4.044E-02	93.35	5.760	4.912E-01	U235
					93.35	4.100	6.901E-01	Ac228
122.61	15.	96.29	0.91	4.878E-02	123.07	40.400	PBC<MDA	Eu154
131.29	10.	162.66	0.92	4.960E-02	131.30	18.200	PBC<MDA	Pa234
143.26	13.	103.02	0.93	5.008E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	7.332E-02	U235
186.02	33.	46.48	0.50	4.795E-02	185.72	57.000	3.766E-02	U235
					185.72	57.000	3.766E-02	U235
186.33	14.	110.57	0.97	4.793E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	2.603E-01	Ra226
238.59	228.	9.31	1.03	4.295E-02	238.63	43.600	3.758E-01	Pb212
241.85	42.	35.29	0.34	4.262E-02	242.00	7.268	4.233E-01	Pb214
277.04	5.	145.06	1.07	3.941E-02	277.37	6.600	PBC<MDA	Tl208
295.23	95.	14.92	1.18	3.794E-02	295.22	18.414	3.943E-01	Pb214
299.68	9.	100.66	0.26	3.755E-02	300.09	3.180	PBC<MDA	Pb212
338.55	54.	25.78	0.56	3.477E-02	338.32	11.400	4.244E-01	Ac228
351.99	177.	10.38	0.52	3.388E-02	351.93	35.600	4.295E-01	Pb214
583.48	60.	15.55	1.36	2.410E-02	583.19	85.000	9.056E-02	Tl208
609.42	138.	11.79	1.14	2.339E-02	609.31	45.490	3.711E-01	Bi214
661.87	3.	294.07	1.42	2.212E-02	661.66	84.990	PBC<MDA	Cs137
727.01	14.	54.32	1.48	2.074E-02	727.33	6.650	3.150E-01	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:04
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_014.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
778.40	4.	205.15	1.52	1.979E-02	778.90	12.970	PBC<MDA	Eu152
785.62	11.	80.44	1.53	1.968E-02	785.37	1.110	PBC<MDA	Bi212
861.11	24.	27.65	0.51	1.847E-02	860.53	12.400	3.294E-01	Tl208
873.16	4.	168.05	1.60	1.829E-02	873.18	12.170	PBC<MDA	Eu154
880.85	6.	131.01	1.60	1.818E-02	880.52	10.500	PBC<MDA	Pa234
910.92	55.	15.81	0.68	1.775E-02	911.20	26.200	3.641E-01	Ac228
969.08	15.	47.59	1.67	1.700E-02	968.96	15.900	1.721E-01	Ac228
996.33	2.	385.65	1.69	1.666E-02	996.25	10.500	PBC<MDA	Eu154
1120.39	5.	85.11	1.78	1.531E-02	1120.29	14.910	PBC<MDA	Bi214
1407.86	4.	147.37	1.95	1.285E-02	1408.01	20.850	PBC<MDA	Eu152
1460.91	718.	3.77	1.92	1.247E-02	1460.82	10.550	1.650E+01	K40
1620.97	4.	78.27	2.06	1.143E-02	1620.74	1.510	PBC<MDA	Bi212
1764.45	8.	36.57	2.13	1.061E-02	1764.49	15.310	1.602E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
308.87	77.25	100.	74.	2.387E+03	45.62	0.819	-	M

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.15	59.31	97.	4.	0.002	648.93	0.839s
Th-234	254.68	63.70	95.	18.	0.007	163.88	0.843s
Th-234	363.03	90.80	134.	-25.	-0.009	135.26	0.875s
U-235	373.25	93.35	127.	37.	0.014	92.09	0.875D
Ac-228	373.25	93.35	127.	37.	0.014	92.09	0.875D
Eu-154	490.23	122.61	97.	15.	0.006	192.59	0.907s
Pa-234	524.93	131.29	136.	10.	0.004	325.31	0.916s
U-235	572.81	143.26	83.	13.	0.005	206.05	0.929s
U-235	652.85	163.28	112.	-2.	-0.001	1375.37	0.950s
U-235	743.86	186.04	115.	18.	0.007	175.02	0.973s
Ra-226	745.01	186.33	119.	14.	0.005	221.13	0.974s
U-235	822.51	205.71	121.	-3.	-0.001	1098.41	0.994s
Pb-212	954.00	238.59	88.	228.	0.084	18.62	1.032

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:04
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_014.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-214	967.04	241.85	76.	42.	0.016	70.57	0.338s
Tl-208	1107.77	277.04	61.	5.	0.002	290.13	1.067s
Pb-214	1180.52	295.23	45.	89.	0.033	29.84	1.180
Pb-212	1198.30	299.68	35.	9.	0.003	201.32	0.264s
Ac-228	1353.74	338.55	53.	54.	0.020	51.55	0.559s
Eu-152	1376.96	344.36	54.	-8.	-0.003	278.88	1.134s
Pb-214	1407.49	351.99	60.	168.	0.062	20.77	0.523s
Pa-234	2274.11	568.68	30.	-5.	-0.002	351.22	1.344s
Tl-208	2333.33	583.48	23.	60.	0.022	31.10	1.357
Bi-214	2437.08	609.42	44.	128.	0.047	23.57	1.141
Cs-137	2646.86	661.87	29.	3.	0.001	588.15	1.425s
Eu-154	2887.97	722.14	22.	-3.	-0.001	455.74	1.477s
Bi-212	2907.44	727.01	22.	14.	0.005	108.63	1.480s
Eu-152	3113.00	778.40	24.	4.	0.001	410.30	1.522s
Bi-212	3141.89	785.62	31.	11.	0.004	160.87	1.528s
Tl-208	3443.89	861.11	7.	24.	0.009	55.30	0.510s
Eu-154	3492.09	873.16	20.	4.	0.001	336.10	1.597s
Pa-234	3522.84	880.85	25.	6.	0.002	262.02	1.603s
Ac-228	3643.15	910.92	15.	55.	0.020	31.62	0.681s
Eu-152	3854.97	963.86	32.	-3.	-0.001	604.29	1.666s
Ac-228	3875.83	969.08	29.	15.	0.006	95.19	1.669s
Eu-154	3984.88	996.33	23.	2.	0.001	771.30	1.689s
Bi-214	4481.23	1120.39	34.	5.	0.002	170.22	1.776s
Co-60	4693.50	1173.44	42.	-6.	-0.002	294.32	1.811s
Co-60	5331.18	1332.79	29.	-7.	-0.002	245.04	1.910s
Eu-152	5631.60	1407.86	12.	4.	0.001	294.73	1.954s
K-40	5843.93	1460.91	20.	702.	0.260	7.55	1.915
Bi-212	6484.55	1620.97	3.	4.	0.002	156.54	2.065s
Bi-214	7058.87	1764.45	8.	8.	0.003	73.15	2.129s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	3.8241E-01					5.12E+12
			911.20	3.641E-01	(P	6.051E-02 1.58E+01 2.62E+01 G	
			968.96	1.721E-01	- P	1.432E-01 4.76E+01 1.59E+01 G	
			338.32	4.244E-01	(P	1.318E-01 2.58E+01 1.14E+01 G	
							Energy duplication
			93.35	6.901E-01	+	4.890E-01 4.60E+01 4.10E+00 XA	
Am-241	I	2.3343E-02					1.58E+05
			59.54	2.334E-02	?(	1.234E-01 3.24E+02 3.59E+01 G	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:04
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_014.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-212	N	5.2803E-01					5.12E+12	
			727.33	3.150E-01	?(	2.455E-01	5.43E+01	6.65E+00 G
			785.37	1.502E+00	?(	1.839E+00	8.04E+01	1.11E+00 G
			1620.74	7.506E-01	?(	7.563E-01	7.83E+01	1.51E+00 G
Bi-214	N	3.7112E-01					5.84E+05	
			609.31	3.711E-01	(P	4.506E-02	1.18E+01	4.55E+01 G
			1120.29	6.486E-02	- P	1.852E-01	8.51E+01	1.49E+01 G
			1764.49	1.602E-01	- P	1.273E-01	3.66E+01	1.53E+01 G
Co-60	T	-1.5430E-02					1.93E+03	
			1332.49	-1.543E-02	?(	2.952E-02	1.23E+02	1.00E+02 G
			1173.23	-1.386E-02	+	3.239E-02	1.47E+02	9.98E+01 G
Cs-137	I	4.3767E-03					1.10E+04	
			661.66	4.377E-03	?(	2.074E-02	2.94E+02	8.50E+01 G
Eu-152	I	1.2109E-02					4.94E+03	
			344.28	-2.622E-02	?(	5.819E-02	1.39E+02	2.66E+01 G
			121.78	-1.205E-03	%	5.668E-02	2.86E+03	2.84E+01 G
			778.90	4.282E-02	?(	1.398E-01	2.05E+02	1.30E+01 G
			964.08	-3.422E-02	+	1.669E-01	3.02E+02	1.45E+01 G
			1112.08	6.953E-03	%	1.830E-01	1.60E+03	1.34E+01 G
			1408.01	4.189E-02	?(	9.498E-02	1.47E+02	2.09E+01 G
Eu-154	I	3.1435E-02					3.14E+03	
			873.18	5.578E-02	?(	1.474E-01	1.68E+02	1.22E+01 G
			123.07	2.392E-02	&(	3.656E-02	9.63E+01	4.04E+01 G
			1274.43	8.499E-04	%	6.637E-02	4.75E+03	3.49E+01 G
			723.30	-2.275E-02	+	8.263E-02	2.28E+02	2.00E+01 G
			1004.72	-1.811E-03	%	1.121E-01	3.77E+03	1.79E+01 G
			996.25	3.215E-02	?(	2.004E-01	3.86E+02	1.05E+01 G
K-40	N	1.6498E+01					4.57E+11	
			1460.82	1.650E+01	(P	2.459E-01	3.77E+00	1.06E+01 G
Pa-234	N	5.6500E-02					1.63E+12	
			131.30	3.542E-02	?(	9.318E-02	1.63E+02	1.82E+01 G
			569.50	-6.207E-02	+	1.731E-01	1.76E+02	9.30E+00 G
			946.00	-2.612E-03	%	1.486E-01	3.46E+03	1.35E+01 G
			880.52	9.303E-02	&(	1.903E-01	1.31E+02	1.05E+01 G
			883.24	0.000E+00	-	2.353E-01	1.00E+03	9.70E+00 G
Pb-212	N	3.7578E-01					5.12E+12	
			238.63	3.758E-01	(	3.621E-02	9.31E+00	4.36E+01 G
			300.09	2.383E-01	-	3.560E-01	1.01E+02	3.18E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 17:47:04
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_014.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   4.1816E-01                                     5.84E+05
                          351.93 4.295E-01 @(P 4.646E-02 1.04E+01 3.56E+01 G
                          295.22 3.943E-01  (P 6.916E-02 1.49E+01 1.84E+01 G
                          242.00 4.233E-01  (  2.023E-01 3.53E+01 7.27E+00 G

Ra-226   N   2.6032E-01                                     5.84E+05
                          186.21 2.603E-01 ?(  4.605E-01 1.11E+02 3.56E+00 G

Th-234   N   7.4271E-01                                     1.63E+12
                           63.30 7.427E-01  (  9.592E-01 8.19E+01 3.75E+00 G
                           92.59-4.492E-01 -   4.784E-01 6.76E+01 4.34E+00 G

Tl-208   N   9.0558E-02                                     5.12E+12
                          583.19 9.056E-02 ?(P 1.698E-02 1.56E+01 8.50E+01 G
                          277.37 6.280E-02 & P 2.168E-01 1.45E+02 6.60E+00 G
                          860.53 3.294E-01 +   8.082E-02 2.77E+01 1.24E+01 G

U-235    N   7.3325E-02                                     2.57E+11
                          143.77 7.332E-02 &(  1.199E-01 1.03E+02 1.09E+01 G
                          205.32-3.795E-02 -   3.414E-01 5.49E+02 5.02E+00 G
                          163.36-2.686E-02 -   3.028E-01 6.88E+02 5.08E+00 G
                          185.72 2.037E-02 -   2.828E-02 8.75E+01 5.70E+01 G
                                                          Energy duplication
                           93.35 4.912E-01     3.480E-01 4.60E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:04
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_014.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.31	97.	4.	0.002	648.93	2.334E-02
Th-234	63.70	95.	18.	0.007	163.88	7.427E-01
Th-234	90.80	134.	-25.	-0.009	135.26	-4.492E-01
U-235	93.35	127.	37.	0.014	92.09	4.912E-01
Eu-154	122.61	97.	15.	0.006	192.59	2.392E-02
Pa-234	131.29	136.	10.	0.004	325.31	3.542E-02
U-235	143.26	83.	13.	0.005	206.05	7.332E-02
U-235	163.28	112.	-2.	-0.001	1375.37	-2.686E-02
U-235	186.04	115.	18.	0.007	175.02	2.037E-02
U-235	205.71	121.	-3.	-0.001	1098.41	-3.795E-02
Eu-152	344.36	54.	-8.	-0.003	278.88	-2.622E-02
Pa-234	568.68	30.	-5.	-0.002	351.22	-6.207E-02
Cs-137	661.87	29.	3.	0.001	588.15	4.377E-03
Eu-154	722.14	22.	-3.	-0.001	455.74	-2.275E-02
Bi-212	727.01	22.	14.	0.005	108.63	3.150E-01
Eu-152	778.40	24.	4.	0.001	410.30	4.282E-02
Bi-212	785.62	31.	11.	0.004	160.87	1.502E+00
Eu-154	873.16	20.	4.	0.001	336.10	5.578E-02
Pa-234	880.85	25.	6.	0.002	262.02	9.303E-02
Eu-152	963.86	32.	-3.	-0.001	604.29	-3.422E-02
Eu-154	996.33	23.	2.	0.001	771.30	3.215E-02
Co-60	1173.44	42.	-6.	-0.002	294.32	-1.386E-02
Co-60	1332.79	29.	-7.	-0.002	245.04	-1.543E-02
Eu-152	1407.86	12.	4.	0.001	294.73	4.189E-02
Bi-212	1620.97	3.	4.	0.002	156.54	7.506E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.8241E-01	3.8241E-01	1.2209E-01	1.2518E-01	6.051E-02
Am-241 #A	2.3337E-02	2.3343E-02	1.5148E-01	1.5149E-01	1.234E-01
Bi-212 #	5.2803E-01	5.2803E-01	4.3892E-01	4.3975E-01	2.455E-01
Bi-214	3.7109E-01	3.7112E-01	9.4802E-02	9.6258E-02	4.506E-02
Co-60 #A	-1.5121E-02	-1.5430E-02	3.7810E-02	3.7816E-02	2.952E-02
Cs-137 #A	4.3612E-03	4.3767E-03	2.5741E-02	2.5742E-02	2.074E-02
Eu-152 #A	1.2014E-02	1.2109E-02	2.3292E-02	2.3299E-02	5.819E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 17:47:04
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_014.An1

Eu-154 #A	3.1048E-02	3.1435E-02	6.0539E-02	6.0561E-02	1.474E-01
K-40	1.6498E+01	1.6498E+01	1.2745E+00	1.5196E+00	2.459E-01
Pa-234 #A	5.6500E-02	5.6500E-02	1.1800E-01	1.1884E-01	9.318E-02
Pb-212	3.7578E-01	3.7578E-01	6.9982E-02	7.5078E-02	3.621E-02
Pb-214	4.1813E-01	4.1816E-01	9.1969E-02	9.4025E-02	4.646E-02
Ra-226 #A	2.6030E-01	2.6032E-01	5.7566E-01	5.7585E-01	4.605E-01
Th-234 #A	7.4271E-01	7.4271E-01	1.2171E+00	1.2192E+00	9.592E-01
Tl-208	9.0558E-02	9.0558E-02	3.0454E-02	3.1000E-02	1.698E-02
U-235 #A	7.3325E-02	7.3325E-02	1.5108E-01	1.5115E-01	1.199E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.5 keV) 1.814E+01 pCi/g
Total Decayed Activity (25.0 to 2035.5 keV) 1.8135857E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE03	Lab ID	: 251449-006	Client ID	: 04-PD-D0034-06
Seqnum	: 1524034937015	Matrix	: Soil	Acct	: ITSI (JG)
File	: 3_20140124_015	Batch	: 207004	Time	: 24-JAN-2014 17:53
Cal	: 24-JAN-2014 06:28:35,29-APR-2013 08:26:15	Caldate	: 24-JAN-2014, 29-APR-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 340.92 g	Live Time	: 2700 sec
				Dead Time	: 0.1 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0836	0.127		.16025	.16036	-0.0012	u
Bismuth-212	0.170	0.234		.37247	.37258	0.00031	u
Bismuth-214	0.285	0.0384		.074978	.076067	-0.011	u
Cesium-137	0.000335	0.0227	0.07	.027585	.027585	0.0048	u
Cobalt-60	0.0120	0.0177		.021401	.021408	0.0015	u
Europium-152	0.0118	0.0558		.027801	.027807	0.020	u
Europium-154	-0.0193	0.175		.21484	.21484	0.019	u
Lead-212	0.271	0.0356		.063999	.066935	-0.0075	u
Lead-214	0.339	0.0414		.0798	.081357	-0.025	u
Potassium-40	15.8	0.227		1.2267	1.4603	-0.068	u
Protactinium-234	0.0107	0.0920		.050616	.050686	0.0066	u
Radium-226 (By Bismuth-214)	0.285	0.0384	0.2	.074978	.076067	-0.011	u
Thallium-208	0.0966	0.0199		.033458	.034023	-0.0042	u
Thorium-232 (By Actinium-228)	0.531	0.0640		.16061	.16513	0.020	u
Thorium-234	0.162	1.17		.51616	.51638	0	u
Uranium-235	0.0273	0.109		.027197	.027247	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-06
Sample Description: 251449-006, 207004

Detector: HPGE03 51-TP42227A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:55
Acquisition Time: 1/24/2014 17:53:12
Analysis Time: 1/24/2014 18:38
Analysis Quantity: 3.409E+02 g

Spectrum ID: 3_20140124_015
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.10 %

Efficiency: HPGE03 S22147 3_20130428002_EffCal RA226
Efficiency Cal Date: 4/29/2013 08:26
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		5.306E-01	1.606E-01	1.651E-01	6.397E-02
Am-241	#AB	-8.364E-02	1.602E-01	1.604E-01	1.267E-01
Bi-212	#AB	1.705E-01	3.725E-01	3.726E-01	2.337E-01
Bi-214		2.853E-01	7.498E-02	7.607E-02	3.844E-02
Co-60	#AB	1.197E-02	2.140E-02	2.141E-02	1.766E-02
Cs-137	#AB	3.352E-04	2.759E-02	2.759E-02	2.269E-02
Eu-152	#AB	1.179E-02	2.780E-02	2.781E-02	5.577E-02
Eu-154	#AB	-1.926E-02	2.148E-01	2.148E-01	1.749E-01
K-40		1.579E+01	1.227E+00	1.460E+00	2.274E-01
Pa-234	#AB	1.068E-02	5.062E-02	5.069E-02	9.200E-02
Pb-212		2.710E-01	6.400E-02	6.693E-02	3.560E-02
Pb-214		3.388E-01	7.980E-02	8.136E-02	4.144E-02
Ra-226	#	6.591E-01	4.741E-01	4.756E-01	3.476E-01
Th-234	#AB	1.624E-01	5.162E-01	5.164E-01	1.171E+00
Tl-208	#	9.658E-02	3.346E-02	3.402E-02	1.988E-02
U-235	#AB	2.730E-02	2.720E-02	2.725E-02	1.092E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.837E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:38:22
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_015.An1

Sample description
     251449-006, 207004


Spectrum Filename: C:\User\SPC\Det3\3_20140124_015.An1

Acquisition information
       Start time:                 1/24/2014 17:53:12
       Live time:               2700
       Real time:               2703
       Dead time:                  0.10 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:28:35
            Zero offset:          -0.141 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/29/2013 08:26:15
            Type:                  Polynomial
            Uncertainty:           1.273 %
            Coefficients:         -0.381561  -4.120787   0.430562
                                  -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.88keV )
       Stop channel:            8144 (  2035.17keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4092E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4092E+02) =
                                   7.9277E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:22
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_015.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:55:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	3_2013-12-28_0934.PBC 12/28/2013 09:34:58
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0710

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.81	4.	396.49	0.87	1.671E-02	63.30	3.750	PBC<MDA	Th234
					63.30	3.750	1.808E-01	Th234
74.76	48.	29.66	0.88	2.588E-02				
77.06	77.	20.96	0.88	2.754E-02				
92.92	47.	34.66	0.51	3.718E-02	93.35	4.100	9.052E-01	Ac228
					93.35	5.760	6.443E-01	U235
93.50	35.	45.37	0.89	3.718E-02	93.35	5.760	4.766E-01	U235
					92.59	4.343	6.384E-01	Th234
95.29	8.	158.96	0.89	3.682E-02				
121.17	10.	117.93	0.92	4.597E-02	121.78	28.410	PBC<MDA	Eu152
185.94	29.	49.81	0.97	4.662E-02	185.72	57.000	3.239E-02	U235
					186.21	3.555	5.197E-01	Ra226
					185.72	57.000	3.239E-02	U235
186.03	37.	35.97	0.97	4.658E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	6.591E-01	Ra226
204.96	2.	552.00	0.99	4.503E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	3.233E-02	U235
238.55	178.	11.19	0.73	4.203E-02	238.63	43.600	2.710E-01	Pb212
241.98	26.	62.53	1.02	4.172E-02	242.00	7.268	2.543E-01	Pb214
277.57	0.	360.62	1.05	3.864E-02	277.37	6.600	PBC<MDA	Tl208
295.34	97.	18.84	1.15	3.720E-02	295.22	18.414	3.865E-01	Pb214
300.54	21.	48.96	1.07	3.683E-02	300.09	3.180	5.317E-01	Pb212
338.64	32.	36.31	1.10	3.412E-02	338.32	11.400	2.391E-01	Ac228
352.01	137.	11.15	0.74	3.324E-02	351.93	35.600	3.142E-01	Pb214
569.88	2.	513.36	1.30	2.396E-02	569.50	9.300	PBC<MDA	Pa234
583.17	77.	15.79	1.11	2.357E-02	583.19	85.000	1.083E-01	Tl208
609.21	99.	11.47	1.34	2.287E-02	609.31	45.490	2.789E-01	Bi214

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:22
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_015.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
727.30	5.	130.38	1.43	2.025E-02	727.33	6.650	PBC<MDA	Bi212
					727.33	6.650	1.154E-01	Bi212
775.47	1.	340.57	1.47	1.932E-02	778.90	12.970	PBC<MDA	Eu152
785.41	4.	175.35	1.48	1.921E-02	785.37	1.110	PBC<MDA	Bi212
					785.37	1.110	5.004E-01	Bi212
860.67	40.	23.10	0.31	1.803E-02	860.53	12.400	5.189E-01	Tl208
882.67	2.	423.66	1.56	1.770E-02	883.24	9.700	PBC<MDA	Pa234
911.24	82.	15.13	0.59	1.732E-02	911.20	26.200	5.306E-01	Ac228
946.95	2.	455.05	1.61	1.687E-02	946.00	13.500	PBC<MDA	Pa234
969.45	24.	40.81	1.63	1.658E-02	968.96	15.900	2.632E-01	Ac228
1120.27	23.	30.40	1.75	1.494E-02	1120.29	14.910	3.049E-01	Bi214
1173.34	8.	91.97	1.80	1.444E-02	1173.23	99.850	PBC<MDA	Co60
1330.31	3.	153.26	1.93	1.311E-02	1332.49	99.983	PBC<MDA	Co60
1408.32	1.	478.87	1.99	1.255E-02	1408.01	20.850	PBC<MDA	Eu152
1460.94	707.	3.80	1.71	1.219E-02	1460.82	10.550	1.579E+01	K40
1764.90	10.	42.45	2.28	1.039E-02	1764.49	15.310	1.932E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
299.22	74.73	85.	27.	1.059E+03	100.12	0.604	- s
308.42	77.03	108.	59.	2.149E+03	57.09	0.633	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	236.91	59.14	80.	-14.	-0.005	191.60	0.864s
Th-234	255.60	63.81	115.	4.	0.001	792.98	0.867s
Th-234	381.39	95.29	76.	8.	0.003	317.93	0.892s
Ac-228	373.66	93.35	91.	47.	0.017	69.32	0.506D
U-235	373.66	93.35	107.	35.	0.013	90.74	0.893D
Eu-152	484.86	121.17	69.	10.	0.004	235.86	0.917s
Pa-234	524.65	131.13	134.	-3.	-0.001	997.73	0.925s
U-235	662.24	165.55	66.	-5.	-0.002	498.50	0.952s
U-235	743.74	185.94	92.	29.	0.011	99.61	0.971s
Ra-226	744.09	186.03	71.	37.	0.014	71.93	0.972

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:22
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_015.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	819.76	204.96	93.	2.	0.001	1104.00	0.988s
Pb-212	954.05	238.55	91.	169.	0.063	22.39	0.733s
Pb-214	967.75	241.98	122.	26.	0.010	125.06	1.019s
Pb-214	1181.09	295.34	78.	90.	0.033	37.68	1.154
Pb-212	1201.88	300.54	43.	21.	0.008	97.93	1.068
Ac-228	1354.18	338.64	50.	32.	0.012	72.61	1.100s
Pb-214	1407.64	352.01	51.	127.	0.047	22.31	0.742s
Pa-234	2278.85	569.88	37.	2.	0.001	1026.71	1.295s
Tl-208	2332.06	583.19	34.	66.	0.024	32.96	1.307
Bi-214	2436.13	609.21	34.	99.	0.037	22.94	1.337
Eu-154	2890.16	722.73	39.	-5.	-0.002	388.84	1.424s
Bi-212	2908.42	727.30	21.	5.	0.002	260.76	1.427s
Eu-152	3101.14	775.47	5.	1.	0.000	681.13	1.470s
Bi-212	3140.88	785.41	18.	4.	0.001	350.70	1.476s
Tl-208	3441.95	860.67	12.	40.	0.015	46.20	0.310s
Eu-154	3494.45	873.79	30.	-1.	-0.001	1115.70	1.549s
Pa-234	3529.98	882.67	22.	2.	0.001	847.32	1.557s
Ac-228	3644.29	911.24	18.	82.	0.030	30.27	0.594s
Pa-234	3787.13	946.95	25.	2.	0.001	910.11	1.610s
Ac-228	3877.17	969.45	35.	24.	0.009	81.62	1.629s
Eu-152	4445.71	1111.53	26.	-4.	-0.002	350.68	1.747s
Bi-214	4480.65	1120.27	21.	23.	0.009	60.80	1.754s
Co-60	4693.06	1173.34	23.	8.	0.003	183.93	1.798s
Co-60	5321.33	1330.31	11.	3.	0.001	306.53	1.929s
Eu-152	5633.58	1408.32	16.	1.	0.000	957.74	1.991s
K-40	5844.27	1460.94	18.	692.	0.256	7.60	1.708
Bi-214	7061.37	1764.90	16.	10.	0.004	84.90	2.282s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	5.3063E-01					5.12E+12
			911.20	5.306E-01	(	6.397E-02 1.51E+01 2.62E+01	G
			968.96	2.632E-01	-	1.528E-01 4.08E+01 1.59E+01	G
			338.32	2.391E-01	-	1.247E-01 3.63E+01 1.14E+01	G
							Energy duplication
			93.35	9.052E-01	+	4.281E-01 3.47E+01 4.10E+00	XA
Am-241	I	-8.3635E-02					1.58E+05
			59.54	-8.364E-02	?(	1.267E-01 9.58E+01 3.59E+01	G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:22
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_015.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-212	N	1.7046E-01					5.12E+12	
			727.33	1.154E-01	(	2.337E-01	1.30E+02	6.65E+00 G
			785.37	5.004E-01	?(	1.379E+00	1.75E+02	1.11E+00 G
			1620.74	0.000E+00	-	1.775E+00	1.00E+03	1.51E+00 G
Bi-214	N	2.8529E-01					5.84E+05	
			609.31	2.789E-01	(P	3.844E-02	1.15E+01	4.55E+01 G
			1120.29	3.049E-01	?(P	1.408E-01	3.04E+01	1.49E+01 G
			1764.49	1.932E-01	- P	1.735E-01	4.24E+01	1.53E+01 G
Co-60	T	1.1973E-02					1.93E+03	
			1332.49	7.499E-03	&(	1.766E-02	1.53E+02	1.00E+02 G
			1173.23	1.645E-02	?(	2.299E-02	9.20E+01	9.98E+01 G
Cs-137	I	3.3519E-04					1.10E+04	
			661.66	3.352E-04	%(	2.269E-02	4.11E+03	8.50E+01 G
Eu-152	I	1.1787E-02					4.94E+03	
			344.28	-1.771E-03	&(	5.577E-02	1.92E+03	2.66E+01 G
			121.78	2.338E-02	?(	4.381E-02	1.18E+02	2.84E+01 G
			778.90	1.144E-02	?(	6.127E-02	3.41E+02	1.30E+01 G
			964.08	0.000E+00	-	3.577E-01	1.00E+03	1.45E+01 G
			1112.08	-6.250E-02	+	1.735E-01	1.75E+02	1.34E+01 G
			1408.01	1.350E-02	?(	1.045E-01	4.79E+02	2.09E+01 G
Eu-154	I	-1.9256E-02					3.14E+03	
			873.18	-1.926E-02	?(	1.749E-01	5.58E+02	1.22E+01 G
			123.07	2.600E-05	%	3.247E-02	7.58E+04	4.04E+01 G
			1274.43	0.000E+00	&	7.509E-02	1.00E+03	3.49E+01 G
			723.30	-3.409E-02	+	1.061E-01	1.94E+02	2.00E+01 G
			1004.72	0.000E+00	+	1.147E-01	1.00E+03	1.79E+01 G
			996.25	0.000E+00	&	1.942E-01	1.00E+03	1.05E+01 G
K-40	N	1.5794E+01					4.57E+11	
			1460.82	1.579E+01	(P	2.274E-01	3.80E+00	1.06E+01 G
Pa-234	N	1.0677E-02					1.63E+12	
			131.30	-1.126E-02	&(	9.200E-02	4.99E+02	1.82E+01 G
			569.50	2.238E-02	?(	1.872E-01	5.13E+02	9.30E+00 G
			946.00	2.022E-02	?(	1.493E-01	4.55E+02	1.35E+01 G
			880.52	0.000E+00	-	2.315E-01	1.00E+03	1.05E+01 G
			883.24	2.733E-02	&(	1.874E-01	4.24E+02	9.70E+00 G
Pb-212	N	2.7097E-01					5.12E+12	
			238.63	2.710E-01	(P	3.560E-02	1.12E+01	4.36E+01 G
			300.09	5.317E-01	+	3.845E-01	4.90E+01	3.18E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:38:22
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_015.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   3.3883E-01                                     5.84E+05
                           351.93 3.142E-01  (P 4.144E-02 1.12E+01 3.56E+01 G
                           295.22 3.865E-01  (P 8.809E-02 1.88E+01 1.84E+01 G
                           242.00 2.543E-01 &   2.489E-01 6.25E+01 7.27E+00 G

Ra-226   N   6.5913E-01                                     5.84E+05
                           186.21 6.591E-01  (  3.476E-01 3.60E+01 3.56E+00 G

Th-234   N   1.6235E-01                                     1.63E+12
                            63.30 1.808E-01 &(  1.171E+00 3.96E+02 3.75E+00 G
                            92.59 1.464E-01  (  3.738E-01 1.59E+02 4.34E+00 G

Tl-208   N   9.6577E-02                                     5.12E+12
                           583.19 9.658E-02 ?(P 1.988E-02 1.65E+01 8.50E+01 G
                           277.37 2.409E-04 & P 1.942E-01 3.61E+02 6.60E+00 G
                           860.53 5.189E-01 +   1.082E-01 2.31E+01 1.24E+01 G

U-235    N   2.7303E-02                                     2.57E+11
                           143.77-1.489E-03 &(  1.092E-01 4.46E+03 1.09E+01 G
                           205.32 3.233E-02 ?(  2.921E-01 5.52E+02 5.02E+00 G
                           163.36-5.655E-02 +   2.282E-01 2.49E+02 5.08E+00 G
                           185.72 3.239E-02 *(  2.468E-02 4.98E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 4.766E-01 &   3.304E-01 4.54E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:22
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_015.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.14	80.	-14.	-0.005	191.60	-8.364E-02
Th-234	63.81	115.	4.	0.001	792.98	1.808E-01
Th-234	95.29	76.	8.	0.003	317.93	1.464E-01
U-235	93.35	107.	35.	0.013	90.74	4.766E-01
Eu-152	121.17	69.	10.	0.004	235.86	2.338E-02
Pa-234	131.13	134.	-3.	-0.001	997.73	-1.126E-02
U-235	165.55	66.	-5.	-0.002	498.50	-5.655E-02
U-235	185.94	92.	29.	0.011	99.61	3.239E-02
Ra-226	186.03	71.	37.	0.014	71.93	6.591E-01
U-235	204.96	93.	2.	0.001	1104.00	3.233E-02
Pa-234	569.88	37.	2.	0.001	1026.71	2.238E-02
Eu-154	722.73	39.	-5.	-0.002	388.84	-3.409E-02
Bi-212	727.30	21.	5.	0.002	260.76	1.154E-01
Eu-152	775.47	5.	1.	0.000	681.13	1.144E-02
Bi-212	785.41	18.	4.	0.001	350.70	5.004E-01
Eu-154	873.79	30.	-1.	-0.001	1115.70	-1.926E-02
Pa-234	882.67	22.	2.	0.001	847.32	2.733E-02
Pa-234	946.95	25.	2.	0.001	910.11	2.022E-02
Eu-152	1111.53	26.	-4.	-0.002	350.68	-6.250E-02
Co-60	1173.34	23.	8.	0.003	183.93	1.645E-02
Co-60	1330.31	11.	3.	0.001	306.53	7.499E-03
Eu-152	1408.32	16.	1.	0.000	957.74	1.350E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	5.3063E-01	5.3063E-01	1.6061E-01	1.6513E-01	6.397E-02
Am-241 #A	-8.3614E-02	-8.3635E-02	1.6025E-01	1.6036E-01	1.267E-01
Bi-212 #A	1.7046E-01	1.7046E-01	3.7247E-01	3.7258E-01	2.337E-01
Bi-214	2.8527E-01	2.8529E-01	7.4978E-02	7.6067E-02	3.844E-02
Co-60 #A	1.1733E-02	1.1973E-02	2.1401E-02	2.1408E-02	1.766E-02
Cs-137 #A	3.3400E-04	3.3519E-04	2.7585E-02	2.7585E-02	2.269E-02
Eu-152 #A	1.1695E-02	1.1787E-02	2.7801E-02	2.7807E-02	5.577E-02
Eu-154 #A	-1.9019E-02	-1.9256E-02	2.1484E-01	2.1484E-01	1.749E-01
K-40	1.5794E+01	1.5794E+01	1.2267E+00	1.4603E+00	2.274E-01
Pa-234 #A	1.0677E-02	1.0677E-02	5.0616E-02	5.0686E-02	9.200E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:22
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_015.An1

Pb-212	2.7097E-01	2.7097E-01	6.3999E-02	6.6935E-02	3.560E-02
Pb-214	3.3880E-01	3.3883E-01	7.9800E-02	8.1357E-02	4.144E-02
Ra-226 #	6.5908E-01	6.5913E-01	4.7414E-01	4.7563E-01	3.476E-01
Th-234 #A	1.6235E-01	1.6235E-01	5.1616E-01	5.1638E-01	1.171E+00
Tl-208 #	9.6577E-02	9.6577E-02	3.3458E-02	3.4023E-02	1.988E-02
U-235 #A	2.7303E-02	2.7303E-02	2.7197E-02	2.7247E-02	1.092E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (24.9 to 2035.2 keV) 1.732E+01 pCi/g
Total Decayed Activity (24.9 to 2035.2 keV) 1.7316795E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514034951015
File : 2_20140124_015
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58
IDF : 1.0
PDF : 1.0

Lab ID : 251449-007
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 07-JAN-2014
Sample Amount : 339.57 g

Client ID : 04-PD-D0034-07
Acct : ITSI (JG)
Time : 24-JAN-2014 17:52
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.11 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0860	0.114		.14439	.14453	-0.0012	u
Bismuth-212	0.361	0.284		.39652	.39702	0.00031	u
Bismuth-214	0.385	0.0359		.084771	.086938	-0.011	u
Cesium-137	0.0346	0.0171	0.07	.025627	.025686	0.0048	u
Cobalt-60	0.00614	0.0250		.03122	.031221	0.0015	u
Europium-152	-0.000532	0.0678		.0011888	.0011891	0.020	u
Europium-154	0.0465	0.173		.089925	.089961	0.019	u
Lead-212	0.361	0.0346		.066107	.071164	-0.0075	u
Lead-214	0.382	0.0431		.088425	.090475	-0.025	u
Potassium-40	17.3	0.306		1.302	1.5658	-0.068	u
Protactinium-234	0.0157	0.0783		.023166	.023491	0.0066	u
Radium-226 (By Bismuth-214)	0.385	0.0359	0.2	.084771	.086938	-0.011	u
Thallium-208	0.137	0.0214		.041587	.042603	-0.0042	u
Thorium-232 (By Actinium-228)	0.469	0.0649		.11764	.12271	0.020	u
Thorium-234	0.583	0.909		.55396	.5567	0	u
Uranium-235	0.0648	0.134		.044404	.044577	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-07
Sample Description: 251449-007, 207004

Detector: HPGE02 50-TP42234A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:57
Acquisition Time: 1/24/2014 17:52:44
Analysis Time: 1/24/2014 18:37
Analysis Quantity: 3.396E+02 g

Spectrum ID: 2_20140124_015
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.11 %

Efficiency: HPGE02 S23325 2_20140106002_EffCal RA226
Efficiency Cal Date: 1/7/2014 11:47
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.692E-01	1.176E-01	1.227E-01	6.490E-02
Am-241	#AB	8.599E-02	1.444E-01	1.445E-01	1.139E-01
Bi-212	#	3.612E-01	3.965E-01	3.970E-01	2.842E-01
Bi-214		3.854E-01	8.477E-02	8.694E-02	3.589E-02
Co-60	#AB	6.142E-03	3.122E-02	3.122E-02	2.499E-02
Cs-137	#	3.459E-02	2.563E-02	2.569E-02	1.707E-02
Eu-152	#AB	-5.315E-04	1.189E-03	1.189E-03	6.783E-02
Eu-154	#AB	4.646E-02	8.992E-02	8.996E-02	1.732E-01
K-40		1.734E+01	1.302E+00	1.566E+00	3.059E-01
Pa-234	#AB	1.568E-02	2.317E-02	2.349E-02	7.832E-02
Pb-212		3.606E-01	6.611E-02	7.116E-02	3.456E-02
Pb-214		3.824E-01	8.842E-02	9.048E-02	4.310E-02
Ra-226	#	8.100E-01	5.545E-01	5.565E-01	4.114E-01
Th-234	#AB	5.834E-01	5.540E-01	5.567E-01	9.087E-01
Tl-208		1.367E-01	4.159E-02	4.260E-02	2.137E-02
U-235	#AB	6.481E-02	4.440E-02	4.458E-02	1.344E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.108E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:37:53
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_015.An1

Sample description
     251449-007, 207004


Spectrum Filename: C:\User\SPC\Det2\2_20140124_015.An1

Acquisition information
       Start time:                1/24/2014 17:52:44
       Live time:              2700
       Real time:              2703
       Dead time:                 0.11 %
       Detector ID:                   2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                  2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:52:16
            Zero offset:          0.026 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:              1/7/2014 11:47:58
            Type:                 Polynomial
            Uncertainty:          1.734 %
            Coefficients:        -0.360765  -4.056690   0.335194
                                 -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.06keV )
       Stop channel:           8144 (  2035.12keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3957E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3957E+02) =
                                  7.9592E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:53
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_015.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:57:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	2_2014-01-08_0518.PBC 1/8/2014 05:18:15
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1452

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.06	2.	277.49	0.00	0.000E+00				
59.56	17.	83.96	0.83	1.629E-02	59.54	35.920	PBC<MDA	Am241
63.27	15.	100.99	0.83	2.025E-02	63.30	3.750	PBC<MDA	Th234
77.28	68.	26.08	0.97	3.366E-02				
87.29	34.	44.04	0.39	4.075E-02				
93.08	37.	48.94	0.86	4.394E-02	92.59	4.343	5.705E-01	Th234
					93.35	5.760	4.266E-01	U235
					93.35	4.100	5.536E-01	Ac228
					93.35	5.760	4.266E-01	U235
93.13	48.	34.21	1.21	4.394E-02	92.59	4.343	7.475E-01	Th234
					93.35	5.760	5.590E-01	U235
					93.35	4.100	7.853E-01	Ac228
93.13	38.	47.47	0.86	4.359E-02	92.59	4.343	5.989E-01	Th234
					93.35	5.760	4.479E-01	U235
					93.35	4.100	5.834E-01	Ac228
100.69	15.	77.37	0.32	4.682E-02				
121.65	11.	142.79	0.89	5.061E-02	121.78	28.410	PBC<MDA	Eu152
143.94	15.	104.07	0.92	5.047E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	8.087E-02	U235
160.91	26.	51.07	0.31	4.907E-02				
186.21	45.	34.23	0.96	4.628E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	8.100E-01	Ra226
					185.72	57.000	5.045E-02	U235
186.21	45.	34.26	0.96	4.633E-02	185.72	57.000	5.061E-02	U235
					186.21	3.555	8.125E-01	Ra226
205.51	14.	91.89	0.98	4.406E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	1.910E-01	U235

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:53
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_015.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
238.66	222.	8.87	0.98	4.044E-02	238.63	43.600	3.583E-01	Pb212
241.90	51.	30.40	1.63	4.010E-02	242.00	7.268	5.169E-01	Pb214
276.97	20.	62.47	1.05	3.684E-02	277.37	6.600	2.395E-01	Tl208
295.24	98.	19.12	1.07	3.540E-02	295.22	18.414	4.417E-01	Pb214
300.43	15.	66.42	0.52	3.503E-02	300.09	3.180	3.916E-01	Pb212
338.03	58.	24.61	0.37	3.242E-02	338.32	11.400	4.595E-01	Ac228
351.84	142.	11.31	1.05	3.160E-02	351.93	35.600	3.517E-01	Pb214
568.46	9.	81.70	1.32	2.325E-02	569.50	9.300	PBC<MDA	Pa234
583.30	90.	14.08	1.53	2.291E-02	583.19	85.000	1.367E-01	Tl208
609.44	139.	10.29	1.04	2.230E-02	609.31	45.490	3.775E-01	Bi214
661.67	21.	37.05	1.39	2.119E-02	661.66	84.990	3.458E-02	Cs137
727.40	16.	54.89	1.44	1.999E-02	727.33	6.650	3.532E-01	Bi212
785.43	2.	396.82	1.49	1.907E-02	785.37	1.110	PBC<MDA	Bi212
873.50	5.	148.47	1.55	1.785E-02	873.18	12.170	PBC<MDA	Eu154
911.47	63.	16.56	1.40	1.738E-02	911.20	26.200	4.110E-01	Ac228
964.60	5.	197.68	1.61	1.677E-02	964.08	14.500	PBC<MDA	Eu152
969.63	52.	22.66	1.62	1.672E-02	968.96	15.900	5.722E-01	Ac228
1112.35	1.	915.75	1.71	1.530E-02	1112.08	13.410	PBC<MDA	Eu152
1120.38	32.	30.85	0.32	1.523E-02	1120.29	14.910	4.095E-01	Bi214
1273.65	6.	124.21	1.80	1.396E-02	1274.43	34.900	PBC<MDA	Eu154
1332.96	3.	254.13	1.83	1.354E-02	1332.49	99.983	PBC<MDA	Co60
1460.80	810.	3.65	1.80	1.268E-02	1460.82	10.550	1.734E+01	K40
1620.22	3.	160.03	1.96	1.173E-02	1620.74	1.510	PBC<MDA	Bi212
1764.71	6.	52.68	2.00	1.097E-02	1764.49	15.310	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
120.00	30.06	18.	2.	0.000E+00	554.98	0.000	-	
308.64	77.28	113.	68.	2.026E+03	52.16	0.973	-	
348.65	87.29	94.	34.	8.465E+02	88.08	0.392	-	s
402.20	100.69	65.	15.	3.246E+02	154.75	0.321	-	sc
642.82	160.91	67.	26.	5.308E+02	97.13	0.312	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:53
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_015.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.86	59.56	94.	17.	0.006	167.92	0.827s
Th-234	252.66	63.27	101.	15.	0.005	201.98	0.831s
Th-234	371.98	93.13	147.	38.	0.014	94.95	0.862s
U-235	372.86	93.35	142.	37.	0.014	97.88	0.863D
Ac-228	372.86	93.35	112.	48.	0.018	68.41	1.210D
Eu-152	485.92	121.65	125.	11.	0.004	285.58	0.893
Eu-154	490.95	122.91	144.	-11.	-0.004	323.06	0.894s
Pa-234	520.43	130.28	112.	-12.	-0.005	246.11	0.903s
U-235	574.99	143.94	117.	15.	0.006	208.14	0.915s
U-235	652.59	163.36	195.	-3.	-0.001	1492.84	0.936s
U-235	743.93	186.21	98.	45.	0.017	68.52	0.959
Ra-226	743.91	186.21	97.	45.	0.017	68.46	0.959
U-235	821.02	205.51	80.	14.	0.005	183.78	0.978s
Pb-212	953.52	238.66	79.	214.	0.079	17.74	0.978
Pb-214	966.48	241.90	78.	51.	0.019	60.81	1.629s
Tl-208	1106.65	276.97	66.	20.	0.007	124.95	1.050
Pb-214	1179.65	295.24	86.	98.	0.036	38.24	1.068s
Pb-212	1200.39	300.43	37.	15.	0.005	132.85	0.525s
Ac-228	1350.68	338.03	49.	58.	0.021	49.21	0.375s
Eu-152	1378.22	344.92	70.	-11.	-0.004	223.65	1.114s
Pb-214	1405.91	351.84	50.	134.	0.050	22.63	1.055
Pa-234	2271.95	568.46	23.	9.	0.003	163.40	1.316s
Tl-208	2331.31	583.30	37.	90.	0.033	28.15	1.530s
Bi-214	2435.82	609.44	28.	130.	0.048	20.58	1.039
Cs-137	2644.71	661.67	20.	21.	0.008	74.10	1.392
Eu-154	2895.87	724.47	46.	-6.	-0.002	335.03	1.440s
Bi-212	2907.61	727.40	30.	16.	0.006	109.79	1.444s
Eu-152	3112.60	778.65	27.	-4.	-0.002	352.47	1.483s
Bi-212	3139.73	785.43	32.	2.	0.001	793.64	1.488s
Eu-154	3492.05	873.50	29.	5.	0.002	296.93	1.552s
Ac-228	3643.97	911.47	19.	63.	0.024	33.11	1.403
Pa-234	3780.62	945.62	34.	-2.	-0.001	754.90	1.602s
Eu-152	3856.54	964.60	39.	5.	0.002	395.36	1.614s
Ac-228	3876.66	969.63	22.	52.	0.019	45.32	1.618s
Eu-152	4447.84	1112.35	32.	1.	0.000	1831.50	1.708s
Bi-214	4479.99	1120.38	25.	32.	0.012	61.69	0.324s
Eu-154	5093.52	1273.65	25.	6.	0.002	248.43	1.800s
Co-60	5330.96	1332.96	23.	3.	0.001	508.26	1.830s
K-40	5842.90	1460.80	35.	787.	0.291	7.30	1.802
Bi-212	6481.41	1620.22	8.	3.	0.001	320.06	1.956s
Bi-214	7060.29	1764.71	12.	6.	0.002	105.37	2.004s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:53
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_015.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Code	MDA Value pCi/g		COMMENTS
Ac-228	N	4.6922E-01					5.12E+12	
			911.20	4.110E-01	(P	6.490E-02	1.66E+01 2.62E+01 G	
			968.96	5.722E-01	(	1.223E-01	2.27E+01 1.59E+01 G	
			338.32	4.595E-01	(	1.306E-01	2.46E+01 1.14E+01 G	
								Energy duplication
			93.35	7.853E-01	+ P	4.034E-01	3.42E+01 4.10E+00 XA	
Am-241	I	8.5986E-02					1.58E+05	
			59.54	8.599E-02	?(	1.139E-01	8.40E+01 3.59E+01 G	
Bi-212	N	3.6117E-01					5.12E+12	
			727.33	3.532E-01	?(	2.842E-01	5.49E+01 6.65E+00 G	
			785.37	2.858E-01	?(	1.840E+00	3.97E+02 1.11E+00 G	
			1620.74	4.515E-01	&(	1.101E+00	1.60E+02 1.51E+00 G	
Bi-214	N	3.8543E-01					5.84E+05	
			609.31	3.775E-01	(P	3.589E-02	1.03E+01 4.55E+01 G	
			1120.29	4.095E-01	(P	1.527E-01	3.08E+01 1.49E+01 G	
			1764.49	1.060E-01	- P	1.392E-01	5.27E+01 1.53E+01 G	
Co-60	T	6.1424E-03					1.93E+03	
			1332.49	6.142E-03	&(	2.499E-02	2.54E+02 1.00E+02 G	
			1173.23	0.000E+00	-	4.326E-02	1.00E+03 9.98E+01 G	
Cs-137	I	3.4585E-02					1.10E+04	
			661.66	3.458E-02	?(	1.707E-02	3.70E+01 8.50E+01 G	
Eu-152	I	-5.3154E-04					4.94E+03	
			344.28	-3.824E-02	?(	6.783E-02	1.12E+02 2.66E+01 G	
			121.78	2.340E-02	+	5.384E-02	1.43E+02 2.84E+01 G	
			778.90	-5.213E-02	+	1.457E-01	1.76E+02 1.30E+01 G	
			964.08	5.643E-02	?(	1.786E-01	1.98E+02 1.45E+01 G	
			1112.08	1.264E-02	?(	1.894E-01	9.16E+02 1.34E+01 G	
			1408.01	0.000E+00	+	1.003E-01	1.00E+03 2.09E+01 G	
Eu-154	I	4.6455E-02					3.14E+03	
			873.18	7.400E-02	&(	1.732E-01	1.48E+02 1.22E+01 G	
			123.07	-1.560E-02	-	4.076E-02	1.62E+02 4.04E+01 G	
			1274.43	3.685E-02	?(	7.123E-02	1.24E+02 3.49E+01 G	
			723.30	-4.405E-02	+	1.179E-01	1.68E+02 2.00E+01 G	
			1004.72	-2.354E-03	%	1.102E-01	2.85E+03 1.79E+01 G	
			996.25	0.000E+00	-	1.443E-01	1.00E+03 1.05E+01 G	

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:37:53
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_015.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

K-40     N   1.7336E+01                                      4.57E+11
                          1460.82 1.734E+01  (P 3.059E-01 3.65E+00 1.06E+01 G

Pa-234   N   1.5683E-02                                      1.63E+12
                           131.30-3.969E-02 ?(  7.832E-02 1.23E+02 1.82E+01 G
                           569.50 1.241E-01 &(  1.526E-01 8.17E+01 9.30E+00 G
                           946.00-2.872E-02 +   1.758E-01 3.77E+02 1.35E+01 G
                           880.52 0.000E+00 -   3.363E-01 1.00E+03 1.05E+01 G
                           883.24 8.653E-03 %   1.965E-01 1.39E+03 9.70E+00 G

Pb-212   N   3.6056E-01                                      5.12E+12
                           238.63 3.583E-01  (P 3.456E-02 8.87E+00 4.36E+01 G
                           300.09 3.916E-01  (  3.760E-01 6.64E+01 3.18E+00 G

Pb-214   N   3.8235E-01                                      5.84E+05
                           351.93 3.517E-01  (P 4.310E-02 1.13E+01 3.56E+01 G
                           295.22 4.417E-01  (P 9.790E-02 1.91E+01 1.84E+01 G
                           242.00 5.169E-01 + P 2.080E-01 3.04E+01 7.27E+00 G

Ra-226   N   8.0996E-01                                      5.84E+05
                           186.21 8.100E-01 ?(  4.114E-01 3.42E+01 3.56E+00 G

Th-234   N   5.8342E-01                                      1.63E+12
                            63.30 5.655E-01 ?(  9.087E-01 1.01E+02 3.75E+00 G
                            92.59 5.989E-01  (  4.406E-01 4.75E+01 4.34E+00 G

Tl-208   N   1.3665E-01                                      5.12E+12
                           583.19 1.367E-01 *(P 2.137E-02 1.41E+01 8.50E+01 G
                           277.37 2.395E-01 +   2.300E-01 6.25E+01 6.60E+00 G
                           860.53 3.799E-03 &   1.654E-01 2.65E+03 1.24E+01 G

U-235    N   6.4807E-02                                      2.57E+11
                           143.77 8.087E-02 ?(  1.344E-01 1.04E+02 1.09E+01 G
                           205.32 1.910E-01 ?(  2.770E-01 9.19E+01 5.02E+00 G
                           163.36-3.154E-02 &   3.865E-01 7.46E+02 5.08E+00 G
                           185.72 5.061E-02 &(  2.574E-02 3.43E+01 5.70E+01 G
                                                            Energy duplication
                            93.35 4.266E-01     3.238E-01 4.89E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
```

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.56	94.	17.	0.006	167.92	8.599E-02
Th-234	63.27	101.	15.	0.005	201.98	5.655E-01
Th-234	93.13	147.	38.	0.014	94.95	5.989E-01
U-235	93.35	142.	37.	0.014	97.88	4.266E-01
Eu-152	121.65	125.	11.	0.004	285.58	2.340E-02
Eu-154	122.91	144.	-11.	-0.004	323.06	-1.560E-02
Pa-234	130.28	112.	-12.	-0.005	246.11	-3.969E-02
U-235	143.94	117.	15.	0.006	208.14	8.087E-02
U-235	163.36	195.	-3.	-0.001	1492.84	-3.154E-02
U-235	186.21	98.	45.	0.017	68.52	5.061E-02
U-235	205.51	80.	14.	0.005	183.78	1.910E-01
Eu-152	344.92	70.	-11.	-0.004	223.65	-3.824E-02
Pa-234	568.46	23.	9.	0.003	163.40	1.241E-01
Eu-154	724.47	46.	-6.	-0.002	335.03	-4.405E-02
Bi-212	727.40	30.	16.	0.006	109.79	3.532E-01
Eu-152	778.65	27.	-4.	-0.002	352.47	-5.213E-02
Bi-212	785.43	32.	2.	0.001	793.64	2.858E-01
Eu-154	873.50	29.	5.	0.002	296.93	7.400E-02
Pa-234	945.62	34.	-2.	-0.001	754.90	-2.872E-02
Eu-152	964.60	39.	5.	0.002	395.36	5.643E-02
Eu-152	1112.35	32.	1.	0.000	1831.50	1.264E-02
Eu-154	1273.65	25.	6.	0.002	248.43	3.685E-02
Co-60	1332.96	23.	3.	0.001	508.26	6.142E-03
Bi-212	1620.22	8.	3.	0.001	320.06	4.515E-01

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:53
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_015.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.6922E-01	4.6922E-01	1.1764E-01	1.2271E-01	6.490E-02
Am-241 #A	8.5965E-02	8.5986E-02	1.4439E-01	1.4453E-01	1.139E-01
Bi-212 #	3.6117E-01	3.6117E-01	3.9652E-01	3.9702E-01	2.842E-01
Bi-214	3.8540E-01	3.8543E-01	8.4771E-02	8.6938E-02	3.589E-02
Co-60 #A	6.0195E-03	6.1424E-03	3.1220E-02	3.1221E-02	2.499E-02
Cs-137 #	3.4462E-02	3.4585E-02	2.5627E-02	2.5686E-02	1.707E-02
Eu-152 #A	-5.2737E-04	-5.3154E-04	1.1888E-03	1.1891E-03	6.783E-02
Eu-154 #A	4.5883E-02	4.6455E-02	8.9925E-02	8.9961E-02	1.732E-01
K-40	1.7336E+01	1.7336E+01	1.3020E+00	1.5658E+00	3.059E-01
Pa-234 #A	1.5683E-02	1.5683E-02	2.3166E-02	2.3491E-02	7.832E-02
Pb-212	3.6056E-01	3.6056E-01	6.6107E-02	7.1164E-02	3.456E-02
Pb-214	3.8233E-01	3.8235E-01	8.8425E-02	9.0475E-02	4.310E-02
Ra-226 #	8.0991E-01	8.0996E-01	5.5452E-01	5.5646E-01	4.114E-01
Th-234 #A	5.8342E-01	5.8342E-01	5.5396E-01	5.5670E-01	9.087E-01
Tl-208	1.3665E-01	1.3665E-01	4.1587E-02	4.2603E-02	2.137E-02
U-235 #A	6.4807E-02	6.4807E-02	4.4404E-02	4.4577E-02	1.344E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2035.1 keV) 1.991E+01 pCi/g
Total Decayed Activity (25.1 to 2035.1 keV) 1.9914328E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE01	Lab ID	: 251449-008	Client ID	: 04-PD-D0034-08
Seqnum	: 1504034935015	Matrix	: Soil	Acct	: ITSI (JG)
File	: 1_20140124_015	Batch	: 207004	Time	: 24-JAN-2014 17:52
Cal	: 24-JAN-2014 06:26:40,19-JUN-2013 18:43:28	Caldate	: 24-JAN-2014, 19-JUN-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 330.01 g	Live Time	: 2700 sec
				Dead Time	: 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0374	0.111		.13723	.13726	-0.0012	u
Bismuth-212	0.327	0.235		.33229	.33271	0.00031	u
Bismuth-214	0.361	0.0442		.090422	.091868	-0.011	u
Cesium-137	-0.000588	0.0240	0.07	.029173	.029173	0.0048	u
Cobalt-60	0.00618	0.0197		.023845	.023847	0.0015	u
Europium-152	0.0151	0.0565		.037124	.037131	0.020	u
Europium-154	0.0583	0.149		.18951	.18953	0.019	u
Lead-212	0.365	0.0337		.068029	.072967	-0.0075	u
Lead-214	0.385	0.0397		.08554	.087413	-0.025	u
Potassium-40	16.5	0.283		1.2903	1.5321	-0.068	u
Protactinium-234	0.0126	0.0852		.027369	.027549	0.0066	u
Radium-226 (By Bismuth-214)	0.361	0.0442	0.2	.090422	.091868	-0.011	u
Thallium-208	0.153	0.0144		.036535	.03783	-0.0042	u
Thorium-232 (By Actinium-228)	0.330	0.0820		.10752	.11013	0.020	u
Thorium-234	0.474	1.06		.65613	.65766	0	u
Uranium-235	0.0992	0.145		.18161	.18171	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-08
Sample Description: 251449-008, 207004

Detector: HPGE01 50-TP42236A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 13:59
Acquisition Time: 1/24/2014 17:52:14
Analysis Time: 1/24/2014 18:37
Analysis Quantity: 3.300E+02 g

Spectrum ID: 1_20140124_015
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE01 S22147 1_20130619002_EffCal RA226
Efficiency Cal Date: 6/19/2013 18:43
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.301E-01	1.075E-01	1.101E-01	8.203E-02
Am-241	#AB	3.740E-02	1.372E-01	1.373E-01	1.107E-01
Bi-212	#	3.266E-01	3.323E-01	3.327E-01	2.354E-01
Bi-214		3.611E-01	9.042E-02	9.187E-02	4.419E-02
Co-60	#AB	6.176E-03	2.385E-02	2.385E-02	1.970E-02
Cs-137	#AB	-5.879E-04	2.917E-02	2.917E-02	2.398E-02
Eu-152	#AB	1.508E-02	3.712E-02	3.713E-02	5.652E-02
Eu-154	#AB	5.830E-02	1.895E-01	1.895E-01	1.490E-01
K-40		1.647E+01	1.290E+00	1.532E+00	2.825E-01
Pa-234	#AB	1.263E-02	2.737E-02	2.755E-02	8.517E-02
Pb-212		3.647E-01	6.803E-02	7.297E-02	3.374E-02
Pb-214		3.849E-01	8.554E-02	8.741E-02	3.973E-02
Ra-226	AB	3.078E-01	4.434E-01	4.437E-01	3.443E-01
Th-234	#AB	4.737E-01	6.561E-01	6.577E-01	1.061E+00
Tl-208		1.534E-01	3.653E-02	3.783E-02	1.438E-02
U-235	AB	9.923E-02	1.816E-01	1.817E-01	1.445E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.940E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:37:23
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_015.An1

Sample description
     251449-008, 207004


Spectrum Filename: C:\User\SPC\Det1\1_20140124_015.An1

Acquisition information
       Start time:                1/24/2014 17:52:14
       Live time:              2700
       Real time:              2702
       Dead time:                 0.06 %
       Detector ID:                   1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                  1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:26:40
            Zero offset:          0.000 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/19/2013 18:43:28
            Type:                 Polynomial
            Uncertainty:          1.382 %
            Coefficients:        -0.396420  -4.062121   0.406738
                                 -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.01keV )
       Stop channel:           8144 (  2035.50keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3001E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3001E+02) =
                                  8.1898E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:23
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_015.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:59:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	1_2013-12-28_0933.PBC 12/28/2013 09:33:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 18 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1331

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.48	7.	183.47	0.84	1.604E-02	59.54	35.920	PBC<MDA	Am241
63.40	14.	113.96	0.84	1.951E-02	63.30	3.750	PBC<MDA	Th234
77.26	86.	20.33	0.49	3.096E-02				
92.34	8.	91.58	0.88	4.044E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	9.923E-02	U235
					93.35	4.100	1.394E-01	Ac228
92.37	22.	78.73	0.87	4.008E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	2.846E-01	U235
					93.35	4.100	3.998E-01	Ac228
122.72	12.	123.11	0.91	4.860E-02	121.78	28.410	PBC<MDA	Eu152
					123.07	40.400	1.896E-02	Eu154
					121.78	28.410	2.693E-02	Eu152
144.53	18.	91.51	0.93	5.008E-02	143.77	10.940	PBC<MDA	U235
185.67	23.	53.30	0.97	4.797E-02	185.72	57.000	2.557E-02	U235
186.16	17.	72.03	0.97	4.793E-02	186.21	3.555	PBC<MDA	Ra226
238.65	225.	9.33	0.91	4.294E-02	238.63	43.600	3.647E-01	Pb212
241.82	44.	36.64	0.32	4.262E-02	242.00	7.268	4.348E-01	Pb214
276.91	8.	111.10	1.07	3.941E-02	277.37	6.600	PBC<MDA	Tl208
295.17	99.	15.98	0.70	3.794E-02	295.22	18.414	4.045E-01	Pb214
300.36	25.	42.72	0.31	3.755E-02	300.09	3.180	6.401E-01	Pb212
338.47	55.	19.28	1.41	3.477E-02	338.32	11.400	4.171E-01	Ac228
351.76	155.	10.40	1.00	3.390E-02	351.93	35.600	3.646E-01	Pb214
568.92	4.	244.12	1.34	2.450E-02	569.50	9.300	PBC<MDA	Pa234
583.35	108.	11.37	0.92	2.410E-02	583.19	85.000	1.534E-01	Tl208
609.42	137.	11.55	0.70	2.339E-02	609.31	45.490	3.611E-01	Bi214
727.62	15.	50.87	1.48	2.074E-02	727.33	6.650	3.266E-01	Bi212
860.67	38.	16.22	0.37	1.847E-02	860.53	12.400	5.032E-01	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:23
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_015.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
873.79	4.	162.53	1.60	1.829E-02	873.18	12.170	PBC<MDA	Eu154
					873.18	12.170	5.830E-02	Eu154
880.66	2.	288.47	1.60	1.818E-02	880.52	10.500	PBC<MDA	Pa234
883.55	4.	181.57	1.60	1.814E-02	883.24	9.700	PBC<MDA	Pa234
911.17	51.	18.09	1.63	1.775E-02	911.20	26.200	3.339E-01	Ac228
969.09	23.	35.90	1.67	1.700E-02	968.96	15.900	2.613E-01	Ac228
1120.71	40.	17.79	0.81	1.531E-02	1120.29	14.910	5.297E-01	Bi214
1172.47	4.	193.06	1.81	1.479E-02	1173.23	99.850	PBC<MDA	Co60
1332.26	2.	337.13	1.91	1.342E-02	1332.49	99.983	PBC<MDA	Co60
1407.73	2.	381.82	1.95	1.285E-02	1408.01	20.850	PBC<MDA	Eu152
					1408.01	20.850	1.815E-02	Eu152
1460.98	731.	3.83	1.87	1.247E-02	1460.82	10.550	1.647E+01	K40
1764.44	6.	50.46	2.13	1.061E-02	1764.49	15.310	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
308.92	77.26	103.	86.	2.765E+03	40.65	0.491	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.82	59.48	81.	7.	0.003	366.94	0.839s
Th-234	253.48	63.40	121.	14.	0.005	227.93	0.843s
Th-234	369.31	92.37	137.	22.	0.008	157.45	0.875s
U-235	373.25	93.35	116.	8.	0.003	183.16	0.875D
Eu-152	490.68	122.72	106.	12.	0.005	246.22	0.906s
Pa-234	523.03	130.81	118.	-14.	-0.005	220.62	0.916s
U-235	577.90	144.53	126.	18.	0.007	183.03	0.929s
U-235	742.59	185.72	85.	23.	0.009	106.60	0.973D
Ra-226	744.55	186.21	69.	17.	0.006	144.05	0.974D
Pb-212	954.25	238.65	80.	225.	0.083	18.65	0.906
Pb-214	966.91	241.82	82.	44.	0.016	73.29	0.316s
Tl-208	1107.24	276.91	59.	8.	0.003	222.19	1.067
Pb-214	1180.27	295.17	60.	93.	0.034	31.95	0.699s
Pb-212	1201.02	300.36	38.	25.	0.009	85.45	0.309s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:23
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_015.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	1353.40	338.47	29.	55.	0.020	38.56	1.414s
Pb-214	1406.56	351.76	46.	145.	0.054	20.80	1.002s
Pa-234	2275.07	568.92	36.	4.	0.001	488.23	1.344s
Tl-208	2332.81	583.35	17.	104.	0.038	22.74	0.919s
Bi-214	2437.09	609.42	44.	127.	0.047	23.09	0.704s
Eu-154	2886.14	721.68	28.	-2.	-0.001	782.69	1.477s
Bi-212	2909.87	727.62	21.	15.	0.006	101.74	1.480s
Eu-152	3115.50	779.02	19.	-1.	0.000	1337.99	1.522s
Tl-208	3442.11	860.67	0.	38.	0.014	32.44	0.375s
Eu-154	3494.61	873.79	21.	4.	0.002	325.07	1.597s
Pa-234	3522.10	880.66	24.	2.	0.001	576.94	1.603s
Pa-234	3533.68	883.55	22.	4.	0.001	363.14	1.605s
Ac-228	3644.14	911.17	29.	51.	0.019	36.17	1.626
Pa-234	3792.26	948.19	31.	-2.	-0.001	675.30	1.652s
Ac-228	3875.89	969.09	33.	23.	0.009	71.79	1.669s
Eu-154	3980.76	995.30	24.	-5.	-0.002	282.72	1.689s
Eu-154	4021.29	1005.43	35.	-6.	-0.002	268.32	1.695s
Eu-152	4448.15	1112.12	29.	-2.	-0.001	970.50	1.770s
Bi-214	4482.53	1120.71	10.	40.	0.015	35.58	0.807s
Co-60	4689.62	1172.47	30.	4.	0.002	386.12	1.811s
Eu-154	5094.22	1273.58	49.	-9.	-0.003	223.66	1.875s
Co-60	5329.05	1332.26	13.	2.	0.001	674.26	1.910s
Eu-152	5631.07	1407.73	18.	2.	0.001	763.65	1.954s
K-40	5844.19	1460.98	28.	714.	0.265	7.66	1.870
Bi-214	7058.85	1764.44	11.	6.	0.002	100.92	2.129s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	3.3005E-01					5.12E+12	
			911.20	3.339E-01	?(P	8.203E-02	1.81E+01 2.62E+01	G
			968.96	2.613E-01	?(P	1.495E-01	3.59E+01 1.59E+01	G
			338.32	4.171E-01	(P	9.682E-02	1.93E+01 1.14E+01	G
							Energy duplication	
			93.35	0.000E+00	}	4.592E-01	1.56E+03 4.10E+00	XA
Am-241	I	3.7399E-02					1.58E+05	
			59.54	3.740E-02	?(	1.107E-01	1.83E+02 3.59E+01	G
Bi-212	N	3.2660E-01					5.12E+12	
			727.33	3.266E-01	(	2.354E-01	5.09E+01 6.65E+00	G
			785.37	0.000E+00	&	1.802E+00	1.00E+03 1.11E+00	G
			1620.74	0.000E+00	-	4.094E-01	1.00E+03 1.51E+00	G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:23
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_015.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	3.6114E-01					5.84E+05	
			609.31	3.611E-01	(P	4.419E-02	1.15E+01	4.55E+01 G
			1120.29	5.297E-01	+ P	9.867E-02	1.78E+01	1.49E+01 G
			1764.49	1.077E-01	- P	1.473E-01	5.05E+01	1.53E+01 G
Co-60	T	6.1756E-03					1.93E+03	
			1332.49	3.649E-03	&(	1.970E-02	3.37E+02	1.00E+02 G
			1173.23	8.706E-03	&(	2.678E-02	1.93E+02	9.98E+01 G
Cs-137	I	-5.8790E-04					1.10E+04	
			661.66	-5.879E-04	%(	2.398E-02	2.48E+03	8.50E+01 G
Eu-152	I	1.5078E-02					4.94E+03	
			344.28	0.000E+00	?(	5.652E-02	1.00E+03	2.66E+01 G
			121.78	2.693E-02	&(	5.313E-02	1.23E+02	2.84E+01 G
			778.90	-1.101E-02	+	1.199E-01	6.69E+02	1.30E+01 G
			964.08	4.897E-03	&	1.446E-01	1.80E+03	1.45E+01 G
			1112.08	-2.366E-02	+	1.866E-01	4.85E+02	1.34E+01 G
			1408.01	1.815E-02	?(	1.117E-01	3.82E+02	2.09E+01 G
Eu-154	I	5.8298E-02					3.14E+03	
			873.18	5.830E-02	&(	1.490E-01	1.63E+02	1.22E+01 G
			123.07	2.006E-03	%	3.927E-02	1.19E+03	4.04E+01 G
			1274.43	-5.892E-02	+	1.038E-01	1.12E+02	3.49E+01 G
			723.30	-1.431E-02	-	9.070E-02	3.91E+02	2.00E+01 G
			1004.72	-6.729E-02	+	1.422E-01	1.34E+02	1.79E+01 G
			996.25	-8.965E-02	+	1.983E-01	1.41E+02	1.05E+01 G
K-40	N	1.6469E+01					4.57E+11	
			1460.82	1.647E+01	(P	2.825E-01	3.83E+00	1.06E+01 G
Pa-234	N	1.2626E-02					1.63E+12	
			131.30	-4.826E-02	?(	8.517E-02	1.10E+02	1.82E+01 G
			569.50	4.755E-02	&(	1.867E-01	2.44E+02	9.30E+00 G
			946.00	-3.078E-02	+	1.680E-01	3.38E+02	1.35E+01 G
			880.52	3.890E-02	?(	1.803E-01	2.88E+02	1.05E+01 G
			883.24	6.495E-02	?(	1.863E-01	1.82E+02	9.70E+00 G
Pb-212	N	3.6468E-01					5.12E+12	
			238.63	3.647E-01	(	3.374E-02	9.33E+00	4.36E+01 G
			300.09	6.401E-01	+	3.639E-01	4.27E+01	3.18E+00 G
Pb-214	N	3.8493E-01					5.84E+05	
			351.93	3.646E-01	*(P	3.973E-02	1.04E+01	3.56E+01 G
			295.22	4.045E-01	@(P	7.827E-02	1.60E+01	1.84E+01 G
			242.00	4.348E-01	(	2.061E-01	3.66E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:37:23
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_015.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   3.0780E-01                                      5.84E+05
                                                            Derived Ave Activity
                           186.21 3.078E-01 }(  3.443E-01 7.20E+01 3.56E+00 G

Th-234   N   4.7371E-01                                      1.63E+12
                            63.30 5.813E-01 ?(  1.061E+00 1.14E+02 3.75E+00 G
                            92.59 3.808E-01 @(  4.753E-01 7.87E+01 4.34E+00 G

Tl-208   N   1.5342E-01                                      5.12E+12
                           583.19 1.534E-01  (P 1.438E-02 1.14E+01 8.50E+01 G
                           277.37 8.848E-02 - P 2.095E-01 1.11E+02 6.60E+00 G
                           860.53 5.032E-01 +   3.086E-02 1.62E+01 1.24E+01 G

U-235    N   9.9226E-02                                      2.57E+11
                           143.77 9.923E-02 &(  1.445E-01 9.15E+01 1.09E+01 G
                           205.32 0.000E+00 -   3.431E-01 1.00E+03 5.02E+00 G
                           163.36-4.566E-03 &   2.441E-01 3.25E+03 5.08E+00 G
                           185.72 2.557E-02 }   2.385E-02 5.33E+01 5.70E+01 G
                                                            Energy duplication
                            93.35 9.923E-02 }   3.268E-01 9.16E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:23
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_015.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	63.40	121.	14.	0.005	227.93	5.813E-01
Th-234	92.37	137.	22.	0.008	157.45	3.808E-01
Eu-152	122.72	106.	12.	0.005	246.22	2.693E-02
Pa-234	130.81	118.	-14.	-0.005	220.62	-4.826E-02
Pa-234	568.92	36.	4.	0.001	488.23	4.755E-02
Eu-154	721.68	28.	-2.	-0.001	782.69	-1.431E-02
Bi-212	727.62	21.	15.	0.006	101.74	3.266E-01
Eu-152	779.02	19.	-1.	0.000	1337.99	-1.101E-02
Eu-154	873.79	21.	4.	0.002	325.07	5.830E-02
Pa-234	880.66	24.	2.	0.001	576.94	3.890E-02
Pa-234	883.55	22.	4.	0.001	363.14	6.495E-02
Pa-234	948.19	31.	-2.	-0.001	675.30	-3.078E-02
Eu-154	995.30	24.	-5.	-0.002	282.72	-8.965E-02
Eu-154	1005.43	35.	-6.	-0.002	268.32	-6.729E-02
Eu-152	1112.12	29.	-2.	-0.001	970.50	-2.366E-02
Co-60	1172.47	30.	4.	0.002	386.12	8.706E-03
Eu-154	1273.58	49.	-9.	-0.003	223.66	-5.892E-02
Co-60	1332.26	13.	2.	0.001	674.26	3.649E-03
Eu-152	1407.73	18.	2.	0.001	763.65	1.815E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.3005E-01	3.3005E-01	1.0752E-01	1.1013E-01	8.203E-02
Am-241 #A	3.7390E-02	3.7399E-02	1.3723E-01	1.3726E-01	1.107E-01
Bi-212 #	3.2660E-01	3.2660E-01	3.3229E-01	3.3271E-01	2.354E-01
Bi-214	3.6112E-01	3.6114E-01	9.0422E-02	9.1868E-02	4.419E-02
Co-60 #A	6.0520E-03	6.1756E-03	2.3845E-02	2.3847E-02	1.970E-02
Cs-137 #A	-5.8582E-04	-5.8790E-04	2.9173E-02	2.9173E-02	2.398E-02
Eu-152 #A	1.4959E-02	1.5078E-02	3.7124E-02	3.7131E-02	5.652E-02
Eu-154 #A	5.7580E-02	5.8298E-02	1.8951E-01	1.8953E-01	1.490E-01
K-40	1.6469E+01	1.6469E+01	1.2903E+00	1.5321E+00	2.825E-01
Pa-234 #A	1.2626E-02	1.2626E-02	2.7369E-02	2.7549E-02	8.517E-02
Pb-212	3.6468E-01	3.6468E-01	6.8029E-02	7.2967E-02	3.374E-02
Pb-214	3.8490E-01	3.8493E-01	8.5540E-02	8.7413E-02	3.973E-02
Ra-226 A	3.0778E-01	3.0780E-01	4.4339E-01	4.4374E-01	3.443E-01
Th-234 #A	4.7371E-01	4.7371E-01	6.5613E-01	6.5766E-01	1.061E+00
Tl-208	1.5342E-01	1.5342E-01	3.6535E-02	3.7830E-02	1.438E-02
U-235 A	9.9226E-02	9.9226E-02	1.8161E-01	1.8171E-01	1.445E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:37:23
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_015.An1

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (205.1 to 2035.5 keV) 1.806E+01 pCi/g
Total Decayed Activity (205.1 to 2035.5 keV) 1.8063272E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952015
File : 4_20140124_015
Cal : 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13
IDF : 1.0
PDF : 1.0

Lab ID : 251449-009
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 05-MAR-2013
Sample Amount : 345.27 g

Client ID : 04-PD-D0034-09
Acct : ITSI (JG)
Time : 24-JAN-2014 17:53
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.29 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0343	0.124		.15275	.15277	-0.0012	u
Bismuth-212	0.390	0.239		.40193	.40243	0.00031	u
Bismuth-214	0.274	0.0417		.072947	.07398	-0.011	u
Cesium-137	0.0172	0.0177	0.07	.023891	.023904	0.0048	u
Cobalt-60	0.00430	0.0225		.015844	.015846	0.0015	u
Europium-152	0.0174	0.0458		.089677	.089681	0.020	u
Europium-154	-0.0531	0.159		.19994	.19996	0.019	u
Lead-212	0.259	0.0363		.063368	.066084	-0.0075	u
Lead-214	0.312	0.0393		.076181	.07757	-0.025	u
Potassium-40	19.9	0.226		1.3609	1.6872	-0.068	u
Protactinium-234	0.0496	0.0766		.070572	.071639	0.0066	u
Radium-226 (By Bismuth-214)	0.274	0.0417	0.2	.072947	.07398	-0.011	u
Thallium-208	0.0853	0.0194		.034894	.035318	-0.0042	u
Thorium-232 (By Actinium-228)	0.398	0.0551		.12282	.12614	0.020	u
Thorium-234	0.130	1.04		.33437	.3346	0	u
Uranium-235	0.112	0.114		.14671	.14687	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-09
Sample Description: 251449-009, 207004

Detector: HPGE04 51-TP32733A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:01
Acquisition Time: 1/24/2014 17:53:43
Analysis Time: 1/24/2014 18:38
Analysis Quantity: 3.453E+02 g

Spectrum ID: 4_20140124_015
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2708 sec
Dead Time: 0.29 %

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.977E-01	1.228E-01	1.261E-01	5.512E-02
Am-241	#AB	3.432E-02	1.528E-01	1.528E-01	1.237E-01
Bi-212	#	3.903E-01	4.019E-01	4.024E-01	2.390E-01
Bi-214		2.740E-01	7.295E-02	7.398E-02	4.173E-02
Co-60	#AB	4.296E-03	1.584E-02	1.585E-02	2.246E-02
Cs-137	#AB	1.716E-02	2.389E-02	2.390E-02	1.774E-02
Eu-152	#AB	1.741E-02	8.968E-02	8.968E-02	4.580E-02
Eu-154	#AB	-5.309E-02	1.999E-01	2.000E-01	1.588E-01
K-40		1.988E+01	1.361E+00	1.687E+00	2.263E-01
Pa-234	#AB	4.955E-02	7.057E-02	7.164E-02	7.659E-02
Pb-212		2.592E-01	6.337E-02	6.608E-02	3.626E-02
Pb-214		3.124E-01	7.618E-02	7.757E-02	3.928E-02
Ra-226	#	5.440E-01	4.856E-01	4.865E-01	3.676E-01
Th-234	#AB	1.301E-01	3.344E-01	3.346E-01	1.038E+00
Tl-208		8.530E-02	3.489E-02	3.532E-02	1.939E-02
U-235	#AB	1.123E-01	1.467E-01	1.469E-01	1.140E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.251E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:38:58
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_015.An1

Sample description
     251449-009, 207004


Spectrum Filename: C:\User\SPC\Det4\4_20140124_015.An1

Acquisition information
       Start time:                 1/24/2014 17:53:43
       Live time:               2700
       Real time:               2708
       Dead time:                  0.29 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4527E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4527E+02) =
                                   7.8278E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:58
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_015.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:01:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 10 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0448

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
58.34	6.	222.53	0.81	1.430E-02	59.54	35.920	PBC<MDA	Am241
77.07	64.	26.75	0.60	2.928E-02				
92.63	13.	128.56	0.84	3.899E-02	92.59	4.343	PBC<MDA	Th234
93.45	17.	94.16	0.84	3.937E-02	93.35	5.760	PBC<MDA	U235
					93.35	4.100	3.131E-01	Ac228
93.45	17.	94.16	0.84	3.937E-02	93.35	5.760	PBC<MDA	U235
					93.35	4.100	3.131E-01	Ac228
143.53	21.	65.31	0.89	5.033E-02	143.77	10.940	PBC<MDA	U235
186.26	32.	44.63	0.93	4.851E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	5.440E-01	Ra226
186.27	32.	44.65	0.93	4.855E-02	185.72	57.000	3.395E-02	U235
					186.21	3.555	5.448E-01	Ra226
238.59	175.	11.81	1.21	4.348E-02	238.63	43.600	2.592E-01	Pb212
241.63	34.	36.26	0.62	4.315E-02	242.00	7.268	3.141E-01	Pb214
277.44	21.	53.39	1.02	3.983E-02	277.37	6.600	2.315E-01	Tl208
295.32	76.	17.23	0.47	3.829E-02	295.22	18.414	3.139E-01	Pb214
299.93	17.	59.50	1.04	3.789E-02	300.09	3.180	4.001E-01	Pb212
338.51	31.	37.81	1.08	3.500E-02	338.32	11.400	2.251E-01	Ac228
345.45	1.	987.41	1.08	3.459E-02	344.28	26.590	PBC<MDA	Eu152
351.90	142.	11.18	1.13	3.408E-02	351.93	35.600	3.113E-01	Pb214
570.49	10.	71.21	1.29	2.435E-02	569.50	9.300	PBC<MDA	Pa234
583.19	66.	18.56	0.90	2.394E-02	583.19	85.000	8.530E-02	Tl208
609.34	104.	11.60	1.14	2.322E-02	609.31	45.490	2.866E-01	Bi214
661.18	11.	69.63	1.37	2.192E-02	661.66	84.990	PBC<MDA	Cs137
727.44	15.	53.23	1.43	2.051E-02	727.33	6.650	3.125E-01	Bi212
883.77	4.	170.07	1.56	1.789E-02	883.24	9.700	PBC<MDA	Pa234
911.42	67.	16.36	0.88	1.750E-02	911.20	26.200	4.236E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:58
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_015.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
969.11	33.	26.19	0.29	1.675E-02	968.96	15.900	3.549E-01	Ac228
996.42	1.	842.29	1.65	1.642E-02	996.25	10.500	PBC<MDA	Eu154
1111.97	3.	257.61	1.75	1.516E-02	1112.08	13.410	PBC<MDA	Eu152
1120.17	3.	119.75	1.76	1.507E-02	1120.29	14.910	PBC<MDA	Bi214
1173.05	5.	184.40	1.80	1.456E-02	1173.23	99.850	PBC<MDA	Co60
1460.86	902.	3.37	1.95	1.229E-02	1460.82	10.550	1.988E+01	K40
1620.23	4.	88.16	2.14	1.128E-02	1620.74	1.510	PBC<MDA	Bi212
1765.10	13.	31.92	2.25	1.048E-02	1764.49	15.310	2.364E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
308.27	77.07	106.	64.	2.200E+03	53.50	0.601	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	233.39	58.34	88.	6.	0.002	445.06	0.810s
Th-234	370.45	92.63	142.	13.	0.005	257.11	0.842
U-235	373.35	93.35	126.	17.	0.006	188.33	0.843D
Ac-228	373.35	93.35	126.	17.	0.006	188.33	0.843D
Eu-152	487.63	121.94	123.	-2.	-0.001	1540.70	0.870s
U-235	573.92	143.53	86.	21.	0.008	130.61	0.891s
U-235	654.34	163.65	125.	-9.	-0.003	368.59	0.910s
U-235	744.77	186.27	88.	32.	0.012	89.29	0.931s
Ra-226	744.73	186.26	88.	32.	0.012	89.25	0.932s
U-235	819.94	205.08	96.	-13.	-0.005	215.85	0.950s
Pb-212	953.92	238.59	104.	169.	0.063	23.62	1.208s
Pb-214	966.07	241.63	72.	34.	0.013	72.52	0.624s
Tl-208	1109.24	277.44	54.	21.	0.008	106.77	1.018
Pb-214	1180.70	295.32	52.	76.	0.028	34.46	0.469s
Pb-212	1199.14	299.93	51.	17.	0.006	119.01	1.039s
Ac-228	1353.36	338.51	53.	31.	0.011	75.63	1.075s
Eu-152	1381.13	345.45	38.	1.	0.000	1974.81	1.081
Pb-214	1406.90	351.90	50.	130.	0.048	22.37	1.125s
Pa-234	2280.94	570.49	22.	10.	0.004	142.42	1.286s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:58
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_015.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Tl-208	2331.73	583.19	34.	60.	0.022	37.11	0.895s
Bi-214	2436.31	609.34	43.	104.	0.039	23.21	1.136
Cs-137	2643.61	661.18	24.	11.	0.004	139.25	1.368s
Eu-154	2890.17	722.83	38.	-5.	-0.002	391.42	1.422s
Bi-212	2908.61	727.44	23.	15.	0.005	106.47	1.426s
Eu-154	3490.56	872.93	26.	-4.	-0.001	376.59	1.551s
Pa-234	3512.50	878.41	19.	-3.	-0.001	479.12	1.558s
Pa-234	3533.91	883.77	19.	4.	0.001	340.13	1.560s
Ac-228	3644.51	911.42	14.	67.	0.025	32.73	0.885s
Ac-228	3875.31	969.11	14.	33.	0.012	52.39	0.291s
Eu-154	3984.57	996.42	27.	1.	0.000	1684.58	1.655s
Eu-152	4446.87	1111.97	33.	3.	0.001	515.22	1.750s
Bi-214	4479.70	1120.17	44.	3.	0.001	239.51	1.757s
Co-60	4691.27	1173.05	34.	5.	0.002	368.80	1.799s
Eu-154	5094.56	1273.83	35.	-2.	-0.001	966.54	1.880s
Eu-152	5644.94	1411.36	14.	-3.	-0.001	327.25	1.984s
K-40	5843.08	1460.86	19.	889.	0.329	6.75	1.951
Bi-212	6481.00	1620.23	5.	4.	0.002	176.33	2.144s
Bi-214	7060.99	1765.10	10.	13.	0.005	63.84	2.248s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	3.9765E-01					5.12E+12
			911.20	4.236E-01	@(	5.512E-02 1.64E+01	2.62E+01 G
			968.96	3.549E-01	(	9.625E-02 2.62E+01	1.59E+01 G
			338.32	2.251E-01	-	1.234E-01 3.78E+01	1.14E+01 G
							Energy duplication
			93.35	3.131E-01	&	4.697E-01 9.42E+01	4.10E+00 XA
Am-241	I	3.4322E-02					1.58E+05
			59.54	3.432E-02	?(	1.237E-01 2.23E+02	3.59E+01 G
Bi-212	N	3.9027E-01					5.12E+12
			727.33	3.125E-01	?(	2.390E-01 5.32E+01	6.65E+00 G
			785.37	0.000E+00	-	1.447E+00 1.00E+03	1.11E+00 G
			1620.74	7.327E-01	?(	8.911E-01 8.82E+01	1.51E+00 G
Bi-214	N	2.7399E-01					5.84E+05
			609.31	2.866E-01	(P	4.173E-02 1.16E+01	4.55E+01 G
			1120.29	3.429E-02	- P	1.994E-01 1.20E+02	1.49E+01 G
			1764.49	2.364E-01	?(P	1.358E-01 3.19E+01	1.53E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:58
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_015.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	4.2962E-03					1.93E+03	
			1332.49	-8.262E-04	&(	2.246E-02	1.66E+03	1.00E+02 G
			1173.23	9.425E-03	?(	2.771E-02	1.84E+02	9.98E+01 G
Cs-137	I	1.7157E-02					1.10E+04	
			661.66	1.716E-02	(	1.774E-02	6.96E+01	8.50E+01 G
Eu-152	I	1.7406E-02					4.94E+03	
			344.28	2.832E-03	?(	4.580E-02	9.87E+02	2.66E+01 G
			121.78	-4.341E-03	+	5.487E-02	7.70E+02	2.84E+01 G
			778.90	0.000E+00	-	1.281E-01	1.00E+03	1.30E+01 G
			964.08	4.784E-03	&	2.364E-01	3.00E+03	1.45E+01 G
			1112.08	4.630E-02	?(	1.919E-01	2.58E+02	1.34E+01 G
			1408.01	-3.758E-02	+	9.559E-02	1.64E+02	2.09E+01 G
Eu-154	I	-5.3093E-02					3.14E+03	
			873.18	-5.309E-02	?(	1.588E-01	1.88E+02	1.22E+01 G
			123.07	1.483E-04	%	3.792E-02	1.55E+04	4.04E+01 G
			1274.43	-1.080E-02	+	8.495E-02	4.83E+02	3.49E+01 G
			723.30	-3.256E-02	+	1.020E-01	1.96E+02	2.00E+01 G
			1004.72	-3.177E-03	%	1.217E-01	2.33E+03	1.79E+01 G
			996.25	1.505E-02	+	2.072E-01	8.42E+02	1.05E+01 G
K-40	N	1.9881E+01					4.57E+11	
			1460.82	1.988E+01	(P	2.263E-01	3.37E+00	1.06E+01 G
Pa-234	N	4.9552E-02					1.63E+12	
			131.30	-2.687E-04	%(	7.659E-02	1.73E+04	1.82E+01 G
			569.50	1.332E-01	&(	1.407E-01	7.12E+01	9.30E+00 G
			946.00	4.428E-04	%	1.561E-01	2.14E+04	1.35E+01 G
			880.52	-4.107E-02	+	1.567E-01	2.40E+02	1.05E+01 G
			883.24	6.282E-02	&(	1.677E-01	1.70E+02	9.70E+00 G
Pb-212	N	2.5918E-01					5.12E+12	
			238.63	2.592E-01	(P	3.626E-02	1.18E+01	4.36E+01 G
			300.09	4.001E-01	+ P	3.996E-01	5.95E+01	3.18E+00 G
Pb-214	N	3.1241E-01					5.84E+05	
			351.93	3.113E-01	@(P	3.928E-02	1.12E+01	3.56E+01 G
			295.22	3.139E-01	(P	6.886E-02	1.72E+01	1.84E+01 G
			242.00	3.141E-01	(P	1.828E-01	3.63E+01	7.27E+00 G
Ra-226	N	5.4402E-01					5.84E+05	
			186.21	5.440E-01	(	3.676E-01	4.46E+01	3.56E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:38:58
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_015.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   1.3005E-01                                      1.63E+12
                            63.30 1.431E-02 %(  1.038E+00 4.41E+03 3.75E+00 G
                            92.59 2.300E-01 ?(  4.760E-01 1.29E+02 4.34E+00 G

Tl-208   N   8.5304E-02                                      5.12E+12
                           583.19 8.530E-02  (P 1.939E-02 1.86E+01 8.50E+01 G
                           277.37 2.315E-01 + P 1.883E-01 5.34E+01 6.60E+00 G
                           860.53-2.331E-03 &   1.312E-01 3.42E+03 1.24E+01 G

U-235    N   1.1232E-01                                      2.57E+11
                           143.77 1.123E-01 ?(  1.140E-01 6.53E+01 1.09E+01 G
                           205.32-1.643E-01 -   2.825E-01 1.08E+02 5.02E+00 G
                           163.36-9.961E-02 &   2.973E-01 1.84E+02 5.08E+00 G
                           185.72 3.395E-02 -   2.296E-02 4.46E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 2.229E-01 &   3.344E-01 9.42E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:58
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_015.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	58.34	88.	6.	0.002	445.06	3.432E-02
Th-234	92.63	142.	13.	0.005	257.11	2.300E-01
U-235	93.35	126.	17.	0.006	188.33	2.229E-01
Eu-152	121.94	123.	-2.	-0.001	1540.70	-4.341E-03
U-235	143.53	86.	21.	0.008	130.61	1.123E-01
U-235	163.65	125.	-9.	-0.003	368.59	-9.961E-02
U-235	186.27	88.	32.	0.012	89.29	3.395E-02
Ra-226	186.26	88.	32.	0.012	89.25	5.440E-01
U-235	205.08	96.	-13.	-0.005	215.85	-1.643E-01
Eu-152	345.45	38.	1.	0.000	1974.81	2.832E-03
Pa-234	570.49	22.	10.	0.004	142.42	1.332E-01
Cs-137	661.18	24.	11.	0.004	139.25	1.716E-02
Eu-154	722.83	38.	-5.	-0.002	391.42	-3.256E-02
Bi-212	727.44	23.	15.	0.005	106.47	3.125E-01
Eu-154	872.93	26.	-4.	-0.001	376.59	-5.309E-02
Pa-234	878.41	19.	-3.	-0.001	479.12	-4.107E-02
Pa-234	883.77	19.	4.	0.001	340.13	6.282E-02
Eu-154	996.42	27.	1.	0.000	1684.58	1.505E-02
Eu-152	1111.97	33.	3.	0.001	515.22	4.630E-02
Co-60	1173.05	34.	5.	0.002	368.80	9.425E-03
Eu-154	1273.83	35.	-2.	-0.001	966.54	-1.080E-02
Eu-152	1411.36	14.	-3.	-0.001	327.25	-3.758E-02
Bi-212	1620.23	5.	4.	0.002	176.33	7.327E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.9765E-01	3.9765E-01	1.2282E-01	1.2614E-01	5.512E-02
Am-241 #A	3.4313E-02	3.4322E-02	1.5275E-01	1.5277E-01	1.237E-01
Bi-212 #	3.9027E-01	3.9027E-01	4.0193E-01	4.0243E-01	2.390E-01
Bi-214	2.7397E-01	2.7399E-01	7.2947E-02	7.3980E-02	4.173E-02
Co-60 #A	4.2102E-03	4.2962E-03	1.5844E-02	1.5846E-02	2.246E-02
Cs-137 #A	1.7096E-02	1.7157E-02	2.3891E-02	2.3904E-02	1.774E-02
Eu-152 #A	1.7269E-02	1.7406E-02	8.9677E-02	8.9681E-02	4.580E-02
Eu-154 #A	-5.2439E-02	-5.3093E-02	1.9994E-01	1.9996E-01	1.588E-01
K-40	1.9881E+01	1.9881E+01	1.3609E+00	1.6872E+00	2.263E-01
Pa-234 #A	4.9552E-02	4.9552E-02	7.0572E-02	7.1639E-02	7.659E-02
Pb-212	2.5918E-01	2.5918E-01	6.3368E-02	6.6084E-02	3.626E-02
Pb-214	3.1239E-01	3.1241E-01	7.6181E-02	7.7570E-02	3.928E-02
Ra-226 #	5.4398E-01	5.4402E-01	4.8556E-01	4.8655E-01	3.676E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:38:58
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_015.An1

Th-234	#A	1.3005E-01	1.3005E-01	3.3437E-01	3.3460E-01	1.038E+00
Tl-208		8.5304E-02	8.5304E-02	3.4894E-02	3.5318E-02	1.939E-02
U-235	#A	1.1232E-01	1.1232E-01	1.4671E-01	1.4687E-01	1.140E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.6 keV) 2.121E+01 pCi/g
Total Decayed Activity (25.0 to 2035.6 keV) 2.1209610E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514034951016
File : 2_20140124_016
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58
IDF : 1.0
PDF : 1.0

Lab ID : 251449-010
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 07-JAN-2014
Sample Amount : 327.83 g

Client ID : 04-PD-D0034-10
Acct : ITSI (JG)
Time : 24-JAN-2014 18:44
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.1 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.00612	0.135		.16408	.16408	-0.0012	u
Bismuth-212	0.142	0.291		.37078	.37086	0.00031	u
Bismuth-214	0.323	0.0382		.081803	.083388	-0.011	u
Cesium-137	0.00254	0.0188	0.07	.023213	.023213	0.0048	u
Cobalt-60	0.0102	0.0235		.022781	.022786	0.0015	u
Europium-152	0.0175	0.0664		.022592	.02261	0.020	u
Europium-154	0.0103	0.149		.026918	.026924	0.019	u
Lead-212	0.343	0.0379		.069918	.074263	-0.0075	u
Lead-214	0.390	0.0481		.101	.10287	-0.025	u
Potassium-40	16.9	0.354		1.3378	1.5843	-0.068	u
Protactinium-234	0.0251	0.0962		.045406	.045832	0.0066	u
Radium-226 (By Bismuth-214)	0.323	0.0382	0.2	.081803	.083388	-0.011	u
Thallium-208	0.141	0.0208		.04259	.04364	-0.0042	u
Thorium-232 (By Actinium-228)	0.483	0.0593		.14607	.15043	0.020	u
Thorium-234	0.590	0.969		1.2159	1.2172	0	u
Uranium-235	0.0418	0.125		.03954	.039622	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-10
Sample Description: 251449-010, 207004

Detector: HPGE02 50-TP42234A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:03
Acquisition Time: 1/24/2014 18:44:48
Analysis Time: 1/24/2014 19:29
Analysis Quantity: 3.278E+02 g

Spectrum ID: 2_20140124_016
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.10 %

Efficiency: HPGE02 S23325 2_20140106002_EffCal RA226
Efficiency Cal Date: 1/7/2014 11:47
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.831E-01	1.461E-01	1.504E-01	5.931E-02
Am-241	#AB	-6.118E-03	1.641E-01	1.641E-01	1.348E-01
Bi-212	#AB	1.419E-01	3.708E-01	3.709E-01	2.906E-01
Bi-214	#	3.233E-01	8.180E-02	8.339E-02	3.816E-02
Co-60	#AB	1.018E-02	2.278E-02	2.279E-02	2.354E-02
Cs-137	#AB	2.537E-03	2.321E-02	2.321E-02	1.881E-02
Eu-152	#AB	1.754E-02	2.259E-02	2.261E-02	6.642E-02
Eu-154	#AB	1.035E-02	2.692E-02	2.692E-02	1.487E-01
K-40		1.691E+01	1.338E+00	1.584E+00	3.535E-01
Pa-234	#AB	2.510E-02	4.541E-02	4.583E-02	9.615E-02
Pb-212		3.426E-01	6.992E-02	7.426E-02	3.790E-02
Pb-214		3.901E-01	1.010E-01	1.029E-01	4.813E-02
Ra-226		5.142E-01	4.886E-01	4.895E-01	3.600E-01
Th-234	AB	5.897E-01	1.216E+00	1.217E+00	9.690E-01
Tl-208	#	1.406E-01	4.259E-02	4.364E-02	2.076E-02
U-235	#AB	4.177E-02	3.954E-02	3.962E-02	1.253E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.995E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:29:58
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_016.An1

Sample description
     251449-010, 207004


Spectrum Filename: C:\User\SPC\Det2\2_20140124_016.An1

Acquisition information
       Start time:                 1/24/2014 18:44:48
       Live time:               2700
       Real time:               2703
       Dead time:                  0.10 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:52:16
            Zero offset:           0.026 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/7/2014 11:47:58
            Type:                  Polynomial
            Uncertainty:           1.734 %
            Coefficients:         -0.360765  -4.056690   0.335194
                                  -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.06keV )
       Stop channel:            8144 (  2035.12keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2783E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2783E+02) =
                                   8.2442E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_016.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:03:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	2_2014-01-08_0518.PBC 1/8/2014 05:18:15
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 19 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.2150

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.31	15.	103.10	0.83	2.025E-02	63.30	3.750	PBC<MDA	Th234
74.91	51.	30.50	0.84	3.160E-02				
77.34	89.	18.49	0.85	3.368E-02				
92.42	2.	711.29	0.86	4.359E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	2.313E-02	U235
93.06	32.	42.62	0.47	4.381E-02	93.35	4.100	4.949E-01	Ac228
122.20	7.	250.96	0.89	5.061E-02	121.78	28.410	PBC<MDA	Eu152
124.44	10.	130.07	0.89	5.069E-02	123.07	40.400	PBC<MDA	Eu154
144.38	11.	130.27	0.92	5.047E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	6.005E-02	U235
186.17	28.	47.52	0.33	4.628E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	5.142E-01	Ra226
186.22	33.	47.33	0.96	4.633E-02	185.72	57.000	3.800E-02	U235
					186.21	3.555	6.100E-01	Ra226
					185.72	57.000	3.800E-02	U235
204.84	3.	414.91	0.98	4.406E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	4.476E-02	U235
238.59	205.	9.85	0.94	4.044E-02	238.63	43.600	3.425E-01	Pb212
241.72	40.	35.67	0.38	4.010E-02	242.00	7.268	4.201E-01	Pb214
295.27	93.	17.90	1.14	3.540E-02	295.22	18.414	4.182E-01	Pb214
300.11	18.	59.44	1.07	3.503E-02	300.09	3.180	4.853E-01	Pb212
337.98	56.	26.18	0.79	3.242E-02	338.32	11.400	4.594E-01	Ac228
351.78	143.	12.29	1.40	3.161E-02	351.93	35.600	3.694E-01	Pb214
569.16	10.	90.46	1.32	2.325E-02	569.50	9.300	PBC<MDA	Pa234
583.19	90.	14.00	0.96	2.291E-02	583.19	85.000	1.406E-01	Tl208
609.52	116.	11.68	0.66	2.229E-02	609.31	45.490	3.233E-01	Bi214
664.58	1.	457.56	1.39	2.119E-02	661.66	84.990	PBC<MDA	Cs137

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_016.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
727.16	6.	130.62	1.44	1.999E-02	727.33	6.650	PBC<MDA	Bi212
779.51	2.	433.54	1.48	1.916E-02	778.90	12.970	PBC<MDA	Eu152
861.25	16.	46.79	1.54	1.801E-02	860.53	12.400	2.200E-01	Tl208
911.58	74.	14.65	1.13	1.738E-02	911.20	26.200	4.934E-01	Ac228
946.60	1.	754.58	1.60	1.698E-02	946.00	13.500	PBC<MDA	Pa234
963.92	6.	136.00	1.61	1.677E-02	964.08	14.500	PBC<MDA	Eu152
969.30	15.	53.78	1.62	1.672E-02	968.96	15.900	1.772E-01	Ac228
1006.11	1.	914.31	1.64	1.634E-02	1004.72	17.860	PBC<MDA	Eu154
1120.14	61.	17.21	0.65	1.523E-02	1120.29	14.910	8.183E-01	Bi214
1173.10	6.	132.99	1.74	1.477E-02	1173.23	99.850	PBC<MDA	Co60
1274.27	1.	518.32	1.80	1.396E-02	1274.43	34.900	PBC<MDA	Eu154
1331.86	4.	179.94	1.83	1.354E-02	1332.49	99.983	PBC<MDA	Co60
1407.92	5.	98.83	1.87	1.302E-02	1408.01	20.850	PBC<MDA	Eu152
1460.81	764.	3.84	1.88	1.268E-02	1460.82	10.550	1.691E+01	K40
1764.56	7.	50.90	2.00	1.097E-02	1764.49	15.310	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
299.01	74.87	94.	37.	1.171E+03	81.08	0.711	- s
308.73	77.30	126.	79.	2.346E+03	49.44	0.908	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Th-234	252.83	63.31	107.	15.	0.005	206.20	0.831s
Th-234	369.81	92.59	92.	2.	0.001	1422.59	0.862D
Ac-228	372.86	93.35	80.	32.	0.012	78.77	0.862D
Eu-152	488.13	122.20	133.	7.	0.002	501.92	0.893s
Eu-154	497.10	124.44	83.	10.	0.004	260.15	0.894s
Pa-234	524.44	131.29	157.	-7.	-0.003	518.16	0.903s
U-235	576.76	144.38	95.	11.	0.004	260.54	0.915s
U-235	655.17	164.00	124.	-10.	-0.004	335.47	0.936s
U-235	743.96	186.22	105.	33.	0.012	94.66	0.959s
Ra-226	743.77	186.17	69.	28.	0.010	95.03	0.331s
U-235	818.35	204.84	89.	3.	0.001	829.83	0.978s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_016.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	953.25	238.59	88.	198.	0.073	19.69	0.941
Pb-214	965.75	241.72	74.	40.	0.015	71.33	0.382s
Tl-208	1107.25	277.12	76.	-3.	-0.001	951.23	1.050s
Pb-214	1179.78	295.27	61.	89.	0.033	35.79	1.143s
Pb-212	1199.13	300.11	47.	18.	0.007	118.88	1.072s
Ac-228	1350.50	337.98	50.	56.	0.021	52.36	0.790s
Eu-152	1379.83	345.32	62.	-12.	-0.005	190.62	1.114s
Pb-214	1405.65	351.78	58.	136.	0.050	24.57	1.403s
Pa-234	2274.76	569.16	34.	10.	0.004	180.92	1.316s
Tl-208	2330.85	583.19	32.	90.	0.033	28.01	0.957s
Bi-214	2436.13	609.52	30.	107.	0.040	23.37	0.664s
Cs-137	2656.33	664.58	23.	1.	0.001	915.13	1.392s
Eu-154	2889.67	722.92	33.	-6.	-0.002	284.09	1.440s
Bi-212	2906.65	727.16	29.	6.	0.002	261.25	1.444s
Eu-152	3116.03	779.51	22.	2.	0.001	867.08	1.483s
Bi-212	3131.12	783.28	28.	-7.	-0.003	216.68	1.488s
Tl-208	3443.04	861.25	20.	16.	0.006	93.59	1.543s
Pa-234	3517.55	879.88	32.	-4.	-0.001	407.91	1.557s
Ac-228	3644.42	911.58	14.	74.	0.027	29.30	1.132s
Pa-234	3784.52	946.60	25.	1.	0.000	1509.16	1.602s
Eu-152	3853.83	963.92	30.	6.	0.002	272.00	1.614s
Ac-228	3875.37	969.30	27.	15.	0.006	107.56	1.617s
Eu-154	4022.65	1006.11	30.	1.	0.000	1828.62	1.641s
Eu-152	4445.74	1111.83	28.	-5.	-0.002	310.44	1.708s
Bi-214	4479.02	1120.14	16.	61.	0.023	34.42	0.645s
Co-60	4690.99	1173.10	26.	6.	0.002	265.98	1.744s
Eu-154	5095.99	1274.27	25.	1.	0.001	1036.64	1.800s
Co-60	5326.54	1331.86	19.	4.	0.001	359.88	1.830s
Eu-152	5631.12	1407.92	10.	5.	0.002	197.66	1.866s
K-40	5842.91	1460.81	44.	741.	0.274	7.67	1.884
Bi-214	7059.69	1764.56	13.	7.	0.003	101.80	2.004s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	4.8310E-01					5.12E+12
			911.20	4.934E-01	(P	5.931E-02 1.47E+01 2.62E+01	G
			968.96	1.772E-01	-	1.383E-01 5.38E+01 1.59E+01	G
			338.32	4.594E-01	(	1.367E-01 2.62E+01 1.14E+01	G
							Energy duplication
			93.35	5.440E-01	P	3.527E-01 3.94E+01 4.10E+00	XA

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:29:58
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_016.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Am-241   I  -6.1178E-03                                     1.58E+05
                            59.54-6.118E-03 %(  1.348E-01 1.34E+03 3.59E+01 G

Bi-212   N   1.4193E-01                                     5.12E+12
                           727.33 1.419E-01 &(  2.906E-01 1.31E+02 6.65E+00 G
                           785.37-1.063E+00 &   1.785E+00 1.08E+02 1.11E+00 G
                          1620.74 5.818E-02 %   1.323E+00 1.39E+03 1.51E+00 G

Bi-214   N   3.2333E-01                                     5.84E+05
                           609.31 3.233E-01 @(P 3.816E-02 1.17E+01 4.55E+01 G
                          1120.29 8.183E-01 + P 1.260E-01 1.72E+01 1.49E+01 G
                          1764.49 1.312E-01 - P 1.542E-01 5.09E+01 1.53E+01 G

Co-60    T   1.0181E-02                                     1.93E+03
                          1332.49 8.305E-03 &(  2.354E-02 1.80E+02 1.00E+02 G
                          1173.23 1.206E-02 ?(  2.508E-02 1.33E+02 9.98E+01 G

Cs-137   I   2.5365E-03                                     1.10E+04
                           661.66 2.537E-03 &(  1.881E-02 4.58E+02 8.50E+01 G

Eu-152   I   1.7535E-02                                     4.94E+03
                           344.28-4.433E-02 &(  6.642E-02 9.53E+01 2.66E+01 G
                           121.78 1.409E-02 +   5.755E-02 2.51E+02 2.84E+01 G
                           778.90 1.948E-02 +   1.368E-01 4.34E+02 1.30E+01 G
                           964.08 7.517E-02 &(  1.606E-01 1.36E+02 1.45E+01 G
                          1112.08-7.517E-02 +   1.841E-01 1.55E+02 1.34E+01 G
                          1408.01 5.636E-02 ?(  8.177E-02 9.88E+01 2.09E+01 G

Eu-154   I   1.0347E-02                                     3.14E+03
                           873.18 0.000E+00 &(  1.487E-01 1.00E+03 1.22E+01 G
                           123.07 1.539E-02 &(  3.200E-02 1.30E+02 4.04E+01 G
                          1274.43 8.762E-03 ?(  7.381E-02 5.18E+02 3.49E+01 G
                           723.30-4.597E-02 +   1.030E-01 1.42E+02 2.00E+01 G
                          1004.72 9.095E-03 ?(  1.360E-01 9.14E+02 1.79E+01 G
                           996.25 6.558E-04 %   2.104E-01 1.95E+04 1.05E+01 G

K-40     N   1.6913E+01                                     4.57E+11
                          1460.82 1.691E+01  (P 3.535E-01 3.84E+00 1.06E+01 G

Pa-234   N   2.5098E-02                                     1.63E+12
                           131.30-2.277E-02 ?(  9.615E-02 2.59E+02 1.82E+01 G
                           569.50 1.371E-01  (  1.910E-01 9.05E+01 9.30E+00 G
                           946.00 1.250E-02 ?(  1.539E-01 7.55E+02 1.35E+01 G
                           880.52-6.591E-02 +   2.148E-01 2.04E+02 1.05E+01 G
                           883.24-5.061E-03 &   2.098E-01 2.52E+03 9.70E+00 G
```

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:29:58
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_016.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   3.4255E-01                                     5.12E+12
                           238.63 3.425E-01  (P 3.790E-02 9.85E+00 4.36E+01 G
                           300.09 4.853E-01 +   4.356E-01 5.94E+01 3.18E+00 G

Pb-214   N   3.9008E-01                                     5.84E+05
                           351.93 3.694E-01  (P 4.813E-02 1.23E+01 3.56E+01 G
                           295.22 4.182E-01 @(P 8.505E-02 1.79E+01 1.84E+01 G
                           242.00 4.201E-01  (P 2.099E-01 3.57E+01 7.27E+00 G

Ra-226   N   5.1417E-01                                     5.84E+05
                           186.21 5.142E-01  (  3.600E-01 4.75E+01 3.56E+00 G

Th-234   N   5.8966E-01                                     1.63E+12
                            63.30 5.897E-01 ?(  9.690E-01 1.03E+02 3.75E+00 G
                            92.59 3.094E-02 -   3.607E-01 7.11E+02 4.34E+00 G

Tl-208   N   1.4061E-01                                     5.12E+12
                           583.19 1.406E-01 @(P 2.076E-02 1.40E+01 8.50E+01 G
                           277.37-3.289E-02 &   2.555E-01 4.76E+02 6.60E+00 G
                           860.53 2.200E-01 +   1.435E-01 4.68E+01 1.24E+01 G

U-235    N   4.1770E-02                                     2.57E+11
                           143.77 6.005E-02 &(  1.253E-01 1.30E+02 1.09E+01 G
                           205.32 4.476E-02 &(  3.032E-01 4.15E+02 5.02E+00 G
                           163.36-1.180E-01 +   3.200E-01 1.68E+02 5.08E+00 G
                           185.72 3.800E-02  (  2.755E-02 4.73E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 0.000E+00 -   3.306E-01 1.00E+03 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_016.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Eu-152	122.20	133.	7.	0.002	501.92	1.409E-02
Eu-154	124.44	83.	10.	0.004	260.15	1.539E-02
Pa-234	131.29	157.	-7.	-0.003	518.16	-2.277E-02
U-235	144.38	95.	11.	0.004	260.54	6.005E-02
U-235	164.00	124.	-10.	-0.004	335.47	-1.180E-01
U-235	186.22	105.	33.	0.012	94.66	3.800E-02
U-235	204.84	89.	3.	0.001	829.83	4.476E-02
Eu-152	345.32	62.	-12.	-0.005	190.62	-4.433E-02
Pa-234	569.16	34.	10.	0.004	180.92	1.371E-01
Cs-137	664.58	23.	1.	0.001	915.13	2.537E-03
Eu-154	722.92	33.	-6.	-0.002	284.09	-4.597E-02
Bi-212	727.16	29.	6.	0.002	261.25	1.419E-01
Eu-152	779.51	22.	2.	0.001	867.08	1.948E-02
Bi-212	783.28	28.	-7.	-0.003	216.68	-1.063E+00
Pa-234	879.88	32.	-4.	-0.001	407.91	-6.591E-02
Pa-234	946.60	25.	1.	0.000	1509.16	1.250E-02
Eu-152	963.92	30.	6.	0.002	272.00	7.517E-02
Eu-154	1006.11	30.	1.	0.000	1828.62	9.095E-03
Eu-152	1111.83	28.	-5.	-0.002	310.44	-7.517E-02
Co-60	1173.10	26.	6.	0.002	265.98	1.206E-02
Eu-154	1274.27	25.	1.	0.001	1036.64	8.762E-03
Co-60	1331.86	19.	4.	0.001	359.88	8.305E-03
Eu-152	1407.92	10.	5.	0.002	197.66	5.636E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.8310E-01	4.8310E-01	1.4607E-01	1.5043E-01	5.931E-02
Am-241 #A	-6.1163E-03	-6.1178E-03	1.6408E-01	1.6408E-01	1.348E-01
Bi-212 #A	1.4193E-01	1.4193E-01	3.7078E-01	3.7086E-01	2.906E-01
Bi-214 #	3.2331E-01	3.2333E-01	8.1803E-02	8.3388E-02	3.816E-02
Co-60 #A	9.9776E-03	1.0181E-02	2.2781E-02	2.2786E-02	2.354E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:58
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_016.An1

Cs-137	#A	2.5276E-03	2.5365E-03	2.3213E-02	2.3213E-02	1.881E-02
Eu-152	#A	1.7397E-02	1.7535E-02	2.2592E-02	2.2610E-02	6.642E-02
Eu-154	#A	1.0220E-02	1.0347E-02	2.6918E-02	2.6924E-02	1.487E-01
K-40		1.6913E+01	1.6913E+01	1.3378E+00	1.5843E+00	3.535E-01
Pa-234	#A	2.5098E-02	2.5098E-02	4.5406E-02	4.5832E-02	9.615E-02
Pb-212		3.4255E-01	3.4255E-01	6.9918E-02	7.4263E-02	3.790E-02
Pb-214		3.9005E-01	3.9008E-01	1.0100E-01	1.0287E-01	4.813E-02
Ra-226		5.1414E-01	5.1417E-01	4.8862E-01	4.8951E-01	3.600E-01
Th-234	A	5.8966E-01	5.8966E-01	1.2159E+00	1.2172E+00	9.690E-01
Tl-208	#	1.4061E-01	1.4061E-01	4.2590E-02	4.3640E-02	2.076E-02
U-235	#A	4.1770E-02	4.1770E-02	3.9540E-02	3.9622E-02	1.253E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (186.0 to 2035.1 keV) 1.911E+01 pCi/g
Total Decayed Activity (186.0 to 2035.1 keV) 1.9106873E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE05
Seqnum : 1544034938016
File : 5_20140124_016
Cal : 24-JAN-2014 06:29:37,29-JUN-2013 15:59:06
IDF : 1.0
PDF : 1.0

Lab ID : 251449-011
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-JUN-2013
Sample Amount : 356.36 g

Client ID : 04-PD-D0034-11
Acct : ITSI (JG)
Time : 24-JAN-2014 18:47
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.133	0.136		.17388	.17416	-0.0012	u
Bismuth-212	0.446	0.215		.34986	.3506	0.00031	u
Bismuth-214	0.383	0.0462		.097282	.09879	-0.011	u
Cesium-137	-0.00739	0.0173	0.07	.022096	.022098	0.0048	u
Cobalt-60	0.0107	0.0228		.020033	.020039	0.0015	u
Europium-152	0.0333	0.0496		.049634	.04966	0.020	u
Europium-154	0.0127	0.148		.060414	.060418	0.019	u
Lead-212	0.313	0.0349		.064415	.068288	-0.0075	u
Lead-214	0.437	0.0368		.081582	.0841	-0.025	u
Potassium-40	18.8	0.181		1.2983	1.6059	-0.068	u
Protactinium-234	-0.0573	0.0890		.11149	.1124	0.0066	u
Radium-226 (By Bismuth-214)	0.383	0.0462	0.2	.097282	.09879	-0.011	u
Thallium-208	0.126	0.0205		.044334	.045058	-0.0042	u
Thorium-232 (By Actinium-228)	0.331	0.0506		.10574	.10841	0.020	u
Thorium-234	0.376	1.10		1.3599	1.3604	0	u
Uranium-235	0.0394	0.135		.032209	.032298	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-11
Sample Description: 251449-011, 207004

Detector: HPGE05 51-TP42242A
Spectrum ID: 5_20140124_016
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 14:06
Live Time: 2700 sec
Acquisition Time: 1/24/2014 18:47:40
Real Time: 2702 sec
Analysis Time: 1/24/2014 19:32
Dead Time: 0.07 %
Analysis Quantity: 3.564E+02 g

Efficiency: HPGE05 S22147 5_20130628003_EffCal RA226
Efficiency Cal Date: 6/29/2013 15:59
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.305E-01	1.057E-01	1.084E-01	5.059E-02
Am-241	#AB	1.332E-01	1.739E-01	1.742E-01	1.356E-01
Bi-212	#	4.462E-01	3.499E-01	3.506E-01	2.154E-01
Bi-214		3.826E-01	9.728E-02	9.879E-02	4.617E-02
Co-60	#AB	1.074E-02	2.003E-02	2.004E-02	2.276E-02
Cs-137	#AB	-7.391E-03	2.210E-02	2.210E-02	1.733E-02
Eu-152	#AB	3.335E-02	4.963E-02	4.966E-02	4.957E-02
Eu-154	#AB	1.275E-02	6.041E-02	6.042E-02	1.481E-01
K-40		1.884E+01	1.298E+00	1.606E+00	1.805E-01
Pa-234	#AB	-5.733E-02	1.115E-01	1.124E-01	8.904E-02
Pb-212		3.134E-01	6.441E-02	6.829E-02	3.487E-02
Pb-214		4.367E-01	8.158E-02	8.410E-02	3.679E-02
Ra-226	AB	1.038E-01	4.770E-01	4.770E-01	3.868E-01
Th-234	#AB	3.765E-01	1.360E+00	1.360E+00	1.099E+00
Tl-208		1.257E-01	4.433E-02	4.506E-02	2.051E-02
U-235	AB	3.942E-02	3.221E-02	3.230E-02	1.349E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.159E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:32:49
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_016.An1

Sample description
     251449-011, 207004


Spectrum Filename: C:\User\SPC\Det5\5_20140124_016.An1

Acquisition information
       Start time:                 1/24/2014 18:47:40
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:29:37
            Zero offset:          -0.064 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/29/2013 15:59:06
            Type:                  Polynomial
            Uncertainty:           1.295 %
            Coefficients:         -0.372021  -4.149771   0.439762
                                  -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.95keV )
       Stop channel:            8144 (  2035.00keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.5636E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.5636E+02) =
                                   7.5842E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:49
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_016.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:06:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2013-12-28_0935.PBC 12/28/2013 09:35:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1530

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.35	23.	65.26	0.97	1.324E-02	59.54	35.920	PBC<MDA	Am241
62.67	8.	180.62	0.97	1.655E-02	63.30	3.750	PBC<MDA	Th234
77.18	93.	20.43	1.18	2.766E-02				
92.84	29.	61.18	1.00	3.733E-02	92.59	4.343	5.087E-01	Th234
					93.35	5.760	3.797E-01	U235
					93.35	4.100	PBC<MDA	Ac228
92.84	28.	61.18	1.00	3.733E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	PBC<MDA	U235
					93.35	4.100	PBC<MDA	Ac228
121.07	10.	143.96	1.02	4.618E-02	121.78	28.410	PBC<MDA	Eu152
143.42	7.	218.72	1.04	4.817E-02	143.77	10.940	PBC<MDA	U235
186.40	54.	31.08	0.74	4.662E-02	185.72	57.000	5.670E-02	U235
					186.21	3.555	9.099E-01	Ra226
238.66	211.	9.94	0.88	4.195E-02	238.63	43.600	3.134E-01	Pb212
241.77	29.	55.76	0.83	4.164E-02	242.00	7.268	2.692E-01	Pb214
277.34	16.	69.05	1.15	3.851E-02	277.37	6.600	PBC<MDA	Tl208
295.43	111.	15.05	1.03	3.704E-02	295.22	18.414	4.254E-01	Pb214
338.31	37.	25.79	0.84	3.392E-02	338.32	11.400	2.703E-01	Ac228
345.31	4.	232.71	1.21	3.353E-02	344.28	26.590	PBC<MDA	Eu152
351.78	195.	8.86	1.29	3.305E-02	351.93	35.600	4.426E-01	Pb214
583.17	83.	16.63	1.70	2.333E-02	583.19	85.000	1.180E-01	Tl208
609.31	140.	11.68	1.13	2.264E-02	609.31	45.490	3.826E-01	Bi214
727.60	19.	39.20	1.54	2.003E-02	727.33	6.650	4.090E-01	Bi212
785.65	7.	109.40	1.59	1.899E-02	785.37	1.110	PBC<MDA	Bi212
861.52	12.	69.85	1.65	1.782E-02	860.53	12.400	PBC<MDA	Tl208
910.87	57.	15.88	0.44	1.712E-02	911.20	26.200	3.567E-01	Ac228
969.15	16.	40.57	1.75	1.640E-02	968.96	15.900	1.754E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:49
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_016.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
996.43	3.	236.98	1.77	1.608E-02	996.25	10.500	PBC<MDA	Eu154
1120.13	48.	18.85	1.12	1.477E-02	1120.29	14.910	6.121E-01	Bi214
1172.92	6.	122.42	1.93	1.428E-02	1173.23	99.850	PBC<MDA	Co60
1275.20	1.	884.75	2.02	1.343E-02	1274.43	34.900	PBC<MDA	Eu154
1332.36	5.	140.78	2.07	1.298E-02	1332.49	99.983	PBC<MDA	Co60
1408.52	7.	74.42	2.14	1.243E-02	1408.01	20.850	PBC<MDA	Eu152
1460.85	863.	3.43	2.11	1.208E-02	1460.82	10.550	1.874E+01	K40
1620.82	2.	229.52	2.33	1.110E-02	1620.74	1.510	PBC<MDA	Bi212
1764.58	9.	36.69	2.46	1.032E-02	1764.49	15.310	1.634E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
308.78	77.18	121.	93.	3.355E+03	40.86	1.181	- M

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.49	59.35	97.	23.	0.008	130.52	0.972s
Th-234	250.77	62.67	109.	8.	0.003	361.23	0.975s
U-235	373.41	93.35	144.	29.	0.011	122.36	1.000D
Ac-228	373.41	93.35	145.	28.	0.010	122.36	1.000D
Eu-152	484.21	121.07	107.	10.	0.004	287.92	1.024s
Pa-234	528.05	132.04	138.	-18.	-0.007	194.47	1.031s
U-235	573.55	143.42	118.	7.	0.003	437.44	1.042s
U-235	742.67	185.72	99.	37.	0.014	77.76	1.077D
Ra-226	744.63	186.21	96.	6.	0.002	459.62	0.743D
U-235	817.58	204.46	93.	-10.	-0.004	290.18	1.094s
Pb-212	954.33	238.66	95.	204.	0.076	19.88	0.883
Pb-214	966.76	241.77	93.	29.	0.011	111.52	0.829s
Tl-208	1108.96	277.34	54.	16.	0.006	138.11	1.154
Pb-214	1181.32	295.43	61.	103.	0.038	30.10	1.033
Ac-228	1352.77	338.31	29.	37.	0.014	51.58	0.838s
Eu-152	1380.77	345.31	45.	4.	0.002	465.42	1.211s
Pb-214	1406.62	351.78	44.	185.	0.069	17.72	1.287s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:49
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_016.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pa-234	2279.72	570.10	34.	-3.	-0.001	518.90	1.402s
Tl-208	2332.03	583.17	39.	83.	0.031	33.26	1.698s
Bi-214	2436.56	609.31	53.	140.	0.052	23.35	1.127
Cs-137	2633.45	658.53	23.	-5.	-0.002	298.96	1.481s
Eu-154	2895.14	723.95	33.	-7.	-0.003	229.66	1.534s
Bi-212	2909.77	727.60	19.	19.	0.007	78.40	1.538s
Eu-152	3108.68	777.33	19.	-5.	-0.002	264.68	1.582s
Bi-212	3142.00	785.65	23.	7.	0.002	218.80	1.588s
Tl-208	3445.54	861.52	28.	12.	0.004	139.69	1.653s
Pa-234	3523.79	881.08	30.	-4.	-0.002	363.90	1.670s
Pa-234	3520.56	880.27	23.	-4.	-0.002	334.74	1.673s
Ac-228	3642.98	910.87	12.	57.	0.021	31.76	0.438s
Pa-234	3786.67	946.78	36.	-4.	-0.001	448.62	1.727s
Eu-152	3866.08	966.62	43.	-10.	-0.004	199.89	1.743s
Ac-228	3876.22	969.15	26.	16.	0.006	81.14	1.747s
Eu-154	3985.38	996.43	23.	3.	0.001	473.97	1.771s
Eu-152	4450.10	1112.55	32.	-1.	0.000	1469.66	1.873s
Bi-214	4480.44	1120.13	18.	48.	0.018	37.70	1.116s
Co-60	4691.72	1172.92	20.	6.	0.002	244.84	1.927s
Eu-154	5101.13	1275.20	27.	1.	0.000	1769.50	2.016s
Co-60	5329.93	1332.36	20.	5.	0.002	281.55	2.068s
Eu-152	5634.83	1408.52	9.	7.	0.003	148.85	2.135s
K-40	5844.41	1460.86	12.	855.	0.317	6.79	2.110
Bi-212	6484.94	1620.82	7.	2.	0.001	459.04	2.326s
Bi-214	7060.72	1764.58	9.	9.	0.003	73.37	2.456s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	3.3051E-01					5.12E+12	
			911.20	3.567E-01	(P	5.059E-02	1.59E+01 2.62E+01 G	
			968.96	1.754E-01	- P	1.292E-01	4.06E+01 1.59E+01 G	
			338.32	2.703E-01	(P	9.082E-02	2.58E+01 1.14E+01 G	
								Energy duplication
			93.35	5.055E-01	P	5.151E-01	6.12E+01 4.10E+00 XA	
Am-241	I	1.3323E-01					1.58E+05	
			59.54	1.332E-01	(	1.356E-01	6.53E+01 3.59E+01 G	
Bi-212	N	4.4623E-01					5.12E+12	
			727.33	4.090E-01	?(	2.154E-01	3.92E+01 6.65E+00 G	
			785.37	8.794E-01	&(	1.481E+00	1.09E+02 1.11E+00 G	
			1620.74	2.916E-01	?(	1.041E+00	2.30E+02 1.51E+00 G	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:49
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_016.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	3.8256E-01					5.84E+05	
			609.31	3.826E-01	(P	4.617E-02	1.17E+01	4.55E+01 G
			1120.29	6.121E-01	+ P	1.261E-01	1.88E+01	1.49E+01 G
			1764.49	1.634E-01	- P	1.213E-01	3.67E+01	1.53E+01 G
Co-60	T	1.0738E-02					1.93E+03	
			1332.49	1.039E-02	?(	2.276E-02	1.41E+02	1.00E+02 G
			1173.23	1.109E-02	?(	2.097E-02	1.22E+02	9.98E+01 G
Cs-137	I	-7.3909E-03					1.10E+04	
			661.66	-7.391E-03	?(	1.733E-02	1.49E+02	8.50E+01 G
Eu-152	I	3.3346E-02					4.94E+03	
			344.28	1.322E-02	?(	4.957E-02	2.33E+02	2.66E+01 G
			121.78	2.250E-02	?(	5.211E-02	1.44E+02	2.84E+01 G
			778.90	-5.681E-02	+	1.165E-01	1.32E+02	1.30E+01 G
			964.08	-1.164E-01	+	1.817E-01	9.99E+01	1.45E+01 G
			1112.08	-1.557E-02	+	1.869E-01	7.35E+02	1.34E+01 G
			1408.01	7.379E-02	?(	7.745E-02	7.44E+01	2.09E+01 G
Eu-154	I	1.2747E-02					3.14E+03	
			873.18	2.687E-03	%(	1.481E-01	3.35E+03	1.22E+01 G
			123.07	2.206E-03	&	4.530E-02	1.25E+03	4.04E+01 G
			1274.43	5.112E-03	?(	7.395E-02	8.85E+02	3.49E+01 G
			723.30	-5.290E-02	+	9.489E-02	1.15E+02	2.00E+01 G
			1004.72	-7.439E-03	%	1.232E-01	1.01E+03	1.79E+01 G
			996.25	4.978E-02	&(	1.884E-01	2.37E+02	1.05E+01 G
K-40	N	1.8841E+01					4.57E+11	
			1460.82	1.884E+01	(P	1.805E-01	3.40E+00	1.06E+01 G
Pa-234	N	-5.7330E-02					1.63E+12	
			131.30	-5.733E-02	?(	8.904E-02	9.72E+01	1.82E+01 G
			569.50	-4.128E-02	+	1.724E-01	2.59E+02	9.30E+00 G
			946.00	-4.843E-02	+	1.743E-01	2.24E+02	1.35E+01 G
			880.52	-6.726E-02	+	1.946E-01	1.82E+02	1.05E+01 G
			883.24	-6.963E-02	&	1.837E-01	1.67E+02	9.70E+00 G
Pb-212	N	3.1337E-01					5.12E+12	
			238.63	3.134E-01	(P	3.487E-02	9.94E+00	4.36E+01 G
			300.09	-5.817E-02	% P	4.068E-01	1.16E+03	3.18E+00 G
Pb-214	N	4.3672E-01					5.84E+05	
			351.93	4.426E-01	*(P	3.679E-02	8.86E+00	3.56E+01 G
			295.22	4.254E-01	(P	7.473E-02	1.51E+01	1.84E+01 G
			242.00	2.692E-01	-	2.086E-01	5.58E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:32:49
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_016.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   1.0378E-01                                      5.84E+05
                                                            Derived Ave Activity
                           186.21 1.038E-01 }(  3.868E-01 2.30E+02 3.56E+00 G

Th-234   N   3.7647E-01                                      1.63E+12
                            63.30 3.765E-01 ?(  1.099E+00 1.81E+02 3.75E+00 G
                            92.59-4.980E-03 %   5.465E-01 6.66E+03 4.34E+00 G

Tl-208   N   1.2570E-01                                      5.12E+12
                           583.19 1.180E-01  (P 2.051E-02 1.66E+01 8.50E+01 G
                           277.37 1.777E-01  (  1.885E-01 6.91E+01 6.60E+00 G
                           860.53 1.505E-01 &(  1.574E-01 6.98E+01 1.24E+01 G

U-235    N   3.9420E-02                                      2.57E+11
                           143.77 3.801E-02 ?(  1.349E-01 2.19E+02 1.09E+01 G
                           205.32-1.197E-01 +   2.789E-01 1.45E+02 5.02E+00 G
                           163.36-1.729E-02 %   2.966E-01 1.04E+03 5.08E+00 G
                           185.72 3.942E-02 }   2.449E-02 3.89E+01 5.70E+01 G
                                                            Energy duplication
                            93.35 3.797E-01     3.647E-01 6.12E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:49
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_016.An1

R - Coincidence Corrected C - Coincidence Peak
H - Halflife limit exceeded

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.35	97.	23.	0.008	130.52	1.332E-01
Th-234	62.67	109.	8.	0.003	361.23	3.765E-01
Eu-152	121.07	107.	10.	0.004	287.92	2.250E-02
Pa-234	132.04	138.	-18.	-0.007	194.47	-5.733E-02
Eu-152	345.31	45.	4.	0.002	465.42	1.322E-02
Pa-234	570.10	34.	-3.	-0.001	518.90	-4.128E-02
Cs-137	658.53	23.	-5.	-0.002	298.96	-7.391E-03
Eu-154	723.95	33.	-7.	-0.003	229.66	-5.290E-02
Bi-212	727.60	19.	19.	0.007	78.40	4.090E-01
Eu-152	777.33	19.	-5.	-0.002	264.68	-5.681E-02
Bi-212	785.65	23.	7.	0.002	218.80	8.794E-01
Pa-234	881.08	30.	-4.	-0.002	363.90	-6.726E-02
Pa-234	880.27	23.	-4.	-0.002	334.74	-6.963E-02
Pa-234	946.78	36.	-4.	-0.001	448.62	-4.843E-02
Eu-152	966.62	43.	-10.	-0.004	199.89	-1.164E-01
Eu-154	996.43	23.	3.	0.001	473.97	4.978E-02
Eu-152	1112.55	32.	-1.	0.000	1469.66	-1.557E-02
Co-60	1172.92	20.	6.	0.002	244.84	1.109E-02
Eu-154	1275.20	27.	1.	0.000	1769.50	5.112E-03
Co-60	1332.36	20.	5.	0.002	281.55	1.039E-02
Eu-152	1408.52	9.	7.	0.003	148.85	7.379E-02
Bi-212	1620.82	7.	2.	0.001	459.04	2.916E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.3051E-01	3.3051E-01	1.0574E-01	1.0841E-01	5.059E-02
Am-241 #A	1.3320E-01	1.3323E-01	1.7388E-01	1.7416E-01	1.356E-01
Bi-212 #	4.4623E-01	4.4623E-01	3.4986E-01	3.5060E-01	2.154E-01
Bi-214	3.8254E-01	3.8256E-01	9.7282E-02	9.8790E-02	4.617E-02
Co-60 #A	1.0523E-02	1.0738E-02	2.0033E-02	2.0039E-02	2.276E-02
Cs-137 #A	-7.3647E-03	-7.3909E-03	2.2096E-02	2.2098E-02	1.733E-02
Eu-152 #A	3.3084E-02	3.3346E-02	4.9634E-02	4.9660E-02	4.957E-02
Eu-154 #A	1.2589E-02	1.2747E-02	6.0414E-02	6.0418E-02	1.481E-01
K-40	1.8841E+01	1.8841E+01	1.2983E+00	1.6059E+00	1.805E-01
Pa-234 #A	-5.7330E-02	-5.7330E-02	1.1149E-01	1.1240E-01	8.904E-02
Pb-212	3.1337E-01	3.1337E-01	6.4415E-02	6.8288E-02	3.487E-02
Pb-214	4.3669E-01	4.3672E-01	8.1582E-02	8.4100E-02	3.679E-02
Ra-226 A	1.0378E-01	1.0378E-01	4.7701E-01	4.7705E-01	3.868E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:49
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_016.An1

Th-234	#A	3.7647E-01	3.7647E-01	1.3599E+00	1.3604E+00	1.099E+00
Tl-208		1.2570E-01	1.2570E-01	4.4334E-02	4.5058E-02	2.051E-02
U-235	A	3.9420E-02	3.9420E-02	3.2209E-02	3.2298E-02	1.349E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (186.1 to 2035.0 keV) 2.043E+01 pCi/g
Total Decayed Activity (186.1 to 2035.0 keV) 2.0430338E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE04	Lab ID	: 251449-012	Client ID	: 04-PD-D0034-12
Seqnum	: 1534034952016	Matrix	: Soil	Acct	: ITSI (JG)
File	: 4_20140124_016	Batch	: 207004	Time	: 24-JAN-2014 18:47
Cal	: 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13	Caldate	: 24-JAN-2014, 05-MAR-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 343.45 g	Live Time	: 2700 sec
				Dead Time	: 0.28 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0414	0.125		.15458	.15461	-0.0012	u
Bismuth-212	0.564	0.185		.36467	.36581	0.00031	u
Bismuth-214	0.290	0.0386		.075797	.076906	-0.011	u
Cesium-137	-0.00497	0.0206	0.07	.025649	.02565	0.0048	u
Cobalt-60	0.000377	0.0220		.026714	.026714	0.0015	u
Europium-152	0.0257	0.0482		.038628	.038647	0.020	u
Europium-154	0.0234	0.197		.059789	.059802	0.019	u
Lead-212	0.263	0.0398		.068306	.070898	-0.0075	u
Lead-214	0.364	0.0370		.067644	.069747	-0.025	u
Potassium-40	16.6	0.207		1.2417	1.4956	-0.068	u
Protactinium-234	0.0529	0.0767		.077414	.078523	0.0066	u
Radium-226 (By Bismuth-214)	0.290	0.0386	0.2	.075797	.076906	-0.011	u
Thallium-208	0.119	0.0140		.032787	.033661	-0.0042	u
Thorium-232 (By Actinium-228)	0.300	0.0762		.096489	.098905	0.020	u
Thorium-234	0.892	1.07		1.3536	1.3563	0	u
Uranium-235	-0.0879	0.136		.1709	.17099	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-12
Sample Description: 251449-012, 207004

Detector: HPGE04 51-TP32733A
Spectrum ID: 4_20140124_016
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 14:08
Live Time: 2700 sec
Acquisition Time: 1/24/2014 18:47:04
Real Time: 2708 sec
Analysis Time: 1/24/2014 19:32
Dead Time: 0.28 %
Analysis Quantity: 3.435E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	3.004E-01	9.649E-02	9.890E-02	7.621E-02
Am-241	#AB	-4.138E-02	1.546E-01	1.546E-01	1.248E-01
Bi-212		5.640E-01	3.647E-01	3.658E-01	1.849E-01
Bi-214		2.896E-01	7.580E-02	7.691E-02	3.862E-02
Co-60	#AB	3.770E-04	2.671E-02	2.671E-02	2.195E-02
Cs-137	#AB	-4.970E-03	2.565E-02	2.565E-02	2.062E-02
Eu-152	AB	2.566E-02	3.863E-02	3.865E-02	4.821E-02
Eu-154	#AB	2.340E-02	5.979E-02	5.980E-02	1.965E-01
K-40		1.662E+01	1.242E+00	1.496E+00	2.074E-01
Pa-234	#AB	5.290E-02	7.741E-02	7.852E-02	7.674E-02
Pb-212		2.626E-01	6.831E-02	7.090E-02	3.977E-02
Pb-214		3.635E-01	6.764E-02	6.975E-02	3.703E-02
Ra-226	#	4.647E-01	5.279E-01	5.285E-01	4.096E-01
Th-234	#AB	8.919E-01	1.354E+00	1.356E+00	1.067E+00
Tl-208		1.191E-01	3.279E-02	3.366E-02	1.401E-02
U-235	#AB	-8.794E-02	1.709E-01	1.710E-01	1.362E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.998E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:32:19
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_016.An1

Sample description
     251449-012, 207004


Spectrum Filename: C:\User\SPC\Det4\4_20140124_016.An1

Acquisition information
       Start time:                 1/24/2014 18:47:04
       Live time:               2700
       Real time:               2708
       Dead time:                  0.28 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4345E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4345E+02) =
                                   7.8693E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:19
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_016.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:08:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 14 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1164

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.10	20.	75.89	0.81	1.777E-02	63.30	3.750	PBC<MDA	Th234
77.04	55.	30.75	0.42	2.926E-02				
92.79	17.	104.73	0.84	3.899E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	2.151E-01	U235
					93.35	4.100	3.022E-01	Ac228
123.62	8.	143.61	0.87	4.861E-02	123.07	40.400	PBC<MDA	Eu154
131.47	5.	301.75	0.88	4.962E-02	131.30	18.200	PBC<MDA	Pa234
186.01	28.	57.33	0.93	4.855E-02	185.72	57.000	2.931E-02	U235
					186.21	3.555	4.704E-01	Ra226
					185.72	57.000	2.931E-02	U235
186.02	27.	56.79	0.93	4.851E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	4.647E-01	Ra226
238.71	177.	12.57	0.88	4.347E-02	238.63	43.600	2.626E-01	Pb212
243.83	13.	77.98	0.98	4.315E-02	242.00	7.268	PBC<MDA	Pb214
277.81	14.	78.79	1.02	3.983E-02	277.37	6.600	PBC<MDA	Tl208
295.08	107.	13.97	1.06	3.831E-02	295.22	18.414	4.102E-01	Pb214
300.01	29.	35.41	1.04	3.789E-02	300.09	3.180	6.937E-01	Pb212
338.46	36.	32.73	1.08	3.500E-02	338.32	11.400	2.634E-01	Ac228
					338.32	11.400	2.634E-01	Ac228
351.72	153.	10.04	1.28	3.409E-02	351.93	35.600	3.394E-01	Pb214
568.96	10.	73.16	1.29	2.435E-02	569.50	9.300	PBC<MDA	Pa234
583.25	81.	12.80	0.97	2.394E-02	583.19	85.000	1.165E-01	Tl208
609.31	120.	11.42	0.92	2.322E-02	609.31	45.490	2.895E-01	Bi214
727.45	26.	32.33	0.30	2.051E-02	727.33	6.650	5.598E-01	Bi212
784.77	4.	150.66	1.48	1.944E-02	785.37	1.110	PBC<MDA	Bi212
911.27	37.	25.81	1.58	1.750E-02	911.20	26.200	2.331E-01	Ac228
					911.20	26.200	2.331E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:19
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_016.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
968.92	40.	24.17	1.63	1.675E-02	968.96	15.900	4.378E-01	Ac228
					968.96	15.900	4.378E-01	Ac228
1005.30	6.	127.75	1.66	1.632E-02	1004.72	17.860	PBC<MDA	Eu154
1112.25	4.	164.80	1.75	1.516E-02	1112.08	13.410	PBC<MDA	Eu152
1120.67	38.	22.73	0.41	1.507E-02	1120.29	14.910	4.919E-01	Bi214
1408.32	6.	82.84	1.98	1.266E-02	1408.01	20.850	PBC<MDA	Eu152
1460.86	752.	3.67	1.59	1.229E-02	1460.82	10.550	1.662E+01	K40
1764.42	11.	34.05	2.25	1.048E-02	1764.49	15.310	2.075E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
308.17	77.04	110.	55.	1.880E+03	61.50	0.425	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	235.55	58.87	89.	-7.	-0.003	373.52	0.810s
Th-234	252.42	63.10	110.	20.	0.008	151.77	0.813s
Th-234	371.12	92.79	145.	17.	0.006	209.46	0.842s
Eu-152	485.63	121.44	97.	-5.	-0.002	549.17	0.870s
Eu-154	494.35	123.62	70.	8.	0.003	287.23	0.871s
Pa-234	525.73	131.47	104.	5.	0.002	603.50	0.879s
U-235	572.15	143.09	122.	-17.	-0.006	194.34	0.891s
U-235	651.56	162.95	95.	-14.	-0.005	204.42	0.910s
U-235	743.72	186.01	113.	28.	0.010	114.66	0.931
Ra-226	743.75	186.02	108.	27.	0.010	113.59	0.932
U-235	820.36	205.18	107.	-16.	-0.006	195.53	0.950s
Pb-212	954.40	238.71	123.	171.	0.063	25.14	0.879
Pb-214	974.88	243.83	91.	13.	0.005	155.96	0.985s
Tl-208	1110.69	277.81	54.	14.	0.005	157.58	1.018
Pb-214	1179.74	295.08	46.	99.	0.037	27.95	1.063s
Pb-212	1199.45	300.01	44.	29.	0.011	70.83	1.039
Ac-228	1353.16	338.46	52.	36.	0.013	65.45	1.075s
Eu-152	1376.30	344.24	42.	-7.	-0.003	260.42	1.081s
Pb-214	1406.18	351.72	44.	141.	0.052	20.09	1.285

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:19
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_016.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pa-234	2274.81	568.96	21.	10.	0.004	146.33	1.286s
Tl-208	2331.96	583.25	18.	81.	0.030	25.60	0.971s
Bi-214	2436.17	609.31	36.	105.	0.039	22.83	0.925s
Cs-137	2649.83	662.73	32.	-3.	-0.001	516.11	1.368s
Bi-212	2908.66	727.45	14.	26.	0.010	64.66	0.304s
Eu-152	3113.73	778.72	19.	-3.	-0.001	474.53	1.471s
Bi-212	3137.93	784.77	19.	4.	0.002	301.32	1.476
Ac-228	3643.93	911.27	26.	37.	0.014	51.63	1.584s
Eu-152	3865.38	966.63	62.	-18.	-0.007	132.78	1.628s
Ac-228	3874.56	968.92	27.	40.	0.015	48.33	1.632
Eu-154	4020.10	1005.30	29.	6.	0.002	255.49	1.662s
Eu-152	4448.01	1112.25	18.	4.	0.001	329.60	1.750
Bi-214	4481.69	1120.67	20.	38.	0.014	45.45	0.414s
Co-60	4690.68	1172.90	38.	-1.	0.000	1466.07	1.799s
Eu-154	5086.65	1271.85	26.	-1.	0.000	1961.44	1.880s
Eu-152	5632.79	1408.32	10.	6.	0.002	165.69	1.984
K-40	5843.09	1460.86	16.	739.	0.274	7.34	1.591
Bi-214	7058.25	1764.42	10.	11.	0.004	68.10	2.248s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	3.0040E-01					5.12E+12
			911.20	2.331E-01	?(	7.621E-02 2.58E+01	2.62E+01 G
			968.96	4.378E-01	(	1.318E-01 2.42E+01	1.59E+01 G
			338.32	2.634E-01	(	1.223E-01 3.27E+01	1.14E+01 G
							Energy duplication
			93.35	-1.468E-02	&	3.507E-01 1.45E+03	4.10E+00 XA
Am-241	I	-4.1384E-02					1.58E+05
			59.54	-4.138E-02	?(	1.248E-01 1.87E+02	3.59E+01 G
Bi-212	N	5.6401E-01					5.12E+12
			727.33	5.598E-01	(	1.849E-01 3.23E+01	6.65E+00 G
			785.37	5.893E-01	(	1.387E+00 1.51E+02	1.11E+00 G
			1620.74	0.000E+00	-	3.987E-01 1.00E+03	1.51E+00 G
Bi-214	N	2.8955E-01					5.84E+05
			609.31	2.895E-01	(P	3.862E-02 1.14E+01	4.55E+01 G
			1120.29	4.919E-01	+ P	1.354E-01 2.27E+01	1.49E+01 G
			1764.49	2.075E-01	- P	1.349E-01 3.41E+01	1.53E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:19
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_016.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	3.7697E-04					1.93E+03	
			1332.49	3.770E-04	&(	2.195E-02	3.54E+03	1.00E+02 G
			1173.23	-2.444E-03	+	2.928E-02	7.33E+02	9.98E+01 G
Cs-137	I	-4.9696E-03					1.10E+04	
			661.66	-4.970E-03	?(	2.062E-02	2.58E+02	8.50E+01 G
Eu-152	I	2.5663E-02					4.94E+03	
			344.28	-2.343E-02	?(	4.821E-02	1.30E+02	2.66E+01 G
			121.78	-1.096E-02	&	4.896E-02	2.75E+02	2.84E+01 G
			778.90	-3.146E-02	+	1.189E-01	2.37E+02	1.30E+01 G
			964.08	-2.155E-01	&	2.203E-01	6.64E+01	1.45E+01 G
			1112.08	5.495E-02	(	1.418E-01	1.65E+02	1.34E+01 G
			1408.01	6.944E-02	(	8.297E-02	8.28E+01	2.09E+01 G
Eu-154	I	2.3402E-02					3.14E+03	
			873.18	0.000E+00	?(	1.965E-01	1.00E+03	1.22E+01 G
			123.07	1.275E-02	?(	2.930E-02	1.44E+02	4.04E+01 G
			1274.43	-4.616E-03	+	7.407E-02	9.81E+02	3.49E+01 G
			723.30	-3.970E-03	%	7.820E-02	1.20E+03	2.00E+01 G
			1004.72	6.344E-02	?(	1.268E-01	1.28E+02	1.79E+01 G
			996.25	2.238E-06	%	1.962E-01	5.32E+06	1.05E+01 G
K-40	N	1.6619E+01					4.57E+11	
			1460.82	1.662E+01	(P	2.074E-01	3.67E+00	1.06E+01 G
Pa-234	N	5.2904E-02					1.63E+12	
			131.30	1.561E-02	&(	7.674E-02	3.02E+02	1.82E+01 G
			569.50	1.259E-01	?(	1.365E-01	7.32E+01	9.30E+00 G
			946.00	0.000E+00	-	1.696E-01	1.00E+03	1.35E+01 G
			880.52	-2.397E-03	&	1.689E-01	4.29E+03	1.05E+01 G
			883.24	-4.376E-03	%	1.787E-01	2.49E+03	9.70E+00 G
Pb-212	N	2.6255E-01					5.12E+12	
			238.63	2.626E-01	(P	3.977E-02	1.26E+01	4.36E+01 G
			300.09	6.937E-01	+ P	3.723E-01	3.54E+01	3.18E+00 G
Pb-214	N	3.6352E-01					5.84E+05	
			351.93	3.394E-01	(P	3.703E-02	1.00E+01	3.56E+01 G
			295.22	4.102E-01	@(P	6.516E-02	1.40E+01	1.84E+01 G
			242.00	1.237E-01	& P	2.067E-01	7.80E+01	7.27E+00 G
Ra-226	N	4.6473E-01					5.84E+05	
			186.21	4.647E-01	(	4.096E-01	5.68E+01	3.56E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:32:19
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_016.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   8.9190E-01                                     1.63E+12
                            63.30 8.919E-01  (  1.067E+00 7.59E+01 3.75E+00 G
                            92.59 2.881E-01 -   4.834E-01 1.05E+02 4.34E+00 G

Tl-208   N   1.1911E-01                                     5.12E+12
                           583.19 1.165E-01  (P 1.401E-02 1.28E+01 8.50E+01 G
                           277.37 1.522E-01  (P 1.891E-01 7.88E+01 6.60E+00 G
                           860.53 0.000E+00 -   2.420E-01 1.00E+03 1.24E+01 G

U-235    N  -8.7941E-02                                     2.57E+11
                           143.77-8.794E-02 ?(  1.362E-01 9.72E+01 1.09E+01 G
                           205.32-1.925E-01 +   2.995E-01 9.78E+01 5.02E+00 G
                           163.36-1.605E-01 +   2.609E-01 1.02E+02 5.08E+00 G
                           185.72 2.931E-02 +   2.613E-02 5.73E+01 5.70E+01 G
                                                            Energy duplication
                            93.35-1.045E-02 &   2.496E-01 1.45E+03 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:19
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_016.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	58.87	89.	-7.	-0.003	373.52	-4.138E-02
Th-234	63.10	110.	20.	0.008	151.77	8.919E-01
Th-234	92.79	145.	17.	0.006	209.46	2.881E-01
Eu-154	123.62	70.	8.	0.003	287.23	1.275E-02
Pa-234	131.47	104.	5.	0.002	603.50	1.561E-02
U-235	143.09	122.	-17.	-0.006	194.34	-8.794E-02
U-235	162.95	95.	-14.	-0.005	204.42	-1.605E-01
U-235	186.01	113.	28.	0.010	114.66	2.931E-02
Ra-226	186.02	108.	27.	0.010	113.59	4.647E-01
U-235	205.18	107.	-16.	-0.006	195.53	-1.925E-01
Ac-228	338.46	52.	36.	0.013	65.45	2.634E-01
Pa-234	568.96	21.	10.	0.004	146.33	1.259E-01
Cs-137	662.73	32.	-3.	-0.001	516.11	-4.970E-03
Ac-228	911.27	26.	37.	0.014	51.63	2.331E-01
Ac-228	968.92	27.	40.	0.015	48.33	4.378E-01
Eu-154	1005.30	29.	6.	0.002	255.49	6.344E-02
Co-60	1172.90	38.	-1.	0.000	1466.07	-2.444E-03
Eu-154	1271.85	26.	-1.	0.000	1961.44	-4.616E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	3.0040E-01	3.0040E-01	9.6489E-02	9.8905E-02	7.621E-02
Am-241 #A	-4.1373E-02	-4.1384E-02	1.5458E-01	1.5461E-01	1.248E-01
Bi-212	5.6401E-01	5.6401E-01	3.6467E-01	3.6581E-01	1.849E-01
Bi-214	2.8953E-01	2.8955E-01	7.5797E-02	7.6906E-02	3.862E-02
Co-60 #A	3.6942E-04	3.7697E-04	2.6714E-02	2.6714E-02	2.195E-02
Cs-137 #A	-4.9520E-03	-4.9696E-03	2.5649E-02	2.5650E-02	2.062E-02
Eu-152 A	2.5461E-02	2.5663E-02	3.8628E-02	3.8647E-02	4.821E-02
Eu-154 #A	2.3113E-02	2.3402E-02	5.9789E-02	5.9802E-02	1.965E-01
K-40	1.6619E+01	1.6619E+01	1.2417E+00	1.4956E+00	2.074E-01
Pa-234 #A	5.2904E-02	5.2904E-02	7.7414E-02	7.8523E-02	7.674E-02
Pb-212	2.6255E-01	2.6255E-01	6.8306E-02	7.0898E-02	3.977E-02
Pb-214	3.6350E-01	3.6352E-01	6.7644E-02	6.9747E-02	3.703E-02
Ra-226 #	4.6470E-01	4.6473E-01	5.2787E-01	5.2854E-01	4.096E-01
Th-234 #A	8.9190E-01	8.9190E-01	1.3536E+00	1.3563E+00	1.067E+00
Tl-208	1.1911E-01	1.1911E-01	3.2787E-02	3.3661E-02	1.401E-02
U-235 #A	-8.7941E-02	-8.7941E-02	1.7090E-01	1.7099E-01	1.362E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:32:19
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_016.An1

```
  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
----------------------------   S U M M A R Y   ----------------------------
Total Activity (   25.0 to  2035.6 keV)     1.822E+01  pCi/g
Total Decayed Activity (   25.0 to  2035.6 keV) 1.8217850E+01  pCi/g
```

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE03
Seqnum : 1524034937016
File : 3_20140124_016
Cal : 24-JAN-2014 06:28:35,29-APR-2013 08:26:15
IDF : 1.0
PDF : 1.0

Lab ID : 251449-013
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-APR-2013
Sample Amount : 334.92 g

Client ID : 04-PD-D0034-13
Acct : ITSI (JG)
Time : 24-JAN-2014 18:46
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.1 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0440	0.152		.18763	.18766	-0.0012	u
Bismuth-212	0.414	0.266		.43625	.43677	0.00031	u
Bismuth-214	0.279	0.0439		.080767	.081737	-0.011	u
Cesium-137	0.00562	0.0174	0.07	.022016	.022018	0.0048	u
Cobalt-60	0.00137	0.0268		.032746	.032746	0.0015	u
Europium-152	0.00566	0.0722		.0084756	.00848	0.020	u
Europium-154	0.0131	0.164		.026943	.026952	0.019	u
Lead-212	0.294	0.0372		.066402	.069727	-0.0075	u
Lead-214	0.309	0.0452		.088532	.089701	-0.025	u
Potassium-40	20.3	0.315		1.4388	1.7626	-0.068	u
Protactinium-234	0.0626	0.0865		.12378	.12476	0.0066	u
Radium-226 (By Bismuth-214)	0.279	0.0439	0.2	.080767	.081737	-0.011	u
Thallium-208	0.107	0.0157		.032802	.033506	-0.0042	u
Thorium-232 (By Actinium-228)	0.352	0.0545		.090786	.094282	0.020	u
Thorium-234	0.493	1.25		.32115	.32451	0	u
Uranium-235	0.0317	0.0921		.049178	.049216	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-13
Sample Description: 251449-013, 207004

Detector: HPGE03 51-TP42227A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:11
Acquisition Time: 1/24/2014 18:46:36
Analysis Time: 1/24/2014 19:31
Analysis Quantity: 3.349E+02 g

Spectrum ID: 3_20140124_016
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.10 %

Efficiency: HPGE03 S22147 3_20130428002_EffCal RA226
Efficiency Cal Date: 4/29/2013 08:26
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.516E-01	9.079E-02	9.428E-02	5.448E-02
Am-241	#AB	-4.399E-02	1.876E-01	1.877E-01	1.522E-01
Bi-212	#	4.143E-01	4.363E-01	4.368E-01	2.663E-01
Bi-214		2.794E-01	8.077E-02	8.174E-02	4.387E-02
Co-60	#AB	1.372E-03	3.275E-02	3.275E-02	2.681E-02
Cs-137	#AB	5.620E-03	2.202E-02	2.202E-02	1.744E-02
Eu-152	#AB	5.659E-03	8.476E-03	8.480E-03	7.219E-02
Eu-154	#AB	1.314E-02	2.694E-02	2.695E-02	1.635E-01
K-40		2.030E+01	1.439E+00	1.763E+00	3.147E-01
Pa-234	#AB	6.264E-02	1.238E-01	1.248E-01	8.646E-02
Pb-212		2.941E-01	6.640E-02	6.973E-02	3.718E-02
Pb-214		3.086E-01	8.853E-02	8.970E-02	4.523E-02
Ra-226	#AB	3.276E-01	5.414E-01	5.417E-01	4.276E-01
Th-234	#AB	4.926E-01	3.212E-01	3.245E-01	1.251E+00
Tl-208		1.068E-01	3.280E-02	3.351E-02	1.569E-02
U-235	#AB	3.169E-02	4.918E-02	4.922E-02	9.207E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.299E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:31:45
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_016.An1

Sample description
     251449-013, 207004


Spectrum Filename: C:\User\SPC\Det3\3_20140124_016.An1

Acquisition information
       Start time:                 1/24/2014 18:46:36
       Live time:               2700
       Real time:               2703
       Dead time:                  0.10 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:28:35
            Zero offset:          -0.141 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/29/2013 08:26:15
            Type:                  Polynomial
            Uncertainty:           1.273 %
            Coefficients:         -0.381561  -4.120787   0.430562
                                  -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.88keV )
       Stop channel:            8144 (  2035.17keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3492E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3492E+02) =
                                   8.0697E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:31:45
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_016.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:11:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	3_2013-12-28_0934.PBC 12/28/2013 09:34:58
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0888

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
51.32	7.	108.55	0.31	6.454E-03				
77.09	54.	31.62	0.61	2.759E-02				
84.10	18.	65.38	0.57	3.218E-02				
93.00	52.	31.25	0.89	3.718E-02	92.59	4.343	9.667E-01	Th234
					93.35	5.760	7.217E-01	U235
					93.35	4.100	1.014E+00	Ac228
					92.59	4.343	9.667E-01	Th234
					93.35	5.760	7.217E-01	U235
93.00	52.	31.25	0.89	3.718E-02	92.59	4.343	9.667E-01	Th234
					93.35	5.760	7.217E-01	U235
					93.35	4.100	1.014E+00	Ac228
93.02	51.	32.60	0.89	3.682E-02	92.59	4.343	9.545E-01	Th234
					93.35	5.760	7.126E-01	U235
					93.35	4.100	1.001E+00	Ac228
123.02	15.	102.54	0.92	4.618E-02	123.07	40.400	PBC<MDA	Eu154
					123.07	40.400	2.446E-02	Eu154
131.07	9.	164.34	0.92	4.722E-02	131.30	18.200	PBC<MDA	Pa234
163.95	12.	118.57	0.95	4.789E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	1.436E-01	U235
186.24	19.	77.60	0.97	4.662E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	3.484E-01	Ra226
					185.72	57.000	2.171E-02	U235
186.42	18.	82.63	0.97	4.658E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	3.276E-01	Ra226
205.19	8.	168.98	0.99	4.503E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	1.011E-01	U235
238.65	199.	9.03	1.02	4.202E-02	238.63	43.600	3.101E-01	Pb212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:31:45
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_016.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
241.83	48.	28.35	1.02	4.173E-02	242.00	7.268	4.695E-01	Pb214
295.33	86.	17.87	1.12	3.720E-02	295.22	18.414	3.454E-01	Pb214
299.87	21.	51.25	1.07	3.683E-02	300.09	3.180	5.478E-01	Pb212
338.35	48.	24.41	0.85	3.412E-02	338.32	11.400	3.658E-01	Ac228
352.03	127.	13.12	0.72	3.324E-02	351.93	35.600	2.928E-01	Pb214
583.26	72.	14.66	1.00	2.357E-02	583.19	85.000	1.068E-01	Tl208
609.32	99.	12.62	1.16	2.287E-02	609.31	45.490	2.844E-01	Bi214
661.60	3.	195.86	1.37	2.162E-02	661.66	84.990	PBC<MDA	Cs137
727.66	16.	52.65	1.43	2.025E-02	727.33	6.650	3.496E-01	Bi212
860.03	5.	134.07	1.54	1.803E-02	860.53	12.400	PBC<MDA	Tl208
883.30	7.	109.76	1.56	1.770E-02	883.24	9.700	PBC<MDA	Pa234
911.04	41.	21.15	0.71	1.732E-02	911.20	26.200	2.727E-01	Ac228
969.56	42.	21.37	0.56	1.658E-02	968.96	15.900	4.716E-01	Ac228
998.06	1.	917.30	1.65	1.626E-02	996.25	10.500	PBC<MDA	Eu154
					996.25	10.500	1.324E-02	Eu154
1120.02	20.	43.82	1.75	1.494E-02	1120.29	14.910	2.638E-01	Bi214
1407.91	5.	95.82	1.99	1.255E-02	1408.01	20.850	PBC<MDA	Eu152
1460.98	888.	3.49	1.91	1.219E-02	1460.82	10.550	2.030E+01	K40
1621.11	4.	116.32	2.16	1.119E-02	1620.74	1.510	PBC<MDA	Bi212
1763.82	4.	71.98	2.28	1.039E-02	1764.49	15.310	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
205.68	51.32	34.	7.	1.146E+03	217.09	0.308	-	
308.68	77.09	108.	54.	1.957E+03	63.25	0.614	-	sM
336.70	84.10	66.	18.	5.687E+02	130.75	0.566	TH-231	sc

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	239.71	59.84	111.	-7.	-0.003	426.50	0.864s
Th-234	372.34	93.02	113.	51.	0.019	65.19	0.892s
U-235	373.66	93.35	105.	52.	0.019	62.50	0.893D
Ac-228	373.66	93.35	105.	52.	0.019	62.50	0.893D

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:31:45
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_016.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Eu-154	492.25	123.02	112.	15.	0.006	205.09	0.918s
Pa-234	524.41	131.07	114.	9.	0.003	328.67	0.925s
U-235	655.86	163.95	90.	12.	0.004	237.13	0.952s
U-235	744.95	186.24	103.	19.	0.007	155.20	0.971s
Ra-226	745.65	186.42	103.	18.	0.007	165.26	0.972s
U-235	820.70	205.19	80.	8.	0.003	337.96	0.988s
Pb-212	954.40	238.64	96.	180.	0.067	21.47	1.168
Pb-214	967.60	241.94	129.	30.	0.011	114.16	1.019s
Pb-214	1181.04	295.33	58.	79.	0.029	35.73	1.124
Pb-212	1199.19	299.87	50.	21.	0.008	102.50	1.068
Ac-228	1353.04	338.35	36.	48.	0.018	48.81	0.851
Eu-152	1379.07	344.86	85.	-12.	-0.004	230.25	1.105s
Pb-214	1407.71	352.03	59.	116.	0.043	26.24	0.721s
Tl-208	2332.35	583.26	20.	72.	0.027	29.32	1.001
Bi-214	2436.56	609.32	43.	99.	0.037	25.25	1.157
Cs-137	2645.64	661.60	21.	3.	0.001	391.73	1.372s
Bi-212	2909.87	727.66	27.	16.	0.006	105.30	1.427s
Tl-208	3439.38	860.03	23.	5.	0.002	268.14	1.539
Eu-154	3491.04	872.94	25.	-2.	-0.001	822.14	1.549s
Pa-234	3532.50	883.30	25.	7.	0.003	219.52	1.557
Ac-228	3643.47	911.04	13.	41.	0.015	42.30	0.705s
Pa-234	3784.25	946.23	32.	-2.	-0.001	783.28	1.610s
Ac-228	3877.60	969.56	10.	42.	0.015	42.74	0.558s
Eu-154	3991.63	998.06	23.	1.	0.000	1834.59	1.651s
Eu-152	4444.11	1111.14	34.	-2.	-0.001	801.14	1.747s
Bi-214	4479.67	1120.02	40.	20.	0.007	87.64	1.754s
Eu-152	5631.98	1407.91	11.	5.	0.002	191.64	1.991s
K-40	5844.42	1460.98	34.	873.	0.323	6.97	1.914
Bi-212	6485.57	1621.11	9.	4.	0.001	232.63	2.165s
Bi-214	7057.06	1763.82	16.	4.	0.001	143.96	2.282s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Code	MDA Value pCi/g	COMMENTS
Ac-228	N	3.5164E-01					5.12E+12
			911.20	2.727E-01	(	5.448E-02 2.12E+01 2.62E+01	G
			968.96	4.716E-01	(	8.518E-02 2.14E+01 1.59E+01	G
			338.32	3.658E-01	(	1.080E-01 2.44E+01 1.14E+01	G
							Energy duplication
			93.35	1.014E+00	+	4.675E-01 3.13E+01 4.10E+00	XA

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:31:45
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_016.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	-4.3993E-02					1.58E+05	
			59.54	-4.399E-02	?(	1.522E-01	2.13E+02	3.59E+01 G
Bi-212	N	4.1428E-01					5.12E+12	
			727.33	3.496E-01	@(	2.663E-01	5.27E+01	6.65E+00 G
			785.37	4.800E-02	%	1.693E+00	2.15E+03	1.11E+00 G
			1620.74	6.993E-01	?(	1.208E+00	1.16E+02	1.51E+00 G
Bi-214	N	2.7936E-01					5.84E+05	
			609.31	2.844E-01	(P	4.387E-02	1.26E+01	4.55E+01 G
			1120.29	2.638E-01	?(P	1.982E-01	4.38E+01	1.49E+01 G
			1764.49	6.754E-02	& P	1.756E-01	7.20E+01	1.53E+01 G
Co-60	T	1.3718E-03					1.93E+03	
			1332.49	1.372E-03	%(	2.681E-02	1.19E+03	1.00E+02 G
			1173.23	1.248E-03	%	2.694E-02	1.32E+03	9.98E+01 G
Cs-137	I	5.6203E-03					1.10E+04	
			661.66	5.620E-03	?(	1.744E-02	1.96E+02	8.50E+01 G
Eu-152	I	5.6585E-03					4.94E+03	
			344.28	-3.935E-02	?(	7.219E-02	1.15E+02	2.66E+01 G
			121.78	-8.018E-04	%	6.065E-02	4.59E+03	2.84E+01 G
			778.90	0.000E+00	+	1.509E-01	1.00E+03	1.30E+01 G
			964.08	-1.055E-03	%	1.591E-01	9.16E+03	1.45E+01 G
			1112.08	-3.124E-02	+	2.031E-01	4.01E+02	1.34E+01 G
			1408.01	6.305E-02	&(	8.910E-02	9.58E+01	2.09E+01 G
Eu-154	I	1.3137E-02					3.14E+03	
			873.18	-2.455E-02	?(	1.635E-01	4.11E+02	1.22E+01 G
			123.07	2.446E-02	(	4.001E-02	1.03E+02	4.04E+01 G
			1274.43	0.000E+00	-	1.303E-01	1.00E+03	3.49E+01 G
			723.30	0.000E+00	-	1.688E-01	1.00E+03	2.00E+01 G
			1004.72	-2.872E-03	&	1.012E-01	2.15E+03	1.79E+01 G
			996.25	1.324E-02	?(	1.986E-01	9.17E+02	1.05E+01 G
K-40	N	2.0296E+01					4.57E+11	
			1460.82	2.030E+01	(P	3.147E-01	3.49E+00	1.06E+01 G
Pa-234	N	6.2637E-02					1.63E+12	
			131.30	3.258E-02	&(	8.646E-02	1.64E+02	1.82E+01 G
			569.50	-2.342E-03	%	1.683E-01	4.37E+03	9.30E+00 G
			946.00	-2.726E-02	&	1.731E-01	3.92E+02	1.35E+01 G
			880.52	-4.477E-04	&	1.924E-01	2.61E+04	1.05E+01 G
			883.24	1.190E-01	?(	2.018E-01	1.10E+02	9.70E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:31:45
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_016.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   2.9410E-01                                     5.12E+12
                          238.63 2.941E-01  (P 3.718E-02 1.07E+01 4.36E+01 G
                          300.09 5.478E-01 +   4.195E-01 5.12E+01 3.18E+00 G

Pb-214   N   3.0864E-01                                     5.84E+05
                          351.93 2.928E-01  (P 4.523E-02 1.31E+01 3.56E+01 G
                          295.22 3.454E-01  (P 7.729E-02 1.79E+01 1.84E+01 G
                          242.00 2.932E-01 ?(  2.611E-01 5.71E+01 7.27E+00 G

Ra-226   N   3.2761E-01                                     5.84E+05
                          186.21 3.276E-01 ?(  4.276E-01 8.26E+01 3.56E+00 G

Th-234   N   4.9262E-01                                     1.63E+12
                           63.30-4.235E-02 %(  1.251E+00 1.80E+03 3.75E+00 G
                           92.59 9.545E-01 *(  4.630E-01 3.26E+01 4.34E+00 G

Tl-208   N   1.0684E-01                                     5.12E+12
                          583.19 1.068E-01  (P 1.569E-02 1.47E+01 8.50E+01 G
                          277.37-3.259E-02 % P 1.978E-01 6.07E+06 6.60E+00 G
                          860.53 7.141E-02 -   1.493E-01 1.34E+02 1.24E+01 G

U-235    N   3.1686E-02                                     2.57E+11
                          143.77-1.600E-04 &(  9.207E-02 3.49E+04 1.09E+01 G
                          205.32 1.011E-01 ?(  2.750E-01 1.69E+02 5.02E+00 G
                          163.36 1.436E-01 ?(  2.719E-01 1.19E+02 5.08E+00 G
                          185.72 2.171E-02 ?(  2.654E-02 7.76E+01 5.70E+01 G
                                                          Energy duplication
                           93.35 7.217E-01 *   3.328E-01 3.13E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:31:45
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_016.An1

T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.84	111.	-7.	-0.003	426.50	-4.399E-02
Th-234	93.02	113.	51.	0.019	65.19	9.545E-01
U-235	93.35	105.	52.	0.019	62.50	7.217E-01
Eu-154	123.02	112.	15.	0.006	205.09	2.446E-02
Pa-234	131.07	114.	9.	0.003	328.67	3.258E-02
U-235	163.95	90.	12.	0.004	237.13	1.436E-01
U-235	186.24	103.	19.	0.007	155.20	2.171E-02
U-235	205.19	80.	8.	0.003	337.96	1.011E-01
Eu-152	344.86	85.	-12.	-0.004	230.25	-3.935E-02
Cs-137	661.60	21.	3.	0.001	391.73	5.620E-03
Bi-212	727.66	27.	16.	0.006	105.30	3.496E-01
Eu-154	872.94	25.	-2.	-0.001	822.14	-2.455E-02
Pa-234	883.30	25.	7.	0.003	219.52	1.190E-01
Pa-234	946.23	32.	-2.	-0.001	783.28	-2.726E-02
Eu-154	998.06	23.	1.	0.000	1834.59	1.324E-02
Eu-152	1111.14	34.	-2.	-0.001	801.14	-3.124E-02
Eu-152	1407.91	11.	5.	0.002	191.64	6.305E-02
Bi-212	1621.11	9.	4.	0.001	232.63	6.993E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.5164E-01	3.5164E-01	9.0786E-02	9.4282E-02	5.448E-02
Am-241 #A	-4.3982E-02	-4.3993E-02	1.8763E-01	1.8766E-01	1.522E-01
Bi-212 #	4.1428E-01	4.1428E-01	4.3625E-01	4.3677E-01	2.663E-01
Bi-214	2.7934E-01	2.7936E-01	8.0767E-02	8.1737E-02	4.387E-02
Co-60 #A	1.3443E-03	1.3718E-03	3.2746E-02	3.2746E-02	2.681E-02
Cs-137 #A	5.6004E-03	5.6203E-03	2.2016E-02	2.2018E-02	1.744E-02
Eu-152 #A	5.6141E-03	5.6585E-03	8.4756E-03	8.4800E-03	7.219E-02
Eu-154 #A	1.2975E-02	1.3137E-02	2.6943E-02	2.6952E-02	1.635E-01
K-40	2.0296E+01	2.0296E+01	1.4388E+00	1.7626E+00	3.147E-01
Pa-234 #A	6.2637E-02	6.2637E-02	1.2378E-01	1.2476E-01	8.646E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:31:45
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_016.An1

Pb-212	2.9410E-01	2.9410E-01	6.6402E-02	6.9727E-02	3.718E-02
Pb-214	3.0862E-01	3.0864E-01	8.8532E-02	8.9701E-02	4.523E-02
Ra-226 #A	3.2759E-01	3.2761E-01	5.4142E-01	5.4174E-01	4.276E-01
Th-234 #A	4.9262E-01	4.9262E-01	3.2115E-01	3.2451E-01	1.251E+00
Tl-208	1.0684E-01	1.0684E-01	3.2802E-02	3.3506E-02	1.569E-02
U-235 #A	3.1686E-02	3.1686E-02	4.9178E-02	4.9216E-02	9.207E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (24.9 to 2035.2 keV) 2.164E+01 pCi/g
Total Decayed Activity (24.9 to 2035.2 keV) 2.1636539E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE01
Seqnum : 1504034935016
File : 1_20140124_016
Cal : 24-JAN-2014 06:26:40,19-JUN-2013 18:43:28
IDF : 1.0
PDF : 1.0

Lab ID : 251449-014
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 19-JUN-2013
Sample Amount : 306.02 g

Client ID : 04-PD-D0034-14
Acct : ITSI (JG)
Time : 24-JAN-2014 18:44
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0290	0.132		.16274	.16276	-0.0012	u
Bismuth-212	0.369	0.299		.47738	.47776	0.00031	u
Bismuth-214	0.332	0.0429		.09004	.091271	-0.011	u
Cesium-137	0.0146	0.0175	0.07	.023521	.02353	0.0048	u
Cobalt-60	0.00100	0.0258		.031516	.031516	0.0015	u
Europium-152	0.0205	0.0601		.049602	.049612	0.020	u
Europium-154	0.0182	0.183		.039165	.039177	0.019	u
Lead-212	0.275	0.0301		.059343	.062589	-0.0075	u
Lead-214	0.311	0.0442		.082595	.083864	-0.025	u
Potassium-40	18.0	0.288		1.391	1.6586	-0.068	u
Protactinium-234	0.0478	0.0956		.10187	.10256	0.0066	u
Radium-226 (By Bismuth-214)	0.332	0.0429	0.2	.09004	.091271	-0.011	u
Thallium-208	0.0767	0.0196		.035869	.036203	-0.0042	u
Thorium-232 (By Actinium-228)	0.226	0.0843		.11459	.11575	0.020	u
Thorium-234	1.08	0.933		1.2142	1.2185	0	u
Uranium-235	0.0199	0.119		.029208	.029233	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-14
Sample Description: 251449-014, 207004

Detector: HPGE01 50-TP42236A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:13
Acquisition Time: 1/24/2014 18:44:22
Analysis Time: 1/24/2014 19:29
Analysis Quantity: 3.060E+02 g

Spectrum ID: 1_20140124_016
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE01 S22147 1_20130619002_EffCal RA226
Efficiency Cal Date: 6/19/2013 18:43
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	2.256E-01	1.146E-01	1.158E-01	8.428E-02
Am-241	#AB	2.902E-02	1.627E-01	1.628E-01	1.324E-01
Bi-212	#	3.691E-01	4.774E-01	4.778E-01	2.985E-01
Bi-214		3.323E-01	9.004E-02	9.127E-02	4.290E-02
Co-60	#AB	1.004E-03	3.152E-02	3.152E-02	2.583E-02
Cs-137	#AB	1.455E-02	2.352E-02	2.353E-02	1.751E-02
Eu-152	#AB	2.053E-02	4.960E-02	4.961E-02	6.014E-02
Eu-154	#AB	1.819E-02	3.917E-02	3.918E-02	1.830E-01
K-40		1.801E+01	1.391E+00	1.659E+00	2.882E-01
Pa-234	#AB	4.785E-02	1.019E-01	1.026E-01	9.555E-02
Pb-212		2.750E-01	5.934E-02	6.259E-02	3.008E-02
Pb-214		3.108E-01	8.259E-02	8.386E-02	4.423E-02
Ra-226	#	4.424E-01	5.454E-01	5.460E-01	4.229E-01
Th-234	#	1.079E+00	1.214E+00	1.218E+00	9.325E-01
Tl-208		7.671E-02	3.587E-02	3.620E-02	1.957E-02
U-235	#AB	1.993E-02	2.921E-02	2.923E-02	1.191E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.127E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:29:31
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_016.An1

Sample description
     251449-014, 207004


Spectrum Filename: C:\User\SPC\Det1\1_20140124_016.An1

Acquisition information
       Start time:                 1/24/2014 18:44:22
       Live time:               2700
       Real time:               2702
       Dead time:                  0.06 %
       Detector ID:                    1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                   1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:26:40
            Zero offset:           0.000 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/19/2013 18:43:28
            Type:                  Polynomial
            Uncertainty:           1.382 %
            Coefficients:         -0.396420  -4.062121   0.406738
                                  -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.01keV )
       Stop channel:            8144 (  2035.50keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.0602E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.0602E+02) =
                                   8.8318E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:31
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_016.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:13:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	1_2013-12-28_0933.PBC 12/28/2013 09:33:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1378

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.55	5.	280.45	0.84	1.604E-02	59.54	35.920	PBC<MDA	Am241
63.34	24.	56.29	0.84	1.951E-02	63.30	3.750	1.079E+00	Th234
74.73	58.	26.74	0.86	2.902E-02				
77.16	84.	19.31	0.86	3.082E-02				
91.17	9.	127.77	0.88	4.044E-02	93.35	4.100	PBC<MDA	Ac228
					93.35	5.760	1.286E-01	U235
					93.35	5.760	1.286E-01	U235
					93.35	4.100	1.806E-01	Ac228
91.17	9.	127.77	0.88	4.044E-02	93.35	4.100	PBC<MDA	Ac228
					93.35	5.760	1.286E-01	U235
123.63	13.	107.68	0.91	4.878E-02	123.07	40.400	PBC<MDA	Eu154
186.33	23.	61.65	0.97	4.793E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	4.424E-01	Ra226
					185.72	57.000	2.756E-02	U235
186.35	20.	73.27	0.97	4.797E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	3.848E-01	Ra226
238.57	157.	10.79	0.73	4.295E-02	238.63	43.600	2.750E-01	Pb212
241.74	28.	45.65	0.63	4.262E-02	242.00	7.268	2.978E-01	Pb214
279.32	5.	100.87	1.07	3.941E-02	277.37	6.600	PBC<MDA	Tl208
295.24	68.	19.05	1.19	3.794E-02	295.22	18.414	3.191E-01	Pb214
338.18	21.	48.83	1.13	3.477E-02	338.32	11.400	1.705E-01	Ac228
					338.32	11.400	1.705E-01	Ac228
352.04	124.	12.23	1.05	3.388E-02	351.93	35.600	3.092E-01	Pb214
570.06	7.	117.57	1.34	2.450E-02	569.50	9.300	PBC<MDA	Pa234
583.69	46.	21.16	0.37	2.410E-02	583.19	85.000	7.396E-02	Tl208
609.49	119.	12.33	1.01	2.339E-02	609.31	45.490	3.323E-01	Bi214
660.70	8.	80.82	1.42	2.212E-02	661.66	84.990	PBC<MDA	Cs137

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:31
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_016.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
727.20	9.	94.74	1.48	2.074E-02	727.33	6.650	PBC<MDA	Bi212
785.30	9.	88.04	1.53	1.968E-02	785.37	1.110	PBC<MDA	Bi212
861.42	7.	110.65	1.59	1.847E-02	860.53	12.400	PBC<MDA	Tl208
880.32	6.	106.45	1.60	1.818E-02	880.52	10.500	PBC<MDA	Pa234
911.29	36.	22.17	1.63	1.775E-02	911.20	26.200	2.533E-01	Ac228
					911.20	26.200	2.533E-01	Ac228
963.83	7.	120.79	1.67	1.706E-02	964.08	14.500	PBC<MDA	Eu152
969.27	18.	42.96	1.67	1.700E-02	968.96	15.900	2.195E-01	Ac228
					968.96	15.900	2.195E-01	Ac228
1120.66	41.	24.67	0.49	1.531E-02	1120.29	14.910	5.884E-01	Bi214
1460.92	741.	3.78	1.61	1.247E-02	1460.82	10.550	1.801E+01	K40
1764.73	11.	33.45	2.13	1.061E-02	1764.49	15.310	2.278E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
298.39	74.63	122.	50.	1.730E+03	73.73	0.748	-	
308.13	77.06	86.	63.	2.044E+03	48.67	0.725	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	238.09	59.55	100.	5.	0.002	560.90	0.839s
Th-234	253.27	63.34	80.	24.	0.009	112.58	0.843
Th-234	368.70	92.21	128.	-2.	-0.001	1676.40	0.875s
Ac-228	373.25	93.35	64.	9.	0.003	255.54	0.875D
U-235	373.25	93.35	64.	9.	0.003	255.54	0.875D
Eu-152	486.20	121.60	119.	-2.	-0.001	1762.19	0.906s
Eu-154	494.32	123.63	90.	13.	0.005	215.36	0.907s
Pa-234	526.10	131.58	128.	-2.	-0.001	1428.59	0.916s
U-235	745.09	186.35	98.	20.	0.007	146.55	0.973s
Ra-226	745.04	186.33	89.	23.	0.009	123.30	0.974s
U-235	820.14	205.11	93.	-6.	-0.002	500.83	0.994s
Pb-212	953.92	238.57	55.	157.	0.058	21.58	0.730s
Pb-214	966.61	241.74	60.	28.	0.010	91.30	0.629s
Tl-208	1116.88	279.32	31.	5.	0.002	201.73	1.067s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:31
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_016.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-214	1180.55	295.24	54.	68.	0.025	38.11	1.188
Pb-212	1201.79	300.55	60.	-4.	-0.001	622.36	1.090
Ac-228	1352.28	338.18	53.	21.	0.008	97.66	1.128s
Eu-152	1378.67	344.78	51.	-5.	-0.002	432.82	1.134s
Pb-214	1407.70	352.04	49.	114.	0.042	24.45	1.046
Pa-234	2279.63	570.06	30.	7.	0.003	235.14	1.344s
Tl-208	2334.17	583.69	28.	46.	0.017	42.31	0.368s
Bi-214	2437.36	609.49	36.	108.	0.040	24.66	1.015s
Cs-137	2642.19	660.70	19.	8.	0.003	161.64	1.425s
Eu-154	2896.06	724.17	43.	-1.	0.000	1894.06	1.477s
Bi-212	2908.19	727.20	29.	9.	0.003	189.49	1.480s
Bi-212	3140.63	785.30	27.	9.	0.003	176.08	1.528s
Tl-208	3445.15	861.42	26.	7.	0.003	221.30	1.587
Pa-234	3520.74	880.32	16.	6.	0.002	212.90	1.603s
Pa-234	3533.67	883.55	26.	-4.	-0.001	386.21	1.605s
Ac-228	3644.64	911.29	26.	36.	0.013	44.33	1.626s
Eu-152	3854.85	963.83	30.	7.	0.002	241.57	1.666s
Ac-228	3876.59	969.27	32.	18.	0.007	85.92	1.669s
Eu-152	4440.54	1110.22	25.	-2.	-0.001	737.32	1.770s
Bi-214	4482.32	1120.66	23.	41.	0.015	49.34	0.491s
Eu-154	5096.25	1274.09	33.	-8.	-0.003	209.39	1.875s
Eu-152	5639.02	1409.71	13.	-2.	-0.001	643.92	1.954s
K-40	5843.97	1460.92	25.	724.	0.268	7.55	1.606
Bi-214	7059.99	1764.73	10.	11.	0.004	66.89	2.130s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	2.2561E-01					5.12E+12
			911.20	2.533E-01	(P	8.428E-02 2.22E+01 2.62E+01 G	
			968.96	2.195E-01	?(P	1.589E-01 4.30E+01 1.59E+01 G	
			338.32	1.705E-01	?(P	1.400E-01 4.88E+01 1.14E+01 G	
							Energy duplication
			93.35	1.806E-01	?	3.673E-01 1.28E+02 4.10E+00 XA	
Am-241	I	2.9015E-02					1.58E+05
			59.54	2.902E-02	?(	1.324E-01 2.80E+02 3.59E+01 G	
Bi-212	N	3.6911E-01					5.12E+12
			727.33	2.049E-01	?(	2.985E-01 9.47E+01 6.65E+00 G	
			785.37	1.353E+00	?(	1.817E+00 8.80E+01 1.11E+00 G	
			1620.74	0.000E+00	&	1.900E+00 1.00E+03 1.51E+00 G	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:31
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_016.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	3.3228E-01					5.84E+05	
			609.31	3.323E-01	(P	4.290E-02	1.23E+01	4.55E+01 G
			1120.29	5.884E-01	+ P	1.600E-01	2.47E+01	1.49E+01 G
			1764.49	2.278E-01	- P	1.453E-01	3.34E+01	1.53E+01 G
Co-60	T	1.0037E-03					1.93E+03	
			1332.49	1.004E-03	&(	2.583E-02	1.57E+03	1.00E+02 G
			1173.23	-1.043E-03	&	2.656E-02	1.55E+03	9.98E+01 G
Cs-137	I	1.4552E-02					1.10E+04	
			661.66	1.455E-02	?(	1.751E-02	8.08E+01	8.50E+01 G
Eu-152	I	2.0533E-02					4.94E+03	
			344.28	-1.726E-02	?(	6.014E-02	2.16E+02	2.66E+01 G
			121.78	-4.195E-03	&	6.067E-02	8.81E+02	2.84E+01 G
			778.90	0.000E+00	+	2.384E-01	1.00E+03	1.30E+01 G
			964.08	8.983E-02	(	1.694E-01	1.21E+02	1.45E+01 G
			1112.08	-3.132E-02	+	1.866E-01	3.69E+02	1.34E+01 G
			1408.01	-2.039E-02	+	1.050E-01	3.22E+02	2.09E+01 G
Eu-154	I	1.8186E-02					3.14E+03	
			873.18	6.716E-03	%(	1.830E-01	1.66E+03	1.22E+01 G
			123.07	2.164E-02	&(	3.709E-02	1.08E+02	4.04E+01 G
			1274.43	-5.588E-02	+	9.086E-02	1.05E+02	3.49E+01 G
			723.30	-7.825E-03	+	1.214E-01	9.47E+02	2.00E+01 G
			1004.72	-8.226E-05	%	1.254E-01	9.25E+04	1.79E+01 G
			996.25	0.000E+00	-	2.282E-01	1.00E+03	1.05E+01 G
K-40	N	1.8006E+01					4.57E+11	
			1460.82	1.801E+01	(P	2.882E-01	3.78E+00	1.06E+01 G
Pa-234	N	4.7847E-02					1.63E+12	
			131.30	-8.155E-03	?(	9.555E-02	7.14E+02	1.82E+01 G
			569.50	1.006E-01	?(	1.846E-01	1.18E+02	9.30E+00 G
			946.00	7.818E-03	%	1.622E-01	1.27E+03	1.35E+01 G
			880.52	9.816E-02	&(	1.583E-01	1.06E+02	1.05E+01 G
			883.24	-7.143E-02	+	2.192E-01	1.93E+02	9.70E+00 G
Pb-212	N	2.7499E-01					5.12E+12	
			238.63	2.750E-01	(	3.008E-02	1.08E+01	4.36E+01 G
			300.09	-9.772E-02	-	4.937E-01	3.11E+02	3.18E+00 G
Pb-214	N	3.1080E-01					5.84E+05	
			351.93	3.092E-01	(P	4.423E-02	1.22E+01	3.56E+01 G
			295.22	3.191E-01	(P	8.007E-02	1.91E+01	1.84E+01 G
			242.00	2.978E-01	(	1.903E-01	4.57E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 19:29:31
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_016.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   4.4236E-01                                     5.84E+05
                           186.21 4.424E-01 ?(  4.229E-01 6.16E+01 3.56E+00 G

Th-234   N   1.0785E+00                                     1.63E+12
                            63.30 1.079E+00 ?(  9.325E-01 5.63E+01 3.75E+00 G
                            92.59-3.605E-02 &   4.960E-01 8.38E+02 4.34E+00 G

Tl-208   N   7.6711E-02                                     5.12E+12
                           583.19 7.396E-02  (P 1.957E-02 2.12E+01 8.50E+01 G
                           277.37 6.914E-02 &(P 1.618E-01 1.01E+02 6.60E+00 G
                           860.53 9.957E-02  (  1.705E-01 1.11E+02 1.24E+01 G

U-235    N   1.9931E-02                                     2.57E+11
                           143.77-1.149E-03 &(  1.191E-01 6.30E+03 1.09E+01 G
                           205.32-7.806E-02 +   3.174E-01 2.50E+02 5.02E+00 G
                           163.36-1.750E-02 &   3.058E-01 1.06E+03 5.08E+00 G
                           185.72 2.398E-02 ?(  2.757E-02 7.33E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 1.286E-01 ?   2.615E-01 1.28E+02 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:31
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_016.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	59.55	100.	5.	0.002	560.90	2.902E-02	
Th-234	63.34	80.	24.	0.009	112.58	1.079E+00	
Th-234	92.21	128.	-2.	-0.001	1676.40	-3.605E-02	
Ac-228	93.35	64.	9.	0.003	255.54	1.806E-01	
U-235	93.35	64.	9.	0.003	255.54	1.286E-01	
Eu-152	121.60	119.	-2.	-0.001	1762.19	-4.195E-03	
Eu-154	123.63	90.	13.	0.005	215.36	2.164E-02	
Pa-234	131.58	128.	-2.	-0.001	1428.59	-8.155E-03	
U-235	186.35	98.	20.	0.007	146.55	2.398E-02	
Ra-226	186.33	89.	23.	0.009	123.30	4.424E-01	
U-235	205.11	93.	-6.	-0.002	500.83	-7.806E-02	
Ac-228	338.18	53.	21.	0.008	97.66	1.705E-01	P
Eu-152	344.78	51.	-5.	-0.002	432.82	-1.726E-02	
Pa-234	570.06	30.	7.	0.003	235.14	1.006E-01	
Eu-154	724.17	43.	-1.	0.000	1894.06	-7.825E-03	
Bi-212	727.20	29.	9.	0.003	189.49	2.049E-01	
Bi-212	785.30	27.	9.	0.003	176.08	1.353E+00	
Pa-234	880.32	16.	6.	0.002	212.90	9.816E-02	
Pa-234	883.55	26.	-4.	-0.001	386.21	-7.143E-02	
Ac-228	911.29	26.	36.	0.013	44.33	2.533E-01	P
Eu-152	963.83	30.	7.	0.002	241.57	8.983E-02	
Ac-228	969.27	32.	18.	0.007	85.92	2.195E-01	P
Eu-152	1110.22	25.	-2.	-0.001	737.32	-3.132E-02	
Eu-154	1274.09	33.	-8.	-0.003	209.39	-5.588E-02	
Eu-152	1409.71	13.	-2.	-0.001	643.92	-2.039E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	2.2561E-01	2.2561E-01	1.1459E-01	1.1575E-01	8.428E-02
Am-241 #A	2.9008E-02	2.9015E-02	1.6274E-01	1.6276E-01	1.324E-01
Bi-212 #C	3.6911E-01	3.6911E-01	4.7738E-01	4.7776E-01	2.985E-01
Bi-214	3.3226E-01	3.3228E-01	9.0040E-02	9.1271E-02	4.290E-02
Co-60 #A	9.8362E-04	1.0037E-03	3.1516E-02	3.1516E-02	2.583E-02
Cs-137 #A	1.4500E-02	1.4552E-02	2.3521E-02	2.3530E-02	1.751E-02
Eu-152 #A	2.0371E-02	2.0533E-02	4.9602E-02	4.9612E-02	6.014E-02
Eu-154 #A	1.7962E-02	1.8186E-02	3.9165E-02	3.9177E-02	1.830E-01
K-40	1.8006E+01	1.8006E+01	1.3910E+00	1.6586E+00	2.882E-01
Pa-234 #A	4.7847E-02	4.7847E-02	1.0187E-01	1.0256E-01	9.555E-02
Pb-212	2.7499E-01	2.7499E-01	5.9343E-02	6.2589E-02	3.008E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 19:29:31
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_016.An1

Pb-214	3.1078E-01	3.1080E-01	8.2595E-02	8.3864E-02	4.423E-02
Ra-226 #	4.4233E-01	4.4236E-01	5.4542E-01	5.4601E-01	4.229E-01
Th-234 #	1.0785E+00	1.0785E+00	1.2142E+00	1.2185E+00	9.325E-01
Tl-208	7.6711E-02	7.6711E-02	3.5869E-02	3.6203E-02	1.957E-02
U-235 #A	1.9931E-02	1.9931E-02	2.9208E-02	2.9233E-02	1.191E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.5 keV) 1.900E+01 pCi/g
Total Decayed Activity (25.0 to 2035.5 keV) 1.9001051E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE03
Seqnum : 1524034937017
File : 3_20140124_017
Cal : 24-JAN-2014 06:28:35,29-APR-2013 08:26:15
IDF : 1.0
PDF : 1.0

Lab ID : 251449-015
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-APR-2013
Sample Amount : 329.98 g

Client ID : 04-PD-D0034-15
Acct : ITSI (JG)
Time : 24-JAN-2014 19:36
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.1 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0165	0.152		.18548	.18548	-0.0012	u
Bismuth-212	0.383	0.227		.33258	.33316	0.00031	u
Bismuth-214	0.289	0.0379		.073743	.074879	-0.011	u
Cesium-137	-0.00640	0.0197	0.07	.024724	.024725	0.0048	u
Cobalt-60	0.0101	0.0236		.030237	.030241	0.0015	u
Europium-152	0.00544	0.0538		.065873	.065874	0.020	u
Europium-154	-0.00869	0.175		.033836	.033839	0.019	u
Lead-212	0.286	0.0388		.0694	.072424	-0.0075	u
Lead-214	0.422	0.0450		.099573	.10151	-0.025	u
Potassium-40	17.5	0.262		1.329	1.5918	-0.068	u
Protactinium-234	-0.0488	0.0957		.11913	.11975	0.0066	u
Radium-226 (By Bismuth-214)	0.289	0.0379	0.2	.073743	.074879	-0.011	u
Thallium-208	0.124	0.0158		.035476	.036351	-0.0042	u
Thorium-232 (By Actinium-228)	0.438	0.0652		.10833	.11286	0.020	u
Thorium-234	0.534	1.16		.65191	.65387	0	u
Uranium-235	0.168	0.129		.15434	.15467	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-15
Sample Description: 251449-015, 207004

Detector: HPGE03 51-TP42227A
Spectrum ID: 3_20140124_017
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 14:15
Live Time: 2700 sec
Acquisition Time: 1/24/2014 19:36:40
Real Time: 2703 sec
Analysis Time: 1/24/2014 20:21
Dead Time: 0.10 %
Analysis Quantity: 3.300E+02 g

Efficiency: HPGE03 S22147 3_20130428002_EffCal RA226
Efficiency Cal Date: 4/29/2013 08:26
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.376E-01	1.083E-01	1.129E-01	6.517E-02
Am-241	#AB	-1.647E-02	1.855E-01	1.855E-01	1.519E-01
Bi-212	#	3.835E-01	3.326E-01	3.332E-01	2.272E-01
Bi-214		2.891E-01	7.374E-02	7.488E-02	3.793E-02
Co-60	#AB	1.015E-02	3.024E-02	3.024E-02	2.357E-02
Cs-137	#AB	-6.402E-03	2.472E-02	2.473E-02	1.965E-02
Eu-152	#AB	5.438E-03	6.587E-02	6.587E-02	5.380E-02
Eu-154	#AB	-8.689E-03	3.384E-02	3.384E-02	1.747E-01
K-40		1.747E+01	1.329E+00	1.592E+00	2.617E-01
Pa-234	#AB	-4.876E-02	1.191E-01	1.197E-01	9.573E-02
Pb-212		2.863E-01	6.940E-02	7.242E-02	3.879E-02
Pb-214		4.217E-01	9.957E-02	1.015E-01	4.500E-02
Ra-226	#	6.799E-01	5.763E-01	5.776E-01	4.377E-01
Th-234	#AB	5.341E-01	6.519E-01	6.539E-01	1.157E+00
Tl-208		1.239E-01	3.548E-02	3.635E-02	1.584E-02
U-235	#	1.683E-01	1.543E-01	1.547E-01	1.285E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.080E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:21:49
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_017.An1

Sample description
     251449-015, 207004


Spectrum Filename: C:\User\SPC\Det3\3_20140124_017.An1

Acquisition information
       Start time:                1/24/2014 19:36:40
       Live time:              2700
       Real time:              2703
       Dead time:                 0.10 %
       Detector ID:                   3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                  3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:28:35
            Zero offset:         -0.141 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:              4/29/2013 08:26:15
            Type:                 Polynomial
            Uncertainty:          1.273 %
            Coefficients:        -0.381561  -4.120787   0.430562
                                 -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.88keV )
       Stop channel:           8144 (  2035.17keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.2998E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.2998E+02) =
                                  8.1905E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:49
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_017.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:15:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	3_2013-12-28_0934.PBC 12/28/2013 09:34:58
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1675

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.16	11.	130.55	0.87	1.671E-02	63.30	3.750	PBC<MDA	Th234
					63.30	3.750	5.522E-01	Th234
77.07	50.	33.41	0.42	2.757E-02				
92.81	40.	36.32	0.89	3.718E-02	92.59	4.343	7.677E-01	Th234
					93.35	5.760	5.731E-01	U235
					93.35	4.100	8.051E-01	Ac228
					92.59	4.343	7.677E-01	Th234
					93.35	5.760	5.731E-01	U235
92.82	27.	61.03	0.89	3.682E-02	92.59	4.343	5.184E-01	Th234
					93.35	5.760	3.870E-01	U235
					93.35	4.100	5.437E-01	Ac228
92.88	27.	51.49	0.42	3.718E-02	92.59	4.343	5.161E-01	Th234
					93.35	5.760	3.853E-01	U235
					93.35	4.100	5.412E-01	Ac228
144.92	15.	95.29	0.94	4.800E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	8.508E-02	U235
163.44	28.	45.86	0.95	4.789E-02	163.36	5.080	3.474E-01	U235
					163.36	5.080	3.474E-01	U235
186.26	37.	42.38	0.97	4.658E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	6.799E-01	Ra226
					185.72	57.000	4.237E-02	U235
186.27	40.	38.05	0.97	4.662E-02	185.72	57.000	4.576E-02	U235
					186.21	3.555	7.344E-01	Ra226
238.62	182.	11.50	0.76	4.202E-02	238.63	43.600	2.862E-01	Pb212
241.81	50.	31.45	0.28	4.172E-02	242.00	7.268	4.983E-01	Pb214
277.21	6.	128.83	1.05	3.864E-02	277.37	6.600	PBC<MDA	Tl208
295.27	116.	13.05	1.01	3.721E-02	295.22	18.414	4.870E-01	Pb214

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:49
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_017.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
300.12	21.	50.56	1.07	3.683E-02	300.09	3.180	5.332E-01	Pb212
338.37	56.	23.24	1.21	3.412E-02	338.32	11.400	4.352E-01	Ac228
346.78	2.	605.69	1.11	3.373E-02	344.28	26.590	PBC<MDA	Eu152
351.86	156.	10.99	0.58	3.325E-02	351.93	35.600	3.723E-01	Pb214
582.99	82.	13.75	0.67	2.357E-02	583.19	85.000	1.239E-01	Tl208
609.30	104.	11.20	1.73	2.287E-02	609.31	45.490	3.027E-01	Bi214
727.15	17.	43.37	1.43	2.025E-02	727.33	6.650	3.835E-01	Bi212
860.45	5.	134.88	1.54	1.803E-02	860.53	12.400	PBC<MDA	Tl208
911.03	62.	17.80	0.69	1.732E-02	911.20	26.200	4.179E-01	Ac228
969.32	41.	22.85	0.41	1.658E-02	968.96	15.900	4.717E-01	Ac228
1004.19	2.	345.46	1.66	1.616E-02	1004.72	17.860	PBC<MDA	Eu154
					1004.72	17.860	2.378E-02	Eu154
1120.73	49.	20.11	0.64	1.494E-02	1120.29	14.910	6.670E-01	Bi214
1333.25	4.	149.00	1.93	1.311E-02	1332.49	99.983	PBC<MDA	Co60
1460.93	755.	3.73	1.84	1.219E-02	1460.82	10.550	1.746E+01	K40
1764.57	13.	29.96	2.28	1.039E-02	1764.49	15.310	2.488E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
308.58	77.07	103.	50.	1.806E+03	66.82	0.416	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	238.03	59.42	108.	-3.	-0.001	1126.08	0.864s
Th-234	252.99	63.16	105.	11.	0.004	261.09	0.867s
Th-234	371.53	92.82	125.	27.	0.010	122.06	0.892s
U-235	373.66	93.35	88.	40.	0.015	72.64	0.893D
Ac-228	373.66	93.35	77.	27.	0.010	102.98	0.424D
Eu-154	492.28	123.03	133.	-8.	-0.003	418.54	0.918s
Pa-234	523.40	130.82	135.	-14.	-0.005	244.31	0.925s
U-235	579.77	144.92	91.	15.	0.005	190.57	0.935s
U-235	653.80	163.44	68.	28.	0.010	91.73	0.952s
U-235	745.05	186.27	96.	40.	0.015	76.09	0.971s
Ra-226	745.02	186.26	105.	37.	0.014	84.77	0.972s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:49
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_017.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	823.82	205.97	114.	-3.	-0.001	1211.64	0.988s
Pb-212	954.32	238.62	101.	173.	0.064	23.01	0.762s
Pb-214	967.10	241.81	75.	50.	0.018	62.90	0.279s
Tl-208	1108.58	277.21	69.	6.	0.002	257.66	1.049s
Pb-214	1180.81	295.27	49.	110.	0.041	26.11	1.014
Pb-212	1200.17	300.12	44.	21.	0.008	101.11	1.068
Ac-228	1353.10	338.37	43.	56.	0.021	46.47	1.212s
Eu-152	1386.74	346.78	46.	2.	0.001	1211.37	1.105s
Pb-214	1407.06	351.86	57.	145.	0.054	21.98	0.582s
Pa-234	2277.85	569.64	38.	-6.	-0.002	298.36	1.295s
Tl-208	2331.26	582.99	20.	82.	0.030	27.50	0.671s
Bi-214	2436.49	609.30	31.	104.	0.038	22.40	1.734s
Cs-137	2642.47	660.80	26.	-4.	-0.001	386.22	1.372s
Eu-154	2893.56	723.58	35.	-8.	-0.003	227.02	1.424s
Bi-212	2907.82	727.15	19.	17.	0.006	86.73	1.427s
Bi-212	3137.33	784.52	27.	-3.	-0.001	594.63	1.476s
Tl-208	3441.06	860.45	23.	5.	0.002	269.76	1.539s
Eu-154	3488.37	872.27	28.	-4.	-0.001	389.43	1.549s
Pa-234	3521.53	880.56	26.	-2.	-0.001	624.23	1.555s
Ac-228	3643.45	911.03	18.	62.	0.023	35.60	0.689s
Pa-234	3800.61	950.32	18.	-4.	-0.001	329.39	1.610s
Eu-152	3867.33	966.99	50.	-15.	-0.006	138.85	1.625s
Ac-228	3876.66	969.32	13.	41.	0.015	45.71	0.413s
Eu-154	3983.90	996.13	27.	-4.	-0.002	357.82	1.651s
Eu-154	4016.16	1004.19	29.	2.	0.001	690.93	1.658s
Eu-152	4448.21	1112.16	20.	-1.	0.000	1476.91	1.747s
Bi-214	4482.52	1120.73	16.	49.	0.018	40.23	0.637s
Co-60	4688.09	1172.10	35.	-1.	0.000	1679.91	1.798s
Co-60	5333.09	1333.25	18.	4.	0.002	298.00	1.929s
K-40	5844.23	1460.93	23.	740.	0.274	7.46	1.843
Bi-214	7060.08	1764.57	9.	13.	0.005	59.93	2.282s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	4.3757E-01					5.12E+12
			911.20	4.179E-01	(	6.517E-02 1.78E+01 2.62E+01	G
			968.96	4.717E-01	(	9.666E-02 2.29E+01 1.59E+01	G
			338.32	4.352E-01	(	1.194E-01 2.32E+01 1.14E+01	G
							Energy duplication
			93.35	5.412E-01		4.063E-01 5.15E+01 4.10E+00	XA

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:49
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_017.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	-1.6471E-02					1.58E+05	
			59.54	-1.647E-02	?(	1.519E-01	5.63E+02	3.59E+01 G
Bi-212	N	3.8345E-01					5.12E+12	
			727.33	3.835E-01	?(	2.272E-01	4.34E+01	6.65E+00 G
			785.37	-3.619E-01	-	1.733E+00	2.97E+02	1.11E+00 G
			1620.74	0.000E+00	-	4.184E-01	1.00E+03	1.51E+00 G
Bi-214	N	2.8912E-01					5.84E+05	
			609.31	3.027E-01	*(P	3.793E-02	1.12E+01	4.55E+01 G
			1120.29	6.670E-01	+ P	1.271E-01	2.01E+01	1.49E+01 G
			1764.49	2.488E-01	?(P	1.329E-01	3.00E+01	1.53E+01 G
Co-60	T	1.0147E-02					1.93E+03	
			1332.49	1.015E-02	?(	2.357E-02	1.49E+02	1.00E+02 G
			1173.23	-2.165E-03	-	2.975E-02	8.40E+02	9.98E+01 G
Cs-137	I	-6.4015E-03					1.10E+04	
			661.66	-6.401E-03	?(	1.965E-02	1.93E+02	8.50E+01 G
Eu-152	I	5.4379E-03					4.94E+03	
			344.28	5.438E-03	&(	5.380E-02	6.06E+02	2.66E+01 G
			121.78	0.000E+00	&	6.057E-02	1.00E+03	2.84E+01 G
			778.90	0.000E+00	-	1.087E-01	1.00E+03	1.30E+01 G
			964.08	-1.957E-01	&	2.082E-01	6.94E+01	1.45E+01 G
			1112.08	-1.310E-02	&	1.577E-01	7.38E+02	1.34E+01 G
			1408.01	5.572E-03	%	1.068E-01	1.17E+03	2.09E+01 G
Eu-154	I	-8.6887E-03					3.14E+03	
			873.18	-5.634E-02	?(	1.747E-01	1.95E+02	1.22E+01 G
			123.07	-1.303E-02	+	4.427E-02	2.09E+02	4.04E+01 G
			1274.43	-2.783E-03	&	7.583E-02	1.66E+03	3.49E+01 G
			723.30	-5.850E-02	+	1.038E-01	1.14E+02	2.00E+01 G
			1004.72	2.378E-02	&(	1.328E-01	3.45E+02	1.79E+01 G
			996.25	-7.675E-02	+	2.178E-01	1.79E+02	1.05E+01 G
K-40	N	1.7465E+01					4.57E+11	
			1460.82	1.746E+01	(P	2.617E-01	3.73E+00	1.06E+01 G
Pa-234	N	-4.8764E-02					1.63E+12	
			131.30	-4.876E-02	?(	9.573E-02	1.22E+02	1.82E+01 G
			569.50	-8.257E-02	+	1.953E-01	1.49E+02	9.30E+00 G
			946.00	-5.042E-02	+	1.300E-01	1.65E+02	1.35E+01 G
			880.52	-3.834E-02	&	1.928E-01	3.12E+02	1.05E+01 G
			883.24	0.000E+00	+	2.867E-01	1.00E+03	9.70E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:21:49
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_017.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   2.8625E-01                                     5.12E+12
                          238.63 2.862E-01  (P 3.879E-02 1.15E+01 4.36E+01 G
                          300.09 5.332E-01 +   3.997E-01 5.06E+01 3.18E+00 G

Pb-214   N   4.2168E-01                                     5.84E+05
                          351.93 3.723E-01  (P 4.500E-02 1.10E+01 3.56E+01 G
                          295.22 4.870E-01  (P 7.223E-02 1.31E+01 1.84E+01 G
                          242.00 4.983E-01  (  2.022E-01 3.15E+01 7.27E+00 G

Ra-226   N   6.7990E-01                                     5.84E+05
                          186.21 6.799E-01  (  4.377E-01 4.24E+01 3.56E+00 G

Th-234   N   5.3407E-01                                     1.63E+12
                           63.30 5.522E-01 ?(  1.157E+00 1.31E+02 3.75E+00 G
                           92.59 5.184E-01  (  4.950E-01 6.10E+01 4.34E+00 G

Tl-208   N   1.2388E-01                                     5.12E+12
                          583.19 1.239E-01  (P 1.584E-02 1.38E+01 8.50E+01 G
                          277.37 7.675E-02 - P 2.301E-01 1.29E+02 6.60E+00 G
                          860.53 7.238E-02 -   1.523E-01 1.35E+02 1.24E+01 G

U-235    N   1.6826E-01                                     2.57E+11
                          143.77 8.508E-02 &(  1.285E-01 9.53E+01 1.09E+01 G
                          205.32-3.370E-02 &   3.345E-01 6.06E+02 5.02E+00 G
                          163.36 3.474E-01  (  2.390E-01 4.59E+01 5.08E+00 G
                          185.72 4.576E-02 -   2.610E-02 3.80E+01 5.70E+01 G
                                                          Energy duplication
                           93.35 5.731E-01     3.091E-01 3.63E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:49
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_017.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.42	108.	-3.	-0.001	1126.08	-1.647E-02
Th-234	63.16	105.	11.	0.004	261.09	5.522E-01
Th-234	92.82	125.	27.	0.010	122.06	5.184E-01
U-235	93.35	88.	40.	0.015	72.64	5.731E-01
Eu-154	123.03	133.	-8.	-0.003	418.54	-1.303E-02
Pa-234	130.82	135.	-14.	-0.005	244.31	-4.876E-02
U-235	144.92	91.	15.	0.005	190.57	8.508E-02
U-235	163.44	68.	28.	0.010	91.73	3.474E-01
U-235	186.27	96.	40.	0.015	76.09	4.576E-02
Ra-226	186.26	105.	37.	0.014	84.77	6.799E-01
U-235	205.97	114.	-3.	-0.001	1211.64	-3.370E-02
Eu-152	346.78	46.	2.	0.001	1211.37	5.438E-03
Pa-234	569.64	38.	-6.	-0.002	298.36	-8.257E-02
Cs-137	660.80	26.	-4.	-0.001	386.22	-6.401E-03
Eu-154	723.58	35.	-8.	-0.003	227.02	-5.850E-02
Bi-212	727.15	19.	17.	0.006	86.73	3.835E-01
Bi-212	784.52	27.	-3.	-0.001	594.63	-3.619E-01
Eu-154	872.27	28.	-4.	-0.001	389.43	-5.634E-02
Pa-234	880.56	26.	-2.	-0.001	624.23	-3.834E-02
Pa-234	950.32	18.	-4.	-0.001	329.39	-5.042E-02
Eu-152	966.99	50.	-15.	-0.006	138.85	-1.957E-01
Eu-154	996.13	27.	-4.	-0.002	357.82	-7.675E-02
Eu-154	1004.19	29.	2.	0.001	690.93	2.378E-02
Eu-152	1112.16	20.	-1.	0.000	1476.91	-1.310E-02
Co-60	1172.10	35.	-1.	0.000	1679.91	-2.165E-03
Co-60	1333.25	18.	4.	0.002	298.00	1.015E-02

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:49
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_017.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.3757E-01	4.3757E-01	1.0833E-01	1.1286E-01	6.517E-02
Am-241 #A	-1.6467E-02	-1.6471E-02	1.8548E-01	1.8548E-01	1.519E-01
Bi-212 #	3.8345E-01	3.8345E-01	3.3258E-01	3.3316E-01	2.272E-01
Bi-214	2.8910E-01	2.8912E-01	7.3743E-02	7.4879E-02	3.793E-02
Co-60 #A	9.9434E-03	1.0147E-02	3.0237E-02	3.0241E-02	2.357E-02
Cs-137 #A	-6.3788E-03	-6.4015E-03	2.4724E-02	2.4725E-02	1.965E-02
Eu-152 #A	5.3952E-03	5.4379E-03	6.5873E-02	6.5874E-02	5.380E-02
Eu-154 #A	-8.5816E-03	-8.6887E-03	3.3836E-02	3.3839E-02	1.747E-01
K-40	1.7465E+01	1.7465E+01	1.3290E+00	1.5918E+00	2.617E-01
Pa-234 #A	-4.8764E-02	-4.8764E-02	1.1913E-01	1.1975E-01	9.573E-02
Pb-212	2.8625E-01	2.8625E-01	6.9400E-02	7.2424E-02	3.879E-02
Pb-214	4.2165E-01	4.2168E-01	9.9573E-02	1.0151E-01	4.500E-02
Ra-226 #	6.7985E-01	6.7990E-01	5.7631E-01	5.7762E-01	4.377E-01
Th-234 #A	5.3407E-01	5.3407E-01	6.5191E-01	6.5387E-01	1.157E+00
Tl-208	1.2388E-01	1.2388E-01	3.5476E-02	3.6351E-02	1.584E-02
U-235 #C	1.6826E-01	1.6826E-01	1.5434E-01	1.5467E-01	1.285E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (24.9 to 2035.2 keV) 1.902E+01 pCi/g
Total Decayed Activity (24.9 to 2035.2 keV) 1.9023121E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE01	Lab ID	: 251449-016	Client ID	: 04-PD-D0034-16
Seqnum	: 1504034935017	Matrix	: Soil	Acct	: ITSI (JG)
File	: 1_20140124_017	Batch	: 207004	Time	: 24-JAN-2014 19:35
Cal	: 24-JAN-2014 06:26:40,19-JUN-2013 18:43:28	Caldate	: 24-JAN-2014, 19-JUN-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 306.6 g	Live Time	: 2700 sec
				Dead Time	: 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0555	0.144		.17805	.17809	-0.0012	u
Bismuth-212	0.346	0.271		.44698	.44733	0.00031	u
Bismuth-214	0.360	0.0456		.093652	.095039	-0.011	u
Cesium-137	-0.000375	0.0227	0.07	.027571	.027571	0.0048	u
Cobalt-60	0.000361	0.0279		.033901	.033901	0.0015	u
Europium-152	0.0205	0.0534		.05342	.053429	0.020	u
Europium-154	0.0125	0.172		.036487	.036493	0.019	u
Lead-212	0.302	0.0372		.067499	.07094	-0.0075	u
Lead-214	0.375	0.0478		.087991	.089722	-0.025	u
Potassium-40	16.0	0.290		1.3177	1.5417	-0.068	u
Protactinium-234	0.0519	0.0784		.083619	.084607	0.0066	u
Radium-226 (By Bismuth-214)	0.360	0.0456	0.2	.093652	.095039	-0.011	u
Thallium-208	0.106	0.0166		.035227	.035874	-0.0042	u
Thorium-232 (By Actinium-228)	0.363	0.0492		.10445	.1077	0.020	u
Thorium-234	0.223	1.07		1.3086	1.3088	0	u
Uranium-235	0.0343	0.158		.028661	.028736	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-16
Sample Description: 251449-016, 207004

Detector: HPGE01 50-TP42236A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:18
Acquisition Time: 1/24/2014 19:35:15
Analysis Time: 1/24/2014 20:20
Analysis Quantity: 3.066E+02 g

Spectrum ID: 1_20140124_017
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE01 S22147 1_20130619002_EffCal RA226
Efficiency Cal Date: 6/19/2013 18:43
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.630E-01	1.045E-01	1.077E-01	4.921E-02
Am-241	#AB	-5.552E-02	1.780E-01	1.781E-01	1.437E-01
Bi-212	#	3.464E-01	4.470E-01	4.473E-01	2.712E-01
Bi-214		3.599E-01	9.365E-02	9.504E-02	4.559E-02
Co-60	#AB	3.606E-04	3.390E-02	3.390E-02	2.788E-02
Cs-137	#AB	-3.746E-04	2.757E-02	2.757E-02	2.267E-02
Eu-152	#AB	2.052E-02	5.342E-02	5.343E-02	5.342E-02
Eu-154	#AB	1.250E-02	3.649E-02	3.649E-02	1.717E-01
K-40		1.595E+01	1.318E+00	1.542E+00	2.900E-01
Pa-234	#AB	5.188E-02	8.362E-02	8.461E-02	7.835E-02
Pb-212		3.017E-01	6.750E-02	7.094E-02	3.724E-02
Pb-214		3.751E-01	8.799E-02	8.972E-02	4.778E-02
Ra-226		8.527E-01	5.694E-01	5.715E-01	3.749E-01
Th-234	#AB	2.232E-01	1.309E+00	1.309E+00	1.065E+00
Tl-208		1.060E-01	3.523E-02	3.587E-02	1.655E-02
U-235	#AB	3.426E-02	2.866E-02	2.874E-02	1.581E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.900E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:20:24
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_017.An1

Sample description
     251449-016, 207004


Spectrum Filename: C:\User\SPC\Det1\1_20140124_017.An1

Acquisition information
       Start time:                1/24/2014 19:35:15
       Live time:              2700
       Real time:              2702
       Dead time:                 0.06 %
       Detector ID:                   1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                  1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:26:40
            Zero offset:          0.000 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/19/2013 18:43:28
            Type:                 Polynomial
            Uncertainty:          1.382 %
            Coefficients:        -0.396420  -4.062121   0.406738
                                 -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.01keV )
       Stop channel:           8144 (  2035.50keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.0660E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.0660E+02) =
                                  8.8151E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:20:24
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_017.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:18:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	1_2013-12-28_0933.PBC 12/28/2013 09:33:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1137

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.36	5.	293.14	0.84	1.951E-02	63.30	3.750	PBC<MDA	Th234
74.79	72.	18.54	0.86	2.917E-02				
77.24	112.	14.36	0.86	3.098E-02				
81.79	19.	62.94	0.49	3.404E-02				
92.75	30.	43.05	0.88	4.044E-02	92.59	4.343	5.617E-01	Th234
					93.35	5.760	4.198E-01	U235
					93.35	4.100	5.897E-01	Ac228
					93.35	5.760	4.198E-01	U235
92.75	30.	43.05	0.88	4.044E-02	92.59	4.343	5.617E-01	Th234
					93.35	5.760	4.198E-01	U235
					93.35	4.100	5.897E-01	Ac228
123.30	10.	145.94	0.91	4.878E-02	123.07	40.400	PBC<MDA	Eu154
					123.07	40.400	1.686E-02	Eu154
131.51	17.	80.59	0.92	4.960E-02	131.30	18.200	PBC<MDA	Pa234
186.13	34.	41.83	0.97	4.797E-02	185.72	57.000	4.084E-02	U235
					186.21	3.555	6.554E-01	Ra226
					185.72	57.000	4.084E-02	U235
186.44	44.	33.39	0.70	4.793E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	8.527E-01	Ra226
238.59	173.	11.19	1.16	4.295E-02	238.63	43.600	3.017E-01	Pb212
277.51	4.	147.46	1.07	3.941E-02	277.37	6.600	PBC<MDA	Tl208
295.11	83.	18.40	0.54	3.795E-02	295.22	18.414	3.592E-01	Pb214
299.75	19.	55.46	1.09	3.755E-02	300.09	3.180	5.134E-01	Pb212
338.35	40.	28.90	1.26	3.477E-02	338.32	11.400	3.270E-01	Ac228
352.01	152.	11.77	0.85	3.388E-02	351.93	35.600	3.833E-01	Pb214
569.82	1.	923.75	1.34	2.450E-02	569.50	9.300	PBC<MDA	Pa234
583.38	67.	15.50	1.09	2.410E-02	583.19	85.000	1.070E-01	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:20:24
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_017.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
609.27	117.	11.93	1.20	2.340E-02	609.31	45.490	3.599E-01	Bi214
727.03	12.	64.51	1.48	2.074E-02	727.33	6.650	2.852E-01	Bi212
779.34	2.	332.01	1.52	1.979E-02	778.90	12.970	PBC<MDA	Eu152
					778.90	12.970	2.338E-02	Eu152
785.78	5.	141.51	1.53	1.968E-02	785.37	1.110	PBC<MDA	Bi212
860.49	7.	99.91	1.59	1.847E-02	860.53	12.400	PBC<MDA	Tl208
880.68	2.	344.30	1.60	1.818E-02	880.52	10.500	PBC<MDA	Pa234
911.46	45.	15.59	0.33	1.775E-02	911.20	26.200	3.156E-01	Ac228
969.10	39.	23.54	1.67	1.700E-02	968.96	15.900	4.669E-01	Ac228
1120.75	7.	70.98	1.78	1.531E-02	1120.29	14.910	PBC<MDA	Bi214
1269.19	2.	212.30	1.88	1.389E-02	1274.43	34.900	PBC<MDA	Eu154
					1274.43	34.900	1.571E-02	Eu154
1406.73	4.	130.19	1.95	1.285E-02	1408.01	20.850	PBC<MDA	Eu152
					1408.01	20.850	5.031E-02	Eu152
1460.92	659.	4.03	1.47	1.247E-02	1460.82	10.550	1.595E+01	K40
1764.91	9.	38.78	2.13	1.061E-02	1764.49	15.310	1.797E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
299.18	74.83	77.	56.	1.920E+03	52.70	0.747	- M
308.98	77.28	89.	92.	2.977E+03	36.78	0.549	- sM
327.02	81.79	62.	19.	5.581E+02	125.88	0.493	- sM

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	236.60	59.18	118.	-10.	-0.004	320.68	0.839s
Th-234	253.31	63.36	105.	5.	0.002	586.27	0.843s
U-235	373.25	93.35	68.	30.	0.011	86.11	0.875D
Ac-228	373.25	93.35	68.	30.	0.011	86.11	0.875D
Eu-152	486.53	121.68	112.	-7.	-0.003	415.50	0.906s
Eu-154	493.01	123.30	103.	10.	0.004	291.88	0.907s
Pa-234	525.82	131.51	86.	17.	0.006	161.18	0.916s
U-235	744.23	186.13	85.	34.	0.013	83.66	0.973s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:20:24
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_017.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ra-226	745.48	186.44	70.	44.	0.016	66.78	0.697s
U-235	818.70	204.75	77.	-13.	-0.005	204.58	0.994s
Pb-212	954.02	238.59	84.	173.	0.064	22.38	1.157
Pb-214	967.65	242.00	151.	-11.	-0.004	316.22	1.031s
Tl-208	1109.62	277.51	49.	4.	0.002	294.93	1.067s
Pb-214	1180.02	295.11	57.	77.	0.028	36.79	0.541s
Pb-212	1198.59	299.75	45.	19.	0.007	110.91	1.090
Ac-228	1352.93	338.35	38.	40.	0.015	57.79	1.259
Eu-152	1375.16	343.91	41.	-1.	0.000	1539.08	1.134s
Pb-214	1407.57	352.01	57.	142.	0.052	23.53	0.848s
Pa-234	2278.68	569.82	27.	1.	0.000	1847.50	1.344s
Tl-208	2332.91	583.38	20.	67.	0.025	30.99	1.092
Bi-214	2436.46	609.27	41.	117.	0.043	23.85	1.202
Eu-154	2900.39	725.25	36.	-5.	-0.002	374.27	1.477s
Bi-212	2907.50	727.03	24.	12.	0.004	129.02	1.480s
Eu-152	3116.78	779.34	17.	2.	0.001	664.02	1.522s
Bi-212	3142.53	785.78	20.	5.	0.002	283.01	1.528s
Tl-208	3441.41	860.49	21.	7.	0.003	199.82	1.587s
Eu-154	3495.05	873.90	25.	-1.	0.000	1880.10	1.597s
Pa-234	3522.18	880.68	23.	2.	0.001	688.61	1.603s
Pa-234	3529.39	882.48	29.	-3.	-0.001	474.12	1.605s
Ac-228	3645.32	911.46	9.	45.	0.017	31.17	0.328s
Pa-234	3788.72	947.30	38.	-3.	-0.001	612.78	1.652s
Ac-228	3875.94	969.10	29.	39.	0.014	47.09	1.669
Eu-154	3987.33	996.95	29.	-5.	-0.002	350.18	1.689s
Eu-152	4450.36	1112.67	35.	-1.	-0.001	1181.34	1.770s
Bi-214	4482.68	1120.75	33.	7.	0.002	141.96	1.776s
Co-60	4700.92	1175.29	25.	-2.	-0.001	779.92	1.811s
Eu-154	5076.66	1269.19	11.	2.	0.001	424.60	1.875s
Eu-152	5627.06	1406.73	12.	4.	0.002	260.38	1.954s
K-40	5843.94	1460.92	25.	643.	0.238	8.05	1.466s
Bi-214	7060.69	1764.91	10.	9.	0.003	77.55	2.129s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	3.6299E-01					5.12E+12
			911.20	3.156E-01	(P	4.921E-02 1.56E+01 2.62E+01 G	
			968.96	4.669E-01	?(P	1.517E-01 2.35E+01 1.59E+01 G	
			338.32	3.270E-01	(P	1.187E-01 2.89E+01 1.14E+01 G	
							Energy duplication
			93.35	5.897E-01	+	3.787E-01 4.31E+01 4.10E+00 XA	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:20:24
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_017.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Am-241	I	-5.5521E-02					1.58E+05	
			59.54	-5.552E-02	?(	1.437E-01	1.60E+02	3.59E+01 G
Bi-212	N	3.4643E-01					5.12E+12	
			727.33	2.852E-01	?(	2.712E-01	6.45E+01	6.65E+00 G
			785.37	7.133E-01	?(	1.574E+00	1.42E+02	1.11E+00 G
			1620.74	8.400E-02	&	1.462E+00	1.07E+03	1.51E+00 G
Bi-214	N	3.5988E-01					5.84E+05	
			609.31	3.599E-01	(P	4.559E-02	1.19E+01	4.55E+01 G
			1120.29	9.388E-02	- P	1.903E-01	7.10E+01	1.49E+01 G
			1764.49	1.797E-01	- P	1.501E-01	3.88E+01	1.53E+01 G
Co-60	T	3.6055E-04					1.93E+03	
			1332.49	3.605E-04	%(	2.788E-02	4.70E+03	1.00E+02 G
			1173.23	-4.185E-03	&	2.641E-02	3.90E+02	9.98E+01 G
Cs-137	I	-3.7455E-04					1.10E+04	
			661.66	-3.746E-04	%(	2.267E-02	3.68E+03	8.50E+01 G
Eu-152	I	2.0516E-02					4.94E+03	
			344.28	-4.244E-03	?(	5.342E-02	7.70E+02	2.66E+01 G
			121.78	-1.742E-02	+	5.866E-02	2.08E+02	2.84E+01 G
			778.90	2.338E-02	&(	1.247E-01	3.32E+02	1.30E+01 G
			964.08	1.023E-02	%	1.705E-01	1.02E+03	1.45E+01 G
			1112.08	-2.281E-02	+	2.197E-01	5.91E+02	1.34E+01 G
			1408.01	5.031E-02	?(	9.984E-02	1.30E+02	2.09E+01 G
Eu-154	I	1.2501E-02					3.14E+03	
			873.18	-1.117E-02	?(	1.717E-01	9.40E+02	1.22E+01 G
			123.07	1.686E-02	&(	3.959E-02	1.46E+02	4.04E+01 G
			1274.43	1.571E-02	?(	5.222E-02	2.12E+02	3.49E+01 G
			723.30	-3.685E-02	&	1.101E-01	1.87E+02	2.00E+01 G
			1004.72	0.000E+00	-	1.244E-01	1.00E+03	1.79E+01 G
			996.25	-8.537E-02	+	2.372E-01	1.75E+02	1.05E+01 G
K-40	N	1.5952E+01					4.57E+11	
			1460.82	1.595E+01	(P	2.900E-01	4.03E+00	1.06E+01 G
Pa-234	N	5.1880E-02					1.63E+12	
			131.30	6.186E-02	&(	7.835E-02	8.06E+01	1.82E+01 G
			569.50	1.145E-02	-	1.730E-01	9.24E+02	9.30E+00 G
			946.00	-4.056E-02	-	2.009E-01	3.06E+02	1.35E+01 G
			880.52	3.458E-02	?(	1.920E-01	3.44E+02	1.05E+01 G
			883.24	-6.157E-02	-	2.340E-01	2.37E+02	9.70E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:20:24
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_017.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   3.0167E-01                                     5.12E+12
                           238.63 3.017E-01  (  3.724E-02 1.12E+01 4.36E+01 G
                           300.09 5.134E-01 +   4.265E-01 5.55E+01 3.18E+00 G

Pb-214   N   3.7506E-01                                     5.84E+05
                           351.93 3.833E-01  (P 4.778E-02 1.18E+01 3.56E+01 G
                           295.22 3.592E-01  (P 8.233E-02 1.84E+01 1.84E+01 G
                           242.00-1.179E-01 -   3.017E-01 1.58E+02 7.27E+00 G

Ra-226   N   8.5267E-01                                     5.84E+05
                           186.21 8.527E-01  (  3.749E-01 3.34E+01 3.56E+00 G

Th-234   N   2.2321E-01                                     1.63E+12
                            63.30 2.232E-01 ?(  1.065E+00 2.93E+02 3.75E+00 G
                            92.59-2.327E-02 %   5.249E-01 1.37E+03 4.34E+00 G

Tl-208   N   1.0597E-01                                     5.12E+12
                           583.19 1.070E-01  (P 1.655E-02 1.55E+01 8.50E+01 G
                           277.37 5.435E-02 - P 2.044E-01 1.47E+02 6.60E+00 G
                           860.53 9.910E-02 &(  1.509E-01 9.99E+01 1.24E+01 G

U-235    N   3.4260E-02                                     2.57E+11
                           143.77 0.000E+00 ?(  1.581E-01 1.00E+03 1.09E+01 G
                           205.32-1.780E-01 +   2.885E-01 1.02E+02 5.02E+00 G
                           163.36 1.277E-02 %   2.874E-01 1.37E+03 5.08E+00 G
                           185.72 4.084E-02 &(  2.568E-02 4.18E+01 5.70E+01 G
                                                            Energy duplication
                            93.35 4.198E-01     2.696E-01 4.31E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:20:24
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_017.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.18	118.	-10.	-0.004	320.68	-5.552E-02
Th-234	63.36	105.	5.	0.002	586.27	2.232E-01
U-235	93.35	68.	30.	0.011	86.11	4.198E-01
Eu-152	121.68	112.	-7.	-0.003	415.50	-1.742E-02
Eu-154	123.30	103.	10.	0.004	291.88	1.686E-02
Pa-234	131.51	86.	17.	0.006	161.18	6.186E-02
U-235	186.13	85.	34.	0.013	83.66	4.084E-02
U-235	204.75	77.	-13.	-0.005	204.58	-1.780E-01
Eu-152	343.91	41.	-1.	0.000	1539.08	-4.244E-03
Pa-234	569.82	27.	1.	0.000	1847.50	1.145E-02
Eu-154	725.25	36.	-5.	-0.002	374.27	-3.685E-02
Bi-212	727.03	24.	12.	0.004	129.02	2.852E-01
Eu-152	779.34	17.	2.	0.001	664.02	2.338E-02
Bi-212	785.78	20.	5.	0.002	283.01	7.133E-01
Eu-154	873.90	25.	-1.	0.000	1880.10	-1.117E-02
Pa-234	880.68	23.	2.	0.001	688.61	3.458E-02
Pa-234	882.48	29.	-3.	-0.001	474.12	-6.157E-02
Pa-234	947.30	38.	-3.	-0.001	612.78	-4.056E-02
Eu-154	996.95	29.	-5.	-0.002	350.18	-8.537E-02
Eu-152	1112.67	35.	-1.	-0.001	1181.34	-2.281E-02
Co-60	1175.29	25.	-2.	-0.001	779.92	-4.185E-03
Eu-154	1269.19	11.	2.	0.001	424.60	1.571E-02
Eu-152	1406.73	12.	4.	0.002	260.38	5.031E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.6299E-01	3.6299E-01	1.0445E-01	1.0770E-01	4.921E-02
Am-241 #A	-5.5508E-02	-5.5521E-02	1.7805E-01	1.7809E-01	1.437E-01
Bi-212 #	3.4643E-01	3.4643E-01	4.4698E-01	4.4733E-01	2.712E-01
Bi-214	3.5985E-01	3.5988E-01	9.3652E-02	9.5039E-02	4.559E-02
Co-60 #A	3.5332E-04	3.6055E-04	3.3901E-02	3.3901E-02	2.788E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:20:24
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_017.An1

Cs-137	#A	-3.7322E-04	-3.7455E-04	2.7571E-02	2.7571E-02	2.267E-02
Eu-152	#A	2.0355E-02	2.0516E-02	5.3420E-02	5.3429E-02	5.342E-02
Eu-154	#A	1.2346E-02	1.2501E-02	3.6487E-02	3.6493E-02	1.717E-01
K-40		1.5952E+01	1.5952E+01	1.3177E+00	1.5417E+00	2.900E-01
Pa-234	#A	5.1880E-02	5.1880E-02	8.3619E-02	8.4607E-02	7.835E-02
Pb-212		3.0167E-01	3.0167E-01	6.7499E-02	7.0940E-02	3.724E-02
Pb-214		3.7504E-01	3.7506E-01	8.7991E-02	8.9722E-02	4.778E-02
Ra-226		8.5261E-01	8.5267E-01	5.6938E-01	5.7146E-01	3.749E-01
Th-234	#A	2.2321E-01	2.2321E-01	1.3086E+00	1.3088E+00	1.065E+00
Tl-208		1.0597E-01	1.0597E-01	3.5227E-02	3.5874E-02	1.655E-02
U-235	#A	3.4260E-02	3.4260E-02	2.8661E-02	2.8736E-02	1.581E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.5 keV) 1.831E+01 pCi/g
Total Decayed Activity (25.0 to 2035.5 keV) 1.8310505E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE05
Seqnum : 1544034938017
File : 5_20140124_017
Cal : 24-JAN-2014 06:29:37,29-JUN-2013 15:59:06
IDF : 1.0
PDF : 1.0

Lab ID : 251449-017
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-JUN-2013
Sample Amount : 352.28 g

Client ID : 04-PD-D0034-17
Acct : ITSI (JG)
Time : 24-JAN-2014 19:37
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0852	0.149		.1862	.18631	-0.0012	u
Bismuth-212	0.395	0.249		.35313	.35371	0.00031	u
Bismuth-214	0.312	0.0442		.085787	.086924	-0.011	u
Cesium-137	-0.00951	0.0210	0.07	.026677	.02668	0.0048	u
Cobalt-60	-0.00206	0.0235		.028842	.028842	0.0015	u
Europium-152	0.0335	0.0412		.051071	.051096	0.020	u
Europium-154	0.00657	0.173		.015588	.015592	0.019	u
Lead-212	0.300	0.0366		.066411	.069859	-0.0075	u
Lead-214	0.340	0.0399		.077911	.07952	-0.025	u
Potassium-40	19.1	0.208		1.3283	1.6389	-0.068	u
Protactinium-234	-0.0593	0.0938		.1172	.11812	0.0066	u
Radium-226 (By Bismuth-214)	0.312	0.0442	0.2	.085787	.086924	-0.011	u
Thallium-208	0.121	0.0156		.03466	.035508	-0.0042	u
Thorium-232 (By Actinium-228)	0.362	0.0752		.11321	.1162	0.020	u
Thorium-234	0.514	1.28		.46166	.46421	0	u
Uranium-235	0.103	0.127		.16089	.16101	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-17
Sample Description: 251449-017, 207004

Detector: HPGE05 51-TP42242A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:20
Acquisition Time: 1/24/2014 19:37:56
Analysis Time: 1/24/2014 20:23
Analysis Quantity: 3.523E+02 g

Spectrum ID: 5_20140124_017
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE05 S22147 5_20130628003_EffCal RA226
Efficiency Cal Date: 6/29/2013 15:59
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		3.624E-01	1.132E-01	1.162E-01	7.524E-02
Am-241	#AB	8.521E-02	1.862E-01	1.863E-01	1.488E-01
Bi-212	#	3.950E-01	3.531E-01	3.537E-01	2.485E-01
Bi-214		3.117E-01	8.579E-02	8.692E-02	4.420E-02
Co-60	#AB	-2.063E-03	2.884E-02	2.884E-02	2.349E-02
Cs-137	#AB	-9.513E-03	2.668E-02	2.668E-02	2.103E-02
Eu-152	#AB	3.350E-02	5.107E-02	5.110E-02	4.121E-02
Eu-154	#AB	6.575E-03	1.559E-02	1.559E-02	1.725E-01
K-40		1.914E+01	1.328E+00	1.639E+00	2.075E-01
Pa-234	#AB	-5.926E-02	1.172E-01	1.181E-01	9.376E-02
Pb-212		2.996E-01	6.641E-02	6.986E-02	3.658E-02
Pb-214		3.404E-01	7.791E-02	7.952E-02	3.985E-02
Ra-226	#AB	0.000E+00	5.108E-01	5.108E-01	5.228E-01
Th-234	#AB	5.144E-01	4.617E-01	4.642E-01	1.277E+00
Tl-208		1.206E-01	3.466E-02	3.551E-02	1.560E-02
U-235	#AB	1.032E-01	1.609E-01	1.610E-01	1.267E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.171E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:23:05
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_017.An1

Sample description
     251449-017, 207004


Spectrum Filename: C:\User\SPC\Det5\5_20140124_017.An1

Acquisition information
       Start time:                 1/24/2014 19:37:56
       Live time:               2700
       Real time:               2702
       Dead time:                  0.07 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:29:37
            Zero offset:          -0.064 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/29/2013 15:59:06
            Type:                  Polynomial
            Uncertainty:           1.295 %
            Coefficients:         -0.372021  -4.149771   0.439762
                                  -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.95keV )
       Stop channel:            8144 (  2035.00keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.5228E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.5228E+02) =
                                   7.6720E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:23:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_017.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:20:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2013-12-28_0935.PBC 12/28/2013 09:35:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0835

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
58.71	14.	109.27	0.97	1.324E-02	59.54	35.920	PBC<MDA	Am241
63.35	6.	292.56	0.97	1.655E-02	63.30	3.750	PBC<MDA	Th234
					63.30	3.750	2.676E-01	Th234
74.68	43.	36.70	0.98	2.586E-02				
77.19	89.	18.80	0.99	2.770E-02				
92.88	40.	43.01	0.79	3.710E-02	92.59	4.343	7.117E-01	Th234
					93.35	5.760	5.313E-01	U235
					93.35	4.100	7.182E-01	Ac228
					92.59	4.343	7.117E-01	Th234
					93.35	5.760	5.313E-01	U235
121.42	13.	117.21	1.02	4.618E-02	121.78	28.410	PBC<MDA	Eu152
143.26	19.	77.95	1.04	4.817E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	1.032E-01	U235
185.82	36.	45.88	1.08	4.667E-02	185.72	57.000	3.824E-02	U235
					186.21	3.555	6.137E-01	Ra226
					185.72	57.000	3.824E-02	U235
238.63	200.	10.70	0.99	4.195E-02	238.63	43.600	2.996E-01	Pb212
242.01	53.	28.80	1.36	4.164E-02	242.00	7.268	4.977E-01	Pb214
295.10	85.	18.76	0.84	3.706E-02	295.22	18.414	3.216E-01	Pb214
338.44	54.	20.58	1.00	3.392E-02	338.32	11.400	3.990E-01	Ac228
347.69	11.	76.24	1.21	3.353E-02	344.28	26.590	PBC<MDA	Eu152
351.90	155.	10.70	1.07	3.304E-02	351.93	35.600	3.501E-01	Pb214
511.03	103.	15.97	0.89	2.557E-02				
569.67	3.	232.86	1.40	2.372E-02	569.50	9.300	PBC<MDA	Pa234
582.76	84.	13.56	1.16	2.333E-02	583.19	85.000	1.206E-01	Tl208
609.23	119.	12.45	1.23	2.264E-02	609.31	45.490	3.277E-01	Bi214
726.99	19.	44.70	1.54	2.003E-02	727.33	6.650	3.950E-01	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:23:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_017.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
860.74	19.	42.31	1.65	1.782E-02	860.53	12.400	2.454E-01	Tl208
911.26	61.	16.50	1.70	1.712E-02	911.20	26.200	3.843E-01	Ac228
961.25	2.	320.69	1.74	1.646E-02	964.08	14.500	PBC<MDA	Eu152
969.26	28.	33.46	1.75	1.640E-02	968.96	15.900	2.999E-01	Ac228
1111.33	1.	600.97	1.87	1.485E-02	1112.08	13.410	PBC<MDA	Eu152
1120.17	20.	39.35	0.53	1.477E-02	1120.29	14.910	2.632E-01	Bi214
1274.99	5.	162.82	2.02	1.343E-02	1274.43	34.900	PBC<MDA	Eu154
1407.84	5.	136.97	2.14	1.243E-02	1408.01	20.850	PBC<MDA	Eu152
1460.86	870.	3.42	1.72	1.208E-02	1460.82	10.550	1.914E+01	K40
1764.07	13.	35.42	2.46	1.032E-02	1764.49	15.310	2.268E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
298.93	74.72	112.	43.	1.670E+03	80.23	0.660	-	sM
308.99	77.24	96.	78.	2.827E+03	42.69	1.040	-	sM
2043.49	511.03	47.	103.	4.036E+03	31.94	0.894	TL-208	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	234.94	58.71	114.	14.	0.005	218.53	0.972s
Th-234	253.46	63.35	143.	6.	0.002	585.11	0.975s
Th-234	371.35	92.84	149.	41.	0.015	89.74	0.999
U-235	373.41	93.35	135.	43.	0.016	81.64	1.000D
Ac-228	373.41	93.35	137.	42.	0.015	81.64	1.000D
Eu-152	485.61	121.42	109.	13.	0.005	234.43	1.024s
Eu-154	492.28	123.09	167.	-22.	-0.008	174.40	1.025s
Pa-234	525.75	131.46	149.	-18.	-0.007	197.78	1.031s
U-235	572.90	143.26	102.	19.	0.007	155.89	1.042s
U-235	743.07	185.82	117.	36.	0.013	91.75	1.077s
Pb-212	954.21	238.63	102.	193.	0.071	21.40	0.987
Pb-214	967.72	242.01	72.	53.	0.020	57.60	1.361s
Pb-214	1180.00	295.10	71.	77.	0.029	37.52	0.839s
Pb-212	1203.83	301.06	76.	-6.	-0.002	501.59	1.173s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:23:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_017.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	1353.27	338.44	34.	54.	0.020	41.17	1.004
Eu-152	1390.26	347.69	30.	11.	0.004	152.47	1.211s
Pb-214	1407.12	351.90	50.	145.	0.054	21.40	1.068
Pa-234	2278.02	569.67	26.	3.	0.001	465.73	1.402s
Tl-208	2330.37	582.76	22.	84.	0.031	27.12	1.160
Bi-214	2436.23	609.23	47.	119.	0.044	24.91	1.235
Cs-137	2644.73	661.35	33.	-6.	-0.002	280.44	1.481s
Eu-154	2893.94	723.65	48.	-6.	-0.002	317.93	1.534s
Bi-212	2907.33	726.99	25.	19.	0.007	89.39	1.538s
Eu-152	3115.68	779.07	41.	-7.	-0.003	264.48	1.582s
Tl-208	3442.40	860.74	23.	19.	0.007	84.62	1.653s
Eu-154	3495.41	873.98	31.	-5.	-0.002	344.70	1.664s
Ac-228	3644.58	911.26	26.	61.	0.022	33.01	1.697
Eu-152	3844.58	961.25	26.	2.	0.001	641.39	1.743s
Ac-228	3876.64	969.26	43.	28.	0.010	66.92	1.747s
Eu-152	4445.19	1111.33	31.	1.	0.000	1201.93	1.873s
Bi-214	4480.58	1120.17	25.	20.	0.008	78.69	0.529s
Eu-154	5100.30	1274.99	31.	5.	0.002	325.64	2.016s
Co-60	5334.47	1333.49	20.	-1.	0.000	1397.75	2.068s
Eu-152	5632.15	1407.84	18.	5.	0.002	273.94	2.135s
K-40	5844.41	1460.86	16.	858.	0.318	6.84	1.725
Bi-214	7058.64	1764.07	12.	13.	0.005	70.84	2.456s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	3.6238E-01					5.12E+12
			911.20	3.843E-01	?(P	7.524E-02 1.65E+01	2.62E+01 G
			968.96	2.999E-01	?(P	1.657E-01 3.35E+01	1.59E+01 G
			338.32	3.990E-01	(P	9.938E-02 2.06E+01	1.14E+01 G
							Energy duplication
			93.35	7.770E-01	+ P	5.055E-01 4.08E+01	4.10E+00 XA
Am-241	I	8.5205E-02					1.58E+05
			59.54	8.521E-02	&(	1.488E-01 1.09E+02	3.59E+01 G
Bi-212	N	3.9503E-01					5.12E+12
			727.33	3.950E-01	(	2.485E-01 4.47E+01	6.65E+00 G
			785.37	0.000E+00	-	1.954E+00 1.00E+03	1.11E+00 G
			1620.74	0.000E+00	&	3.951E-01 1.00E+03	1.51E+00 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:23:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_017.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	3.1174E-01					5.84E+05	
			609.31	3.277E-01	(P	4.420E-02	1.25E+01	4.55E+01 G
			1120.29	2.632E-01	(P	1.491E-01	3.93E+01	1.49E+01 G
			1764.49	2.268E-01	- P	1.475E-01	3.54E+01	1.53E+01 G
Co-60	T	-2.0634E-03					1.93E+03	
			1332.49	-2.063E-03	&(	2.349E-02	6.99E+02	1.00E+02 G
			1173.23	-2.411E-04	&	2.590E-02	6.52E+03	9.98E+01 G
Cs-137	I	-9.5125E-03					1.10E+04	
			661.66	-9.512E-03	?(	2.103E-02	1.40E+02	8.50E+01 G
Eu-152	I	3.3495E-02					4.94E+03	
			344.28	3.569E-02	?(	4.121E-02	7.62E+01	2.66E+01 G
			121.78	2.835E-02	&(	5.320E-02	1.17E+02	2.84E+01 G
			778.90	-8.269E-02	+	1.728E-01	1.32E+02	1.30E+01 G
			964.08	2.754E-02	?(	1.424E-01	3.21E+02	1.45E+01 G
			1112.08	1.918E-02	?(	1.879E-01	6.01E+02	1.34E+01 G
			1408.01	5.105E-02	?(	1.084E-01	1.37E+02	2.09E+01 G
Eu-154	I	6.5747E-03					3.14E+03	
			873.18	-6.303E-02	?(	1.725E-01	1.72E+02	1.22E+01 G
			123.07	-3.319E-02	+	4.621E-02	8.72E+01	4.04E+01 G
			1274.43	3.085E-02	?(	7.958E-02	1.63E+02	3.49E+01 G
			723.30	-4.544E-02	+	1.153E-01	1.59E+02	2.00E+01 G
			1004.72	7.309E-03	%	1.248E-01	1.04E+03	1.79E+01 G
			996.25	1.087E-03	&	2.054E-01	1.15E+04	1.05E+01 G
K-40	N	1.9136E+01					4.57E+11	
			1460.82	1.914E+01	(P	2.075E-01	3.42E+00	1.06E+01 G
Pa-234	N	-5.9255E-02					1.63E+12	
			131.30	-5.925E-02	?(	9.376E-02	9.89E+01	1.82E+01 G
			569.50	4.134E-02	+	1.540E-01	2.33E+02	9.30E+00 G
			946.00	-6.854E-03	&	1.695E-01	1.51E+03	1.35E+01 G
			880.52	-3.732E-03	%	1.816E-01	2.96E+03	1.05E+01 G
			883.24	1.840E-03	%	1.715E-01	5.67E+03	9.70E+00 G
Pb-212	N	2.9960E-01					5.12E+12	
			238.63	2.996E-01	(P	3.658E-02	1.07E+01	4.36E+01 G
			300.09	-1.584E-01	- P	4.965E-01	2.51E+02	3.18E+00 G
Pb-214	N	3.4038E-01					5.84E+05	
			351.93	3.501E-01	(P	3.985E-02	1.07E+01	3.56E+01 G
			295.22	3.216E-01	(P	8.164E-02	1.88E+01	1.84E+01 G
			242.00	4.977E-01	+	1.856E-01	2.88E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:23:05
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_017.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   5.1442E-01                                      1.63E+12
                            63.30 2.676E-01 ?(  1.277E+00 2.93E+02 3.75E+00 G
                            92.59 7.275E-01 ?(  5.043E-01 4.49E+01 4.34E+00 G

Tl-208   N   1.2056E-01                                      5.12E+12
                           583.19 1.206E-01  (P 1.560E-02 1.36E+01 8.50E+01 G
                           277.37 0.000E+00 &   2.321E-01 1.00E+03 6.60E+00 G
                           860.53 2.454E-01 +   1.439E-01 4.23E+01 1.24E+01 G

U-235    N   1.0321E-01                                      2.57E+11
                           143.77 1.032E-01 &(  1.267E-01 7.79E+01 1.09E+01 G
                           205.32-1.206E-02 %   3.025E-01 1.53E+03 5.02E+00 G
                           163.36 1.068E-02 %   2.814E-01 1.60E+03 5.08E+00 G
                           185.72 3.824E-02 -   2.692E-02 4.59E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 5.731E-01 ?   3.578E-01 4.08E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:23:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_017.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	63.35	143.	6.	0.002	585.11	2.676E-01
Th-234	92.84	149.	41.	0.015	89.74	7.275E-01
U-235	93.35	135.	43.	0.016	81.64	5.731E-01
Eu-152	121.42	109.	13.	0.005	234.43	2.835E-02
Eu-154	123.09	167.	-22.	-0.008	174.40	-3.319E-02
Pa-234	131.46	149.	-18.	-0.007	197.78	-5.925E-02
U-235	143.26	102.	19.	0.007	155.89	1.032E-01
U-235	185.82	117.	36.	0.013	91.75	3.824E-02
Eu-152	347.69	30.	11.	0.004	152.47	3.569E-02
Pa-234	569.67	26.	3.	0.001	465.73	4.134E-02
Cs-137	661.35	33.	-6.	-0.002	280.44	-9.512E-03
Eu-154	723.65	48.	-6.	-0.002	317.93	-4.544E-02
Bi-212	726.99	25.	19.	0.007	89.39	3.950E-01
Eu-152	779.07	41.	-7.	-0.003	264.48	-8.269E-02
Eu-154	873.98	31.	-5.	-0.002	344.70	-6.303E-02
Eu-152	961.25	26.	2.	0.001	641.39	2.754E-02
Eu-152	1111.33	31.	1.	0.000	1201.93	1.918E-02
Eu-154	1274.99	31.	5.	0.002	325.64	3.085E-02
Co-60	1333.49	20.	-1.	0.000	1397.75	-2.063E-03
Eu-152	1407.84	18.	5.	0.002	273.94	5.105E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	3.6238E-01	3.6238E-01	1.1321E-01	1.1620E-01	7.524E-02
Am-241 #A	8.5184E-02	8.5205E-02	1.8620E-01	1.8631E-01	1.488E-01
Bi-212 #	3.9503E-01	3.9503E-01	3.5313E-01	3.5371E-01	2.485E-01
Bi-214	3.1172E-01	3.1174E-01	8.5787E-02	8.6924E-02	4.420E-02
Co-60 #A	-2.0221E-03	-2.0634E-03	2.8842E-02	2.8842E-02	2.349E-02
Cs-137 #A	-9.4788E-03	-9.5125E-03	2.6677E-02	2.6680E-02	2.103E-02
Eu-152 #A	3.3232E-02	3.3495E-02	5.1071E-02	5.1096E-02	4.121E-02
Eu-154 #A	6.4937E-03	6.5747E-03	1.5588E-02	1.5592E-02	1.725E-01
K-40	1.9136E+01	1.9136E+01	1.3283E+00	1.6389E+00	2.075E-01
Pa-234 #A	-5.9255E-02	-5.9255E-02	1.1720E-01	1.1812E-01	9.376E-02
Pb-212	2.9960E-01	2.9960E-01	6.6411E-02	6.9859E-02	3.658E-02
Pb-214	3.4036E-01	3.4038E-01	7.7911E-02	7.9520E-02	3.985E-02
Ra-226 #A	0.0000E+00	0.0000E+00	5.1078E-01	5.1078E-01	5.228E-01
Th-234 #A	5.1442E-01	5.1442E-01	4.6166E-01	4.6421E-01	1.277E+00
Tl-208	1.2056E-01	1.2056E-01	3.4660E-02	3.5508E-02	1.560E-02
U-235 #A	1.0321E-01	1.0321E-01	1.6089E-01	1.6101E-01	1.267E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:23:05
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_017.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.0 keV)     2.057E+01  pCi/g
 Total Decayed Activity (   25.0 to  2035.0 keV) 2.0570189E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952017
File : 4_20140124_017
Cal : 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13
IDF : 1.0
PDF : 1.0

Lab ID : 251449-018
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 05-MAR-2013
Sample Amount : 343.7 g

Client ID : 04-PD-D0034-18
Acct : ITSI (JG)
Time : 24-JAN-2014 19:37
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.3 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.174	0.110		.1478	.14835	-0.0012	u
Bismuth-212	0.234	0.300		.43496	.43512	0.00031	u
Bismuth-214	0.326	0.0444		.087806	.089021	-0.011	u
Cesium-137	0.00578	0.0203	0.07	.025328	.025329	0.0048	u
Cobalt-60	0.0121	0.0204		.023007	.023013	0.0015	u
Europium-152	0.0369	0.0576		.033727	.033774	0.020	u
Europium-154	-0.00665	0.163		.020886	.020889	0.019	u
Lead-212	0.271	0.0303		.05667	.059962	-0.0075	u
Lead-214	0.356	0.0379		.077451	.079223	-0.025	u
Potassium-40	15.9	0.214		1.2223	1.4597	-0.068	u
Protactinium-234	-0.00910	0.0854		.10427	.10429	0.0066	u
Radium-226 (By Bismuth-214)	0.326	0.0444	0.2	.087806	.089021	-0.011	u
Thallium-208	0.0926	0.0188		.03224	.03278	-0.0042	u
Thorium-232 (By Actinium-228)	0.429	0.0502		.13045	.13408	0.020	u
Thorium-234	-0.349	1.11		1.3654	1.3658	0	u
Uranium-235	0.0369	0.129		.031155	.031235	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-18
Sample Description: 251449-018, 207004

Detector: HPGE04 51-TP32733A
Spectrum ID: 4_20140124_017
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 14:23
Live Time: 2700 sec
Acquisition Time: 1/24/2014 19:37:11
Real Time: 2708 sec
Analysis Time: 1/24/2014 20:22
Dead Time: 0.30 %
Analysis Quantity: 3.437E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.287E-01	1.304E-01	1.341E-01	5.019E-02
Am-241	#	1.739E-01	1.478E-01	1.484E-01	1.102E-01
Bi-212	AB	2.339E-01	4.350E-01	4.351E-01	2.996E-01
Bi-214		3.260E-01	8.781E-02	8.902E-02	4.441E-02
Co-60	#AB	1.207E-02	2.301E-02	2.301E-02	2.043E-02
Cs-137	#AB	5.785E-03	2.533E-02	2.533E-02	2.027E-02
Eu-152	#AB	3.687E-02	3.373E-02	3.377E-02	5.755E-02
Eu-154	#AB	-6.649E-03	2.089E-02	2.089E-02	1.634E-01
K-40		1.591E+01	1.222E+00	1.460E+00	2.144E-01
Pa-234	#AB	-9.104E-03	1.043E-01	1.043E-01	8.543E-02
Pb-212		2.708E-01	5.667E-02	5.996E-02	3.032E-02
Pb-214		3.563E-01	7.745E-02	7.922E-02	3.792E-02
Ra-226	#	5.834E-01	4.944E-01	4.955E-01	3.730E-01
Th-234	#AB	-3.486E-01	1.365E+00	1.366E+00	1.106E+00
Tl-208		9.260E-02	3.224E-02	3.278E-02	1.877E-02
U-235	#AB	3.687E-02	3.116E-02	3.124E-02	1.292E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.847E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:22:26
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_017.An1

Sample description
     251449-018, 207004


Spectrum Filename: C:\User\SPC\Det4\4_20140124_017.An1

Acquisition information
       Start time:                 1/24/2014 19:37:11
       Live time:               2700
       Real time:               2708
       Dead time:                  0.30 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.4370E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.4370E+02) =
                                   7.8636E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:22:26
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_017.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:23:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0681

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.34	31.	42.49	0.81	1.430E-02	59.54	35.920	1.739E-01	Am241
74.74	72.	22.04	0.82	2.748E-02				
77.04	100.	16.08	0.83	2.923E-02				
93.02	36.	45.38	0.84	3.937E-02	93.35	4.100	6.415E-01	Ac228
					93.35	5.760	4.566E-01	U235
					92.59	4.343	6.116E-01	Th234
					93.35	5.760	4.566E-01	U235
93.13	48.	33.04	0.56	3.937E-02	93.35	4.100	8.715E-01	Ac228
					93.35	5.760	6.203E-01	U235
121.73	22.	59.28	0.87	4.840E-02	121.78	28.410	4.757E-02	Eu152
142.93	6.	240.89	0.89	5.033E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	3.301E-02	U235
163.52	4.	346.93	0.91	5.004E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	5.146E-02	U235
186.11	35.	42.37	0.93	4.851E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	5.834E-01	Ra226
					185.72	57.000	3.635E-02	U235
186.18	35.	42.25	0.93	4.855E-02	185.72	57.000	3.631E-02	U235
					186.21	3.555	5.827E-01	Ra226
238.67	182.	10.12	0.97	4.347E-02	238.63	43.600	2.708E-01	Pb212
241.93	39.	31.43	1.41	4.315E-02	242.00	7.268	3.601E-01	Pb214
277.76	10.	90.52	1.02	3.983E-02	277.37	6.600	PBC<MDA	Tl208
295.28	69.	16.79	1.11	3.829E-02	295.22	18.414	2.860E-01	Pb214
338.47	32.	39.09	0.93	3.500E-02	338.32	11.400	2.307E-01	Ac228
351.93	160.	10.07	1.13	3.408E-02	351.93	35.600	3.555E-01	Pb214
583.14	63.	15.87	1.30	2.394E-02	583.19	85.000	9.015E-02	Tl208
609.46	134.	11.92	1.24	2.322E-02	609.31	45.490	3.260E-01	Bi214

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:22:26
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_017.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
661.33	4.	218.93	1.37	2.192E-02	661.66	84.990	PBC<MDA	Cs137
726.95	9.	98.28	1.43	2.051E-02	727.33	6.650	PBC<MDA	Bi212
860.92	8.	105.34	1.54	1.823E-02	860.53	12.400	PBC<MDA	Tl208
911.35	68.	15.21	0.33	1.750E-02	911.20	26.200	4.287E-01	Ac228
968.84	28.	29.59	1.63	1.675E-02	968.96	15.900	3.026E-01	Ac228
995.78	3.	239.90	1.65	1.642E-02	996.25	10.500	PBC<MDA	Eu154
1004.36	1.	482.06	1.66	1.632E-02	1004.72	17.860	PBC<MDA	Eu154
1120.57	12.	49.35	1.76	1.507E-02	1120.29	14.910	PBC<MDA	Bi214
1174.56	5.	185.37	1.80	1.456E-02	1173.23	99.850	PBC<MDA	Co60
1274.49	2.	359.21	1.88	1.368E-02	1274.43	34.900	PBC<MDA	Eu154
1331.64	6.	95.34	1.93	1.322E-02	1332.49	99.983	PBC<MDA	Co60
1407.54	10.	45.74	1.98	1.266E-02	1408.01	20.850	1.073E-01	Eu152
1460.78	721.	3.77	1.97	1.229E-02	1460.82	10.550	1.591E+01	K40
1620.08	2.	157.89	2.14	1.128E-02	1620.74	1.510	PBC<MDA	Bi212
1764.53	13.	29.63	2.25	1.048E-02	1764.49	15.310	2.431E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
298.83	74.71	103.	56.	2.023E+03	59.41	0.673	-	
308.03	77.01	109.	90.	3.072E+03	41.12	0.773	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.39	59.34	70.	31.	0.011	84.98	0.810
Th-234	254.36	63.58	118.	-8.	-0.003	391.68	0.813s
Ac-228	373.35	93.35	90.	48.	0.018	66.07	0.556D
U-235	373.35	93.35	112.	36.	0.013	90.75	0.843D
Eu-152	486.79	121.73	76.	22.	0.008	118.57	0.870s
Eu-154	491.49	122.91	132.	-15.	-0.006	218.10	0.871s
Pa-234	525.03	131.30	129.	-3.	-0.001	1145.35	0.879s
U-235	571.54	142.93	110.	6.	0.002	481.78	0.891s
U-235	653.84	163.52	119.	4.	0.002	693.87	0.910s
U-235	744.41	186.18	89.	35.	0.013	84.50	0.931s
Ra-226	744.11	186.11	90.	35.	0.013	84.74	0.932s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:22:26
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_017.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	954.25	238.67	72.	176.	0.065	20.24	0.968
Pb-214	967.25	241.93	63.	39.	0.014	62.85	1.410s
Tl-208	1110.52	277.76	42.	10.	0.004	181.04	1.018
Pb-214	1180.54	295.28	46.	69.	0.026	33.57	1.115
Ac-228	1353.22	338.47	50.	32.	0.012	78.17	0.928
Eu-152	1375.59	344.07	60.	-9.	-0.003	243.73	1.081s
Pb-214	1407.03	351.93	46.	148.	0.055	20.14	1.131
Pa-234	2276.45	569.37	30.	-2.	-0.001	966.27	1.286s
Tl-208	2331.51	583.14	32.	63.	0.023	31.73	1.299
Bi-214	2436.79	609.46	48.	118.	0.044	23.83	1.239
Cs-137	2644.21	661.33	31.	4.	0.001	437.85	1.368s
Bi-212	2906.67	726.95	36.	9.	0.003	196.55	1.426s
Tl-208	3442.53	860.92	28.	8.	0.003	210.69	1.541
Eu-154	3494.94	874.02	27.	-4.	-0.001	405.64	1.551s
Ac-228	3644.27	911.35	12.	68.	0.025	30.43	0.328s
Ac-228	3874.26	968.84	20.	28.	0.010	59.18	1.632s
Eu-154	3982.03	995.78	18.	3.	0.001	479.81	1.655s
Eu-154	4016.33	1004.36	22.	1.	0.001	964.11	1.662s
Bi-214	4481.27	1120.57	33.	12.	0.005	98.70	1.757s
Co-60	4697.33	1174.56	37.	5.	0.002	370.75	1.799s
Eu-154	5097.18	1274.49	24.	2.	0.001	718.43	1.880s
Co-60	5325.91	1331.64	15.	6.	0.002	190.67	1.926s
Eu-152	5629.68	1407.54	5.	10.	0.004	91.47	1.984s
K-40	5842.75	1460.78	17.	708.	0.262	7.55	1.970
Bi-212	6480.42	1620.08	6.	2.	0.001	315.77	2.144
Bi-214	7058.71	1764.53	9.	13.	0.005	59.26	2.248s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	4.2873E-01					5.12E+12
			911.20	4.287E-01	(	5.019E-02 1.52E+01 2.62E+01	G
			968.96	3.026E-01	-	1.131E-01 2.96E+01 1.59E+01	G
			338.32	2.307E-01	-	1.207E-01 3.91E+01 1.14E+01	G
							Energy duplication
			93.35	8.715E-01	+	3.982E-01 3.30E+01 4.10E+00	XA
Am-241	I	1.7392E-01					1.58E+05
			59.54	1.739E-01	(	1.102E-01 4.25E+01 3.59E+01	G
Bi-212	N	2.3388E-01					5.12E+12
			727.33	1.964E-01	?(	2.996E-01 9.83E+01 6.65E+00	G
			785.37	-7.598E-02	%	1.642E+00 1.32E+03 1.11E+00	G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:22:26
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_017.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
			1620.74	3.990E-01	(	9.444E-01	1.58E+02	1.51E+00 G
Bi-214	N	3.2601E-01					5.84E+05	
			609.31	3.260E-01	(P	4.441E-02	1.19E+01	4.55E+01 G
			1120.29	1.593E-01	- P	1.737E-01	4.94E+01	1.49E+01 G
			1764.49	2.431E-01	- P	1.244E-01	2.96E+01	1.53E+01 G
Co-60	T	1.2066E-02					1.93E+03	
			1332.49	1.430E-02	?(	2.043E-02	9.53E+01	1.00E+02 G
			1173.23	9.826E-03	?(	2.909E-02	1.85E+02	9.98E+01 G
Cs-137	I	5.7845E-03					1.10E+04	
			661.66	5.785E-03	?(	2.027E-02	2.19E+02	8.50E+01 G
Eu-152	I	3.6871E-02					4.94E+03	
			344.28	-2.976E-02	&(	5.755E-02	1.22E+02	2.66E+01 G
			121.78	4.757E-02	?(	4.340E-02	5.93E+01	2.84E+01 G
			778.90	0.000E+00	-	1.941E-01	1.00E+03	1.30E+01 G
			964.08	-5.264E-03	%	1.668E-01	1.93E+03	1.45E+01 G
			1112.08	0.000E+00	-	3.037E-01	1.00E+03	1.34E+01 G
			1408.01	1.073E-01	?(	5.739E-02	4.57E+01	2.09E+01 G
Eu-154	I	-6.6485E-03					3.14E+03	
			873.18	-5.055E-02	?(	1.634E-01	2.03E+02	1.22E+01 G
			123.07	-2.304E-02	+	4.025E-02	1.09E+02	4.04E+01 G
			1274.43	1.226E-02	+	7.114E-02	3.59E+02	3.49E+01 G
			723.30	-5.271E-03	%	1.021E-01	1.18E+03	2.00E+01 G
			1004.72	1.430E-02	+	1.118E-01	4.82E+02	1.79E+01 G
			996.25	4.423E-02	&(	1.689E-01	2.40E+02	1.05E+01 G
K-40	N	1.5908E+01					4.57E+11	
			1460.82	1.591E+01	(P	2.144E-01	3.77E+00	1.06E+01 G
Pa-234	N	-9.1038E-03					1.63E+12	
			131.30	-9.104E-03	?(	8.543E-02	5.73E+02	1.82E+01 G
			569.50	-2.081E-02	+	1.634E-01	4.83E+02	9.30E+00 G
			946.00	-2.970E-03	%	1.509E-01	3.09E+03	1.35E+01 G
			880.52	0.000E+00	+	1.604E-01	1.00E+03	1.05E+01 G
			883.24	0.000E+00	+	2.177E-01	1.00E+03	9.70E+00 G
Pb-212	N	2.7081E-01					5.12E+12	
			238.63	2.708E-01	(P	3.032E-02	1.01E+01	4.36E+01 G
			300.09	-2.194E-02	& P	4.261E-01	1.72E+03	3.18E+00 G
Pb-214	N	3.5626E-01					5.84E+05	
			351.93	3.555E-01	(P	3.792E-02	1.01E+01	3.56E+01 G
			295.22	2.860E-01	- P	6.511E-02	1.68E+01	1.84E+01 G
			242.00	3.601E-01	(P	1.721E-01	3.14E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:22:26
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_017.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   5.8339E-01                                     5.84E+05
                           186.21 5.834E-01  (  3.730E-01 4.24E+01 3.56E+00 G

Th-234   N  -3.4859E-01                                     1.63E+12
                            63.30-3.486E-01 ?(  1.106E+00 1.96E+02 3.75E+00 G
                            92.59 0.000E+00 +   4.719E-01 1.00E+03 4.34E+00 G

Tl-208   N   9.2601E-02                                     5.12E+12
                           583.19 9.015E-02 ?(P 1.877E-02 1.59E+01 8.50E+01 G
                           277.37 1.158E-01  (P 1.663E-01 9.05E+01 6.60E+00 G
                           860.53 9.710E-02  (  1.581E-01 1.05E+02 1.24E+01 G

U-235    N   3.6869E-02                                     2.57E+11
                           143.77 3.301E-02 ?(  1.292E-01 2.41E+02 1.09E+01 G
                           205.32-8.268E-03 &   2.758E-01 2.03E+03 5.02E+00 G
                           163.36 5.146E-02 ?(  2.914E-01 3.47E+02 5.08E+00 G
                           185.72 3.631E-02 @(  2.313E-02 4.23E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 4.566E-01     3.172E-01 4.54E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:22:26
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_017.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.34	70.	31.	0.011	84.98	1.739E-01
Th-234	63.58	118.	-8.	-0.003	391.68	-3.486E-01
U-235	93.35	112.	36.	0.013	90.75	4.566E-01
Eu-152	121.73	76.	22.	0.008	118.57	4.757E-02
Eu-154	122.91	132.	-15.	-0.006	218.10	-2.304E-02
Pa-234	131.30	129.	-3.	-0.001	1145.35	-9.104E-03
U-235	142.93	110.	6.	0.002	481.78	3.301E-02
U-235	163.52	119.	4.	0.002	693.87	5.146E-02
U-235	186.18	89.	35.	0.013	84.50	3.631E-02
Ra-226	186.11	90.	35.	0.013	84.74	5.834E-01
Eu-152	344.07	60.	-9.	-0.003	243.73	-2.976E-02
Pa-234	569.37	30.	-2.	-0.001	966.27	-2.081E-02
Cs-137	661.33	31.	4.	0.001	437.85	5.785E-03
Eu-154	874.02	27.	-4.	-0.001	405.64	-5.055E-02
Eu-154	995.78	18.	3.	0.001	479.81	4.423E-02
Eu-154	1004.36	22.	1.	0.001	964.11	1.430E-02
Co-60	1174.56	37.	5.	0.002	370.75	9.826E-03
Eu-154	1274.49	24.	2.	0.001	718.43	1.226E-02
Co-60	1331.64	15.	6.	0.002	190.67	1.430E-02
Eu-152	1407.54	5.	10.	0.004	91.47	1.073E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.2873E-01	4.2873E-01	1.3045E-01	1.3408E-01	5.019E-02
Am-241 #	1.7388E-01	1.7392E-01	1.4780E-01	1.4835E-01	1.102E-01
Bi-212 A	2.3388E-01	2.3388E-01	4.3496E-01	4.3512E-01	2.996E-01
Bi-214	3.2599E-01	3.2601E-01	8.7806E-02	8.9021E-02	4.441E-02
Co-60 #A	1.1824E-02	1.2066E-02	2.3007E-02	2.3013E-02	2.043E-02
Cs-137 #A	5.7640E-03	5.7845E-03	2.5328E-02	2.5329E-02	2.027E-02
Eu-152 #A	3.6581E-02	3.6871E-02	3.3727E-02	3.3774E-02	5.755E-02
Eu-154 #A	-6.5665E-03	-6.6485E-03	2.0886E-02	2.0889E-02	1.634E-01
K-40	1.5908E+01	1.5908E+01	1.2223E+00	1.4597E+00	2.144E-01
Pa-234 #A	-9.1038E-03	-9.1038E-03	1.0427E-01	1.0429E-01	8.543E-02
Pb-212	2.7081E-01	2.7081E-01	5.6670E-02	5.9962E-02	3.032E-02
Pb-214	3.5624E-01	3.5626E-01	7.7451E-02	7.9223E-02	3.792E-02
Ra-226 #	5.8335E-01	5.8339E-01	4.9439E-01	4.9551E-01	3.730E-01
Th-234 #A	-3.4859E-01	-3.4859E-01	1.3654E+00	1.3658E+00	1.106E+00
Tl-208	9.2601E-02	9.2601E-02	3.2240E-02	3.2780E-02	1.877E-02
U-235 #A	3.6869E-02	3.6869E-02	3.1155E-02	3.1235E-02	1.292E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:22:26
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_017.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.6 keV)     1.738E+01  pCi/g
 Total Decayed Activity (   25.0 to  2035.6 keV) 1.7382851E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE03
Seqnum : 1524034937018
File : 3_20140124_018
Cal : 24-JAN-2014 06:28:35,29-APR-2013 08:26:15
IDF : 1.0
PDF : 1.0

Lab ID : 251449-019
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 29-APR-2013
Sample Amount : 335.76 g

Client ID : 04-PD-D0034-19
Acct : ITSI (JG)
Time : 24-JAN-2014 20:27
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.11 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.000351	0.131		.15864	.15864	-0.0012	u
Bismuth-212	0.361	0.237		.40964	.41005	0.00031	u
Bismuth-214	0.246	0.0460		.073928	.074753	-0.011	u
Cesium-137	-0.000156	0.0194	0.07	.023521	.023521	0.0048	u
Cobalt-60	-0.000102	0.0267		.032471	.032471	0.0015	u
Europium-152	0.0404	0.0492		.066542	.06657	0.020	u
Europium-154	0.0383	0.143		.095471	.095492	0.019	u
Lead-212	0.330	0.0315		.060637	.06517	-0.0075	u
Lead-214	0.334	0.0369		.071466	.07315	-0.025	u
Potassium-40	17.6	0.304		1.3602	1.6211	-0.068	u
Protactinium-234	0.0245	0.101		.043357	.043783	0.0066	u
Radium-226 (By Bismuth-214)	0.246	0.0460	0.2	.073928	.074753	-0.011	u
Thallium-208	0.119	0.0181		.037714	.038478	-0.0042	u
Thorium-232 (By Actinium-228)	0.457	0.0321		.12021	.12468	0.020	u
Thorium-234	0.874	0.847		.61069	.61625	0	u
Uranium-235	0.0391	0.130		.028974	.029071	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-19
Sample Description: 251449-019, 207004

Detector: HPGE03 51-TP42227A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:25
Acquisition Time: 1/24/2014 20:27:28
Analysis Time: 1/24/2014 21:12
Analysis Quantity: 3.358E+02 g

Spectrum ID: 3_20140124_018
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.11 %

Efficiency: HPGE03 S22147 3_20130428002_EffCal RA226
Efficiency Cal Date: 4/29/2013 08:26
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.573E-01	1.202E-01	1.247E-01	3.211E-02
Am-241	#AB	-3.513E-04	1.586E-01	1.586E-01	1.307E-01
Bi-212	#	3.607E-01	4.096E-01	4.101E-01	2.373E-01
Bi-214		2.464E-01	7.393E-02	7.475E-02	4.596E-02
Co-60	#AB	-1.021E-04	3.247E-02	3.247E-02	2.674E-02
Cs-137	#AB	-1.564E-04	2.352E-02	2.352E-02	1.936E-02
Eu-152	#AB	4.039E-02	6.654E-02	6.657E-02	4.916E-02
Eu-154	#AB	3.834E-02	9.547E-02	9.549E-02	1.430E-01
K-40		1.758E+01	1.360E+00	1.621E+00	3.040E-01
Pa-234	#AB	2.451E-02	4.336E-02	4.378E-02	1.014E-01
Pb-212		3.301E-01	6.064E-02	6.517E-02	3.152E-02
Pb-214	#	3.337E-01	7.147E-02	7.315E-02	3.693E-02
Ra-226	#	6.498E-01	5.106E-01	5.119E-01	3.810E-01
Th-234	#	8.744E-01	6.107E-01	6.163E-01	8.469E-01
Tl-208	#	1.193E-01	3.771E-02	3.848E-02	1.814E-02
U-235	AB	3.910E-02	2.897E-02	2.907E-02	1.297E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.110E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:12:37
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_018.An1

Sample description
     251449-019, 207004


Spectrum Filename: C:\User\SPC\Det3\3_20140124_018.An1

Acquisition information
       Start time:                1/24/2014 20:27:28
       Live time:              2700
       Real time:              2703
       Dead time:                 0.11 %
       Detector ID:                   3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                  3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:28:35
            Zero offset:         -0.141 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:              4/29/2013 08:26:15
            Type:                 Polynomial
            Uncertainty:          1.273 %
            Coefficients:        -0.381561  -4.120787   0.430562
                                 -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.88keV )
       Stop channel:           8144 (  2035.17keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3576E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3576E+02) =
                                  8.0495E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:37
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_018.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:25:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	3_2013-12-28_0934.PBC 12/28/2013 09:34:58
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 15 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1808

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
62.50	24.	49.95	0.87	1.671E-02	63.30	3.750	1.129E+00	Th234
					63.30	3.750	1.129E+00	Th234
74.75	56.	27.41	0.88	2.591E-02				
77.05	99.	16.80	0.88	2.756E-02				
84.31	38.	39.63	0.68	3.230E-02				
89.85	27.	48.95	0.60	3.543E-02				
92.68	35.	48.82	0.89	3.682E-02	92.59	4.343	6.546E-01	Th234
					92.59	4.343	6.546E-01	Th234
122.09	16.	96.24	0.92	4.597E-02	121.78	28.410	PBC<MDA	Eu152
163.31	3.	493.65	0.95	4.789E-02	163.36	5.080	PBC<MDA	U235
186.12	38.	37.05	0.97	4.662E-02	185.72	57.000	4.217E-02	U235
					186.21	3.555	6.767E-01	Ra226
186.13	36.	39.29	0.97	4.658E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	6.498E-01	Ra226
206.23	7.	205.05	0.99	4.503E-02	205.32	5.020	PBC<MDA	U235
238.64	213.	8.78	0.92	4.202E-02	238.63	43.600	3.318E-01	Pb212
242.03	73.	23.53	1.99	4.172E-02	242.00	7.268	7.178E-01	Pb214
277.87	10.	80.21	1.05	3.864E-02	277.37	6.600	PBC<MDA	Tl208
295.46	68.	21.81	1.28	3.721E-02	295.22	18.414	2.949E-01	Pb214
300.01	12.	96.71	1.07	3.683E-02	300.09	3.180	PBC<MDA	Pb212
338.14	45.	30.06	0.45	3.412E-02	338.32	11.400	3.449E-01	Ac228
346.08	2.	449.89	1.11	3.373E-02	344.28	26.590	PBC<MDA	Eu152
351.98	140.	9.94	1.30	3.324E-02	351.93	35.600	3.538E-01	Pb214
570.12	6.	133.40	1.30	2.396E-02	569.50	9.300	PBC<MDA	Pa234
583.08	82.	15.19	0.59	2.357E-02	583.19	85.000	1.214E-01	Tl208
609.25	86.	12.85	1.33	2.287E-02	609.31	45.490	2.464E-01	Bi214
727.06	13.	56.78	1.43	2.025E-02	727.33	6.650	2.903E-01	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:37
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_018.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
777.77	9.	82.37	1.47	1.932E-02	778.90	12.970	PBC<MDA	Eu152
860.49	8.	99.15	1.54	1.803E-02	860.53	12.400	PBC<MDA	Tl208
872.03	1.	757.09	1.55	1.784E-02	873.18	12.170	PBC<MDA	Eu154
883.09	5.	144.84	1.56	1.770E-02	883.24	9.700	PBC<MDA	Pa234
911.62	70.	13.14	0.45	1.732E-02	911.20	26.200	4.573E-01	Ac228
964.25	5.	183.55	1.62	1.664E-02	964.08	14.500	PBC<MDA	Eu152
968.97	21.	46.35	1.63	1.658E-02	968.96	15.900	2.327E-01	Ac228
995.48	3.	216.86	1.65	1.626E-02	996.25	10.500	PBC<MDA	Eu154
1005.52	4.	191.65	1.66	1.616E-02	1004.72	17.860	PBC<MDA	Eu154
1120.38	28.	23.22	0.82	1.494E-02	1120.29	14.910	3.770E-01	Bi214
1274.10	6.	124.51	1.88	1.356E-02	1274.43	34.900	PBC<MDA	Eu154
1407.93	3.	174.15	1.99	1.255E-02	1408.01	20.850	PBC<MDA	Eu152
1460.96	773.	3.79	1.81	1.219E-02	1460.82	10.550	1.758E+01	K40
1620.72	4.	107.02	2.16	1.119E-02	1620.74	1.510	PBC<MDA	Bi212
1764.63	10.	35.49	2.28	1.039E-02	1764.49	15.310	1.823E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
299.34	74.76	109.	32.	1.239E+03	100.62	0.415	-	s
308.55	77.06	104.	91.	3.287E+03	39.51	0.673	-	
337.51	84.31	84.	38.	1.192E+03	79.27	0.684	TH-228	
359.67	89.85	73.	27.	7.720E+02	96.08	0.599	-	sM

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Th-234	250.36	62.50	58.	24.	0.009	99.90	0.867s
Th-234	370.96	92.68	129.	35.	0.013	97.63	0.892s
Eu-152	488.53	122.09	105.	16.	0.006	192.47	0.917
Eu-154	494.16	123.50	141.	-2.	-0.001	1390.16	0.918s
Pa-234	524.60	131.11	157.	-10.	-0.004	355.68	0.925s
U-235	653.29	163.31	84.	3.	0.001	987.29	0.952s
U-235	744.47	186.12	78.	38.	0.014	74.10	0.971
Ra-226	744.49	186.13	82.	36.	0.013	78.58	0.971s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:37
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_018.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	824.86	206.23	93.	7.	0.003	410.11	0.988s
Pb-212	954.40	238.64	69.	204.	0.076	17.57	0.922
Pb-214	967.95	242.03	74.	73.	0.027	47.06	1.989s
Tl-208	1111.23	277.87	52.	10.	0.004	160.43	1.049s
Pb-214	1181.57	295.46	76.	68.	0.025	43.61	1.283s
Pb-212	1199.75	300.01	62.	12.	0.004	193.41	1.068s
Ac-228	1352.18	338.14	46.	45.	0.017	60.12	0.454s
Eu-152	1383.95	346.08	40.	2.	0.001	899.79	1.105s
Pb-214	1407.53	351.98	40.	140.	0.052	19.89	1.297s
Pa-234	2279.80	570.12	31.	6.	0.002	266.80	1.295s
Tl-208	2331.61	583.08	27.	82.	0.030	30.37	0.591s
Bi-214	2436.27	609.25	47.	86.	0.032	25.70	1.328
Bi-212	2907.48	727.06	21.	13.	0.005	113.56	1.427s
Eu-152	3110.33	777.77	23.	9.	0.003	164.75	1.470s
Tl-208	3441.22	860.49	26.	8.	0.003	198.30	1.538s
Eu-154	3487.42	872.03	19.	1.	0.000	1514.18	1.549s
Pa-234	3517.95	879.67	29.	-6.	-0.002	283.98	1.555s
Pa-234	3531.64	883.09	21.	5.	0.002	289.68	1.557s
Ac-228	3645.79	911.62	4.	70.	0.026	26.29	0.447s
Pa-234	3782.97	945.91	30.	-4.	-0.002	392.65	1.610s
Eu-152	3856.38	964.25	39.	5.	0.002	367.09	1.625s
Ac-228	3875.23	968.97	35.	21.	0.008	92.70	1.629s
Eu-154	3981.33	995.48	21.	3.	0.001	433.72	1.651s
Eu-154	4021.50	1005.52	26.	4.	0.001	383.30	1.658s
Eu-152	4445.82	1111.56	29.	-1.	-0.001	1085.93	1.747s
Bi-214	4481.11	1120.38	11.	28.	0.010	46.43	0.821s
Co-60	4694.95	1173.81	36.	-2.	-0.001	1002.70	1.798s
Eu-154	5096.32	1274.10	29.	6.	0.002	249.02	1.881s
Eu-152	5632.05	1407.93	11.	3.	0.001	348.30	1.991s
K-40	5844.33	1460.96	32.	758.	0.281	7.59	1.811
Bi-212	6484.02	1620.72	6.	4.	0.001	214.04	2.165s
Bi-214	7060.30	1764.63	9.	10.	0.004	70.98	2.282s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	4.5731E-01					5.12E+12
			911.20	4.573E-01	(	3.211E-02	1.31E+01 2.62E+01 G
			968.96	2.327E-01	-	1.564E-01	4.64E+01 1.59E+01 G
			338.32	3.449E-01	-	1.211E-01	3.01E+01 1.14E+01 G
							Energy duplication
			93.35	0.000E+00	}	5.534E-01	1.50E+03 4.10E+00 XA

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:12:37
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_018.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Am-241   I  -3.5134E-04                                     1.58E+05
                            59.54-3.513E-04 &(  1.307E-01 2.26E+04 3.59E+01 G

Bi-212   N   3.6073E-01                                     5.12E+12
                           727.33 2.903E-01 &(  2.373E-01 5.68E+01 6.65E+00 G
                           785.37 9.408E-02 %   1.559E+00 1.01E+03 1.11E+00 G
                          1620.74 6.707E-01 ?(  1.038E+00 1.07E+02 1.51E+00 G

Bi-214   N   2.4643E-01                                     5.84E+05
                           609.31 2.464E-01 ?(P 4.596E-02 1.29E+01 4.55E+01 G
                          1120.29 3.770E-01 + P 1.027E-01 2.32E+01 1.49E+01 G
                          1764.49 1.823E-01 - P 1.344E-01 3.55E+01 1.53E+01 G

Co-60    T  -1.0212E-04                                     1.93E+03
                          1332.49-1.021E-04 %(  2.674E-02 1.59E+04 1.00E+02 G
                          1173.23-3.602E-03 &   2.940E-02 5.01E+02 9.98E+01 G

Cs-137   I  -1.5640E-04                                     1.10E+04
                           661.66-1.564E-04 %(  1.936E-02 7.52E+03 8.50E+01 G

Eu-152   I   4.0390E-02                                     4.94E+03
                           344.28 6.716E-03 &(  4.916E-02 4.50E+02 2.66E+01 G
                           121.78 3.587E-02 &(  5.487E-02 9.62E+01 2.84E+01 G
                           778.90 1.071E-01 ?(  1.328E-01 8.24E+01 1.30E+01 G
                           964.08 6.218E-02 ?(  1.824E-01 1.84E+02 1.45E+01 G
                          1112.08-2.111E-02 +   1.866E-01 5.43E+02 1.34E+01 G
                          1408.01 3.286E-02 ?(  8.868E-02 1.74E+02 2.09E+01 G

Eu-154   I   3.8339E-02                                     3.14E+03
                           873.18 1.159E-02 &(  1.430E-01 7.57E+02 1.22E+01 G
                           123.07-3.927E-03 +   4.478E-02 6.95E+02 4.04E+01 G
                          1274.43 4.128E-02 ?(  8.035E-02 1.25E+02 3.49E+01 G
                           723.30 0.000E+00 -   1.404E-01 1.00E+03 2.00E+01 G
                          1004.72 4.086E-02 &(  1.244E-01 1.92E+02 1.79E+01 G
                           996.25 5.529E-02 ?(  1.907E-01 2.17E+02 1.05E+01 G

K-40     N   1.7581E+01                                     4.57E+11
                          1460.82 1.758E+01  (P 3.040E-01 3.79E+00 1.06E+01 G

Pa-234   N   2.4511E-02                                     1.63E+12
                           131.30-3.515E-02 ?(  1.014E-01 1.78E+02 1.82E+01 G
                           569.50 8.231E-02 ?(  1.724E-01 1.33E+02 9.30E+00 G
                           946.00-5.335E-02 +   1.670E-01 1.96E+02 1.35E+01 G
                           880.52-9.025E-02 +   2.016E-01 1.42E+02 1.05E+01 G
                           883.24 8.104E-02 &(  1.833E-01 1.45E+02 9.70E+00 G
```

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:12:37
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124_018.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-212   N   3.3007E-01                                     5.12E+12
                           238.63 3.318E-01  (P 3.152E-02 8.78E+00 4.36E+01 G
                           300.09 3.069E-01 ?(  4.668E-01 9.67E+01 3.18E+00 G

Pb-214   N   3.3372E-01                                     5.84E+05
                           351.93 3.538E-01  (P 3.693E-02 9.94E+00 3.56E+01 G
                           295.22 2.949E-01 *(P 8.851E-02 2.18E+01 1.84E+01 G
                           242.00 7.178E-01 +   1.971E-01 2.35E+01 7.27E+00 G

Ra-226   N   6.4981E-01                                     5.84E+05
                           186.21 6.498E-01  (  3.810E-01 3.93E+01 3.56E+00 G

Th-234   N   8.7437E-01                                     1.63E+12
                            63.30 1.129E+00 &(  8.469E-01 5.00E+01 3.75E+00 G
                            92.59 6.546E-01  (  4.940E-01 4.88E+01 4.34E+00 G

Tl-208   N   1.1925E-01                                     5.12E+12
                           583.19 1.214E-01 @(P 1.814E-02 1.52E+01 8.50E+01 G
                           277.37 1.209E-01 ?(P 1.957E-01 8.02E+01 6.60E+00 G
                           860.53 1.033E-01 &(  1.573E-01 9.91E+01 1.24E+01 G

U-235    N   3.9102E-02                                     2.57E+11
                           143.77 3.295E-03 %(  1.297E-01 2.39E+03 1.09E+01 G
                           205.32 8.912E-02 ?(  2.957E-01 2.05E+02 5.02E+00 G
                           163.36 3.239E-02 &(  2.613E-01 4.94E+02 5.08E+00 G
                           185.72 4.217E-02  (  2.311E-02 3.70E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 2.807E-03 }   3.939E-01 1.50E+03 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:37
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_018.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Th-234	62.50	58.	24.	0.009	99.90	1.129E+00
Th-234	92.68	129.	35.	0.013	97.63	6.546E-01
Eu-152	122.09	105.	16.	0.006	192.47	3.587E-02
Eu-154	123.50	141.	-2.	-0.001	1390.16	-3.927E-03
Pa-234	131.11	157.	-10.	-0.004	355.68	-3.515E-02
Ra-226	186.13	82.	36.	0.013	78.58	6.498E-01
Eu-152	346.08	40.	2.	0.001	899.79	6.716E-03
Pa-234	570.12	31.	6.	0.002	266.80	8.231E-02
Bi-212	727.06	21.	13.	0.005	113.56	2.903E-01
Eu-152	777.77	23.	9.	0.003	164.75	1.071E-01
Eu-154	872.03	19.	1.	0.000	1514.18	1.159E-02
Pa-234	879.67	29.	-6.	-0.002	283.98	-9.025E-02
Pa-234	883.09	21.	5.	0.002	289.68	8.104E-02
Pa-234	945.91	30.	-4.	-0.002	392.65	-5.335E-02
Eu-152	964.25	39.	5.	0.002	367.09	6.218E-02
Eu-154	995.48	21.	3.	0.001	433.72	5.529E-02
Eu-154	1005.52	26.	4.	0.001	383.30	4.086E-02
Eu-152	1111.56	29.	-1.	-0.001	1085.93	-2.111E-02
Co-60	1173.81	36.	-2.	-0.001	1002.70	-3.602E-03
Eu-154	1274.10	29.	6.	0.002	249.02	4.128E-02
Eu-152	1407.93	11.	3.	0.001	348.30	3.286E-02
Bi-212	1620.72	6.	4.	0.001	214.04	6.707E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.5731E-01	4.5731E-01	1.2021E-01	1.2468E-01	3.211E-02
Am-241 #A	-3.5125E-04	-3.5134E-04	1.5864E-01	1.5864E-01	1.307E-01
Bi-212 #	3.6073E-01	3.6073E-01	4.0964E-01	4.1005E-01	2.373E-01
Bi-214	2.4641E-01	2.4643E-01	7.3928E-02	7.4753E-02	4.596E-02
Co-60 #A	-1.0007E-04	-1.0212E-04	3.2471E-02	3.2471E-02	2.674E-02
Cs-137 #A	-1.5584E-04	-1.5640E-04	2.3521E-02	2.3521E-02	1.936E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:37
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124_018.An1

Eu-152 #A	4.0072E-02	4.0390E-02	6.6542E-02	6.6570E-02	4.916E-02
Eu-154 #A	3.7866E-02	3.8339E-02	9.5471E-02	9.5492E-02	1.430E-01
K-40	1.7581E+01	1.7581E+01	1.3602E+00	1.6211E+00	3.040E-01
Pa-234 #A	2.4511E-02	2.4511E-02	4.3357E-02	4.3783E-02	1.014E-01
Pb-212	3.3007E-01	3.3007E-01	6.0637E-02	6.5170E-02	3.152E-02
Pb-214 #	3.3370E-01	3.3372E-01	7.1466E-02	7.3150E-02	3.693E-02
Ra-226 #	6.4977E-01	6.4981E-01	5.1060E-01	5.1195E-01	3.810E-01
Th-234 #	8.7437E-01	8.7437E-01	6.1069E-01	6.1625E-01	8.469E-01
Tl-208 #	1.1925E-01	1.1925E-01	3.7714E-02	3.8478E-02	1.814E-02
U-235 A	3.9102E-02	3.9102E-02	2.8974E-02	2.9071E-02	1.297E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (24.9 to 2035.2 keV) 1.907E+01 pCi/g
Total Decayed Activity (24.9 to 2035.2 keV) 1.9068083E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514034951018
File : 2_20140124_018
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58
IDF : 1.0
PDF : 1.0

Lab ID : 251449-020
Matrix : Soil
Batch : 207004
Caldate : 24-JAN-2014, 07-JAN-2014

Sample Amount : 335.16 g

Client ID : 04-PD-D0034-20
Acct : ITSI (JG)
Time : 24-JAN-2014 20:28

Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.1 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0171	0.111		.13629	.13629	-0.0012	u
Bismuth-212	0.339	0.267		.42936	.42977	0.00031	u
Bismuth-214	0.415	0.0362		.08608	.088547	-0.011	u
Cesium-137	-0.00723	0.0231	0.07	.028863	.028865	0.0048	u
Cobalt-60	-0.0124	0.0254		.032604	.032608	0.0015	u
Europium-152	0.0360	0.0578		.064425	.064451	0.020	u
Europium-154	0.0297	0.179		.03305	.033091	0.019	u
Lead-212	0.457	0.0377		.074115	.081291	-0.0075	u
Lead-214	0.500	0.0455		.098328	.10146	-0.025	u
Potassium-40	14.7	0.369		1.2537	1.4538	-0.068	u
Protactinium-234	0.0780	0.0686		.098526	.10041	0.0066	u
Radium-226 (By Bismuth-214)	0.415	0.0362	0.2	.08608	.088547	-0.011	u
Thallium-208	0.110	0.0209		.038133	.038853	-0.0042	u
Thorium-232 (By Actinium-228)	0.409	0.0796		.12803	.13159	0.020	u
Thorium-234	0.200	1.12		.4334	.43381	0	u
Uranium-235	0.0429	0.151		.035196	.035292	0.062	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-20
Sample Description: 251449-020, 207004

Detector: HPGE02 50-TP42234A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 11/29/2013 14:27
Acquisition Time: 1/24/2014 20:28:10
Analysis Time: 1/24/2014 21:13
Analysis Quantity: 3.352E+02 g

Spectrum ID: 2_20140124_018
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2703 sec
Dead Time: 0.10 %

Efficiency: HPGE02 S23325 2_20140106002_EffCal RA226
Efficiency Cal Date: 1/7/2014 11:47
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	4.087E-01	1.280E-01	1.316E-01	7.961E-02
Am-241	#AB	1.712E-02	1.363E-01	1.363E-01	1.112E-01
Bi-212	#	3.395E-01	4.294E-01	4.298E-01	2.671E-01
Bi-214		4.148E-01	8.608E-02	8.855E-02	3.617E-02
Co-60	#AB	-1.242E-02	3.260E-02	3.261E-02	2.541E-02
Cs-137	#AB	-7.225E-03	2.886E-02	2.886E-02	2.308E-02
Eu-152	#AB	3.601E-02	6.442E-02	6.445E-02	5.778E-02
Eu-154	#AB	2.966E-02	3.305E-02	3.309E-02	1.789E-01
K-40		1.467E+01	1.254E+00	1.454E+00	3.686E-01
Pa-234	#	7.797E-02	9.853E-02	1.004E-01	6.863E-02
Pb-212		4.570E-01	7.412E-02	8.129E-02	3.769E-02
Pb-214		4.997E-01	9.833E-02	1.015E-01	4.551E-02
Ra-226	#	6.593E-01	5.947E-01	5.959E-01	4.555E-01
Th-234	#AB	1.995E-01	4.334E-01	4.338E-01	1.116E+00
Tl-208		1.099E-01	3.813E-02	3.885E-02	2.093E-02
U-235	#AB	4.286E-02	3.520E-02	3.529E-02	1.507E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.796E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:13:20
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_018.An1

Sample description
     251449-020, 207004


Spectrum Filename: C:\User\SPC\Det2\2_20140124_018.An1

Acquisition information
       Start time:                1/24/2014 20:28:10
       Live time:              2700
       Real time:              2703
       Dead time:                 0.10 %
       Detector ID:                   2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                  2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:52:16
            Zero offset:          0.026 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:              1/7/2014 11:47:58
            Type:                 Polynomial
            Uncertainty:          1.734 %
            Coefficients:        -0.360765  -4.056690   0.335194
                                 -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.06keV )
       Stop channel:           8144 (  2035.12keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3516E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3516E+02) =
                                  8.0639E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:20
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_018.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 14:27:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	2_2014-01-08_0518.PBC 1/8/2014 05:18:15
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 10 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0907

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.22	3.	398.06	0.83	1.629E-02	59.54	35.920	PBC<MDA	Am241
63.50	4.	480.96	0.83	2.025E-02	63.30	3.750	PBC<MDA	Th234
77.23	81.	25.85	0.70	3.361E-02				
87.41	40.	41.65	0.71	4.082E-02				
92.87	16.	108.60	0.86	4.359E-02	92.59	4.343	PBC<MDA	Th234
					93.35	4.100	PBC<MDA	Ac228
					93.35	5.760	1.866E-01	U235
					93.35	4.100	2.157E-01	Ac228
93.22	10.	132.54	0.86	4.394E-02	92.59	4.343	PBC<MDA	Th234
					93.35	4.100	PBC<MDA	Ac228
					93.35	5.760	PBC<MDA	U235
93.22	13.	132.54	0.86	4.394E-02	92.59	4.343	PBC<MDA	Th234
					93.35	4.100	PBC<MDA	Ac228
					93.35	5.760	1.504E-01	U235
120.12	12.	98.65	0.89	5.061E-02	121.78	28.410	PBC<MDA	Eu152
121.93	5.	281.74	0.89	5.069E-02	123.07	40.400	PBC<MDA	Eu154
129.58	15.	87.84	0.90	5.088E-02	131.30	18.200	PBC<MDA	Pa234
154.21	10.	96.56	0.34	4.969E-02				
161.19	11.	87.01	0.94	4.882E-02	163.36	5.080	PBC<MDA	U235
186.06	39.	41.06	0.96	4.633E-02	185.72	57.000	4.394E-02	U235
					186.21	3.555	7.054E-01	Ra226
186.09	36.	45.10	0.96	4.628E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	6.593E-01	Ra226
238.66	277.	7.90	0.97	4.044E-02	238.63	43.600	4.570E-01	Pb212
241.74	54.	28.97	1.43	4.010E-02	242.00	7.268	5.585E-01	Pb214
277.64	30.	40.81	1.05	3.684E-02	277.37	6.600	3.669E-01	Tl208
295.08	115.	12.14	0.81	3.541E-02	295.22	18.414	5.089E-01	Pb214

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:20
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_018.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
338.22	41.	31.77	1.11	3.242E-02	338.32	11.400	3.290E-01	Ac228
					338.32	11.400	3.290E-01	Ac228
343.02	12.	89.46	1.11	3.205E-02	344.28	26.590	PBC<MDA	Eu152
351.84	189.	9.46	1.22	3.160E-02	351.93	35.600	4.829E-01	Pb214
569.65	10.	90.85	1.32	2.325E-02	569.50	9.300	PBC<MDA	Pa234
583.24	72.	15.74	0.78	2.291E-02	583.19	85.000	1.099E-01	Tl208
609.40	138.	9.75	1.39	2.230E-02	609.31	45.490	4.069E-01	Bi214
721.67	11.	55.72	1.44	2.006E-02	723.30	20.050	8.571E-02	Eu154
727.66	13.	63.24	1.44	1.999E-02	727.33	6.650	2.860E-01	Bi212
778.94	1.	528.52	1.48	1.916E-02	778.90	12.970	PBC<MDA	Eu152
786.06	5.	139.51	1.49	1.907E-02	785.37	1.110	PBC<MDA	Bi212
859.84	5.	140.21	1.54	1.801E-02	860.53	12.400	PBC<MDA	Tl208
911.38	70.	15.28	1.58	1.738E-02	911.20	26.200	4.574E-01	Ac228
					911.20	26.200	4.574E-01	Ac228
969.04	34.	30.80	1.62	1.672E-02	968.96	15.900	3.857E-01	Ac228
					968.96	15.900	3.857E-01	Ac228
996.80	3.	279.27	1.64	1.643E-02	996.25	10.500	PBC<MDA	Eu154
1120.43	33.	24.93	0.53	1.523E-02	1120.29	14.910	4.386E-01	Bi214
1411.15	5.	104.20	1.87	1.302E-02	1408.01	20.850	PBC<MDA	Eu152
1460.93	680.	4.13	1.63	1.268E-02	1460.82	10.550	1.467E+01	K40
1764.68	7.	52.69	2.00	1.097E-02	1764.49	15.310	PBC<MDA	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
308.44	77.23	150.	81.	2.416E+03	51.71	0.703	-	s
349.11	87.41	108.	40.	9.799E+02	83.31	0.710	-	
616.03	154.21	42.	10.	1.932E+02	193.11	0.337	AC-228	c

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	236.51	59.22	87.	3.	0.001	796.12	0.827s
Th-234	253.60	63.50	148.	4.	0.001	961.92	0.831s
Th-234	370.95	92.87	140.	16.	0.006	217.21	0.862s
Ac-228	372.86	93.35	139.	10.	0.004	265.08	0.863D

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:20
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_018.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	372.86	93.35	136.	13.	0.005	265.08	0.863D
Eu-152	479.80	120.12	68.	12.	0.005	197.29	0.893s
Eu-154	487.03	121.93	101.	5.	0.002	563.47	0.894s
Pa-234	517.62	129.58	83.	15.	0.006	175.69	0.903s
U-235	643.93	161.19	37.	11.	0.004	174.03	0.936s
U-235	743.33	186.06	108.	39.	0.014	82.12	0.959s
Ra-226	743.41	186.09	116.	36.	0.013	90.20	0.959s
U-235	818.86	204.96	99.	-6.	-0.002	460.97	0.978s
Pb-212	953.53	238.66	91.	270.	0.100	15.80	0.968
Pb-214	965.84	241.74	80.	54.	0.020	57.94	1.434s
Tl-208	1109.33	277.64	59.	30.	0.011	81.63	1.050
Pb-214	1179.03	295.08	34.	111.	0.041	24.29	0.812s
Ac-228	1351.45	338.22	63.	41.	0.015	63.53	1.109s
Eu-152	1370.63	343.02	49.	12.	0.004	178.91	1.114s
Pb-214	1405.92	351.84	54.	182.	0.067	18.92	1.224
Pa-234	2276.72	569.65	34.	10.	0.004	181.70	1.316s
Tl-208	2331.07	583.24	34.	72.	0.027	31.48	0.778s
Bi-214	2435.65	609.40	28.	138.	0.051	19.50	1.387s
Cs-137	2646.75	662.18	35.	-4.	-0.002	399.47	1.392s
Eu-154	2884.68	721.67	14.	11.	0.004	111.44	1.440s
Bi-212	2908.63	727.66	26.	13.	0.005	126.47	1.444s
Eu-152	3113.77	778.94	23.	1.	0.000	1057.04	1.483s
Bi-212	3142.23	786.06	19.	5.	0.002	279.01	1.488s
Tl-208	3437.40	859.84	27.	5.	0.002	280.43	1.543
Pa-234	3531.67	883.40	26.	-1.	-0.001	1046.85	1.559s
Ac-228	3643.58	911.38	27.	70.	0.026	30.57	1.578s
Eu-152	3847.89	962.44	43.	-5.	-0.002	357.40	1.614s
Ac-228	3874.33	969.04	39.	34.	0.013	61.60	1.617
Eu-154	3985.38	996.80	24.	3.	0.001	558.54	1.635s
Eu-152	4440.40	1110.49	33.	-4.	-0.002	392.01	1.708s
Bi-214	4480.18	1120.43	18.	33.	0.012	49.85	0.527s
Co-60	4696.91	1174.58	40.	-3.	-0.001	541.01	1.744s
Eu-154	5100.52	1275.40	29.	-4.	-0.001	395.64	1.800s
Co-60	5323.76	1331.16	23.	-6.	-0.002	262.55	1.829s
Eu-152	5644.07	1411.15	11.	5.	0.002	208.41	1.866s
K-40	5843.40	1460.93	50.	657.	0.243	8.26	1.630
Bi-214	7060.14	1764.68	14.	7.	0.003	105.38	2.004s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:20
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_018.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g		COMMENTS
Ac-228	N	4.0874E-01					5.12E+12	
			911.20	4.574E-01	(P	7.961E-02	1.53E+01	2.62E+01 G
			968.96	3.857E-01	?(	1.629E-01	3.08E+01	1.59E+01 G
			338.32	3.290E-01	(	1.498E-01	3.18E+01	1.14E+01 G
								Energy duplication
			93.35	1.648E-01	- P	4.555E-01	1.33E+02	4.10E+00 XA
Am-241	I	1.7119E-02					1.58E+05	
			59.54	1.712E-02	?(	1.112E-01	3.98E+02	3.59E+01 G
Bi-212	N	3.3949E-01					5.12E+12	
			727.33	2.860E-01	?(	2.671E-01	6.32E+01	6.65E+00 G
			785.37	6.599E-01	&(	1.431E+00	1.40E+02	1.11E+00 G
			1620.74	0.000E+00	&	1.684E+00	1.00E+03	1.51E+00 G
Bi-214	N	4.1475E-01					5.84E+05	
			609.31	4.069E-01	@(P	3.617E-02	9.75E+00	4.55E+01 G
			1120.29	4.386E-01	(P	1.289E-01	2.49E+01	1.49E+01 G
			1764.49	1.272E-01	- P	1.560E-01	5.27E+01	1.53E+01 G
Co-60	T	-1.2418E-02					1.93E+03	
			1332.49	-1.242E-02	?(	2.541E-02	1.31E+02	1.00E+02 G
			1173.23	-7.006E-03	+	3.059E-02	2.71E+02	9.98E+01 G
Cs-137	I	-7.2252E-03					1.10E+04	
			661.66	-7.225E-03	?(	2.308E-02	2.00E+02	8.50E+01 G
Eu-152	I	3.6009E-02					4.94E+03	
			344.28	4.148E-02	?(	5.778E-02	8.95E+01	2.66E+01 G
			121.78	2.594E-02	?(	4.036E-02	9.86E+01	2.84E+01 G
			778.90	1.576E-02	?(	1.354E-01	5.29E+02	1.30E+01 G
			964.08	-6.614E-02	+	1.889E-01	1.79E+02	1.45E+01 G
			1112.08	-6.317E-02	+	1.977E-01	1.96E+02	1.34E+01 G
			1408.01	5.536E-02	?(	8.583E-02	1.04E+02	2.09E+01 G
Eu-154	I	2.9658E-02					3.14E+03	
			873.18	-1.796E-03	&(	1.789E-01	6.05E+03	1.22E+01 G
			123.07	7.534E-03	?(	3.454E-02	2.82E+02	4.04E+01 G
			1274.43	-2.453E-02	&	7.732E-02	1.98E+02	3.49E+01 G
			723.30	8.571E-02	&(	6.664E-02	5.57E+01	2.00E+01 G
			1004.72	5.403E-03	&	1.271E-01	1.43E+03	1.79E+01 G
			996.25	4.421E-02	?(	1.982E-01	2.79E+02	1.05E+01 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:13:20
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_018.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

K-40     N   1.4667E+01                                     4.57E+11
                         1460.82 1.467E+01  (P 3.686E-01 4.13E+00 1.06E+01 G

Pa-234   N   7.7965E-02                                     1.63E+12
                          131.30 4.956E-02 ?(  6.863E-02 8.78E+01 1.82E+01 G
                          569.50 1.336E-01 ?(  1.870E-01 9.08E+01 9.30E+00 G
                          946.00-2.893E-03 %   1.696E-01 3.56E+03 1.35E+01 G
                          880.52 0.000E+00 -   2.352E-01 1.00E+03 1.05E+01 G
                          883.24-2.420E-02 -   2.059E-01 5.23E+02 9.70E+00 G

Pb-212   N   4.5702E-01                                     5.12E+12
                          238.63 4.570E-01  (P 3.769E-02 7.90E+00 4.36E+01 G
                          300.09 1.482E-02 %   5.105E-01 2.10E+03 3.18E+00 G

Pb-214   N   4.9970E-01                                     5.84E+05
                          351.93 4.829E-01  (P 4.551E-02 9.46E+00 3.56E+01 G
                          295.22 5.089E-01  (P 6.219E-02 1.21E+01 1.84E+01 G
                          242.00 5.585E-01  (P 2.129E-01 2.90E+01 7.27E+00 G

Ra-226   N   6.5934E-01                                     5.84E+05
                          186.21 6.593E-01 ?(  4.555E-01 4.51E+01 3.56E+00 G

Th-234   N   1.9953E-01                                     1.63E+12
                           63.30 1.417E-01 &(  1.116E+00 4.81E+02 3.75E+00 G
                           92.59 2.495E-01 ?(  4.343E-01 1.09E+02 4.34E+00 G

Tl-208   N   1.0993E-01                                     5.12E+12
                          583.19 1.099E-01  (P 2.093E-02 1.57E+01 8.50E+01 G
                          277.37 3.669E-01 +   2.205E-01 4.08E+01 6.60E+00 G
                          860.53 7.301E-02 -   1.606E-01 1.40E+02 1.24E+01 G

U-235    N   4.2861E-02                                     2.57E+11
                          143.77-2.250E-03 %(  1.507E-01 4.07E+03 1.09E+01 G
                          205.32-8.388E-02 +   3.137E-01 2.30E+02 5.02E+00 G
                          163.36 1.279E-01 ?(  1.716E-01 8.70E+01 5.08E+00 G
                          185.72 4.394E-02 ?(  2.736E-02 4.11E+01 5.70E+01 G
                                                          Energy duplication
                           93.35 1.504E-01 *   3.209E-01 1.33E+02 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
```

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Am-241	59.22	87.	3.	0.001	796.12	1.712E-02	
Th-234	63.50	148.	4.	0.001	961.92	1.417E-01	
Th-234	92.87	140.	16.	0.006	217.21	2.495E-01	
Ac-228	93.35	139.	10.	0.004	265.08	1.648E-01	P
U-235	93.35	136.	13.	0.005	265.08	1.504E-01	
Eu-152	120.12	68.	12.	0.005	197.29	2.594E-02	
Eu-154	121.93	101.	5.	0.002	563.47	7.534E-03	
Pa-234	129.58	83.	15.	0.006	175.69	4.956E-02	
U-235	161.19	37.	11.	0.004	174.03	1.279E-01	
U-235	186.06	108.	39.	0.014	82.12	4.394E-02	
Ra-226	186.09	116.	36.	0.013	90.20	6.593E-01	
U-235	204.96	99.	-6.	-0.002	460.97	-8.388E-02	
Ac-228	338.22	63.	41.	0.015	63.53	3.290E-01	
Eu-152	343.02	49.	12.	0.004	178.91	4.148E-02	
Pa-234	569.65	34.	10.	0.004	181.70	1.336E-01	
Cs-137	662.18	35.	-4.	-0.002	399.47	-7.225E-03	
Eu-154	721.67	14.	11.	0.004	111.44	8.571E-02	
Bi-212	727.66	26.	13.	0.005	126.47	2.860E-01	
Eu-152	778.94	23.	1.	0.000	1057.04	1.576E-02	
Bi-212	786.06	19.	5.	0.002	279.01	6.599E-01	
Pa-234	883.40	26.	-1.	-0.001	1046.85	-2.420E-02	
Ac-228	911.38	27.	70.	0.026	30.57	4.574E-01	P
Eu-152	962.44	43.	-5.	-0.002	357.40	-6.614E-02	
Ac-228	969.04	39.	34.	0.013	61.60	3.857E-01	
Eu-154	996.80	24.	3.	0.001	558.54	4.421E-02	
Eu-152	1110.49	33.	-4.	-0.002	392.01	-6.317E-02	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:20
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_018.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Co-60	1174.58	40.	-3.	-0.001	541.01	-7.006E-03	
Eu-154	1275.40	29.	-4.	-0.001	395.64	-2.453E-02	
Co-60	1331.16	23.	-6.	-0.002	262.55	-1.242E-02	
Eu-152	1411.15	11.	5.	0.002	208.41	5.536E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	4.0874E-01	4.0874E-01	1.2803E-01	1.3159E-01	7.961E-02
Am-241 #A	1.7115E-02	1.7119E-02	1.3629E-01	1.3629E-01	1.112E-01
Bi-212 #	3.3949E-01	3.3949E-01	4.2936E-01	4.2977E-01	2.671E-01
Bi-214	4.1473E-01	4.1475E-01	8.6080E-02	8.8547E-02	3.617E-02
Co-60 #A	-1.2169E-02	-1.2418E-02	3.2604E-02	3.2608E-02	2.541E-02
Cs-137 #A	-7.1996E-03	-7.2252E-03	2.8863E-02	2.8865E-02	2.308E-02
Eu-152 #A	3.5726E-02	3.6009E-02	6.4425E-02	6.4451E-02	5.778E-02
Eu-154 #A	2.9292E-02	2.9658E-02	3.3050E-02	3.3091E-02	1.789E-01
K-40	1.4667E+01	1.4667E+01	1.2537E+00	1.4538E+00	3.686E-01
Pa-234 #C	7.7965E-02	7.7965E-02	9.8526E-02	1.0041E-01	6.863E-02
Pb-212	4.5702E-01	4.5702E-01	7.4115E-02	8.1291E-02	3.769E-02
Pb-214	4.9967E-01	4.9970E-01	9.8328E-02	1.0146E-01	4.551E-02
Ra-226 #	6.5929E-01	6.5934E-01	5.9472E-01	5.9592E-01	4.555E-01
Th-234 #A	1.9953E-01	1.9953E-01	4.3340E-01	4.3381E-01	1.116E+00
Tl-208	1.0993E-01	1.0993E-01	3.8133E-02	3.8853E-02	2.093E-02
U-235 #A	4.2861E-02	4.2861E-02	3.5196E-02	3.5292E-02	1.507E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2035.1 keV) 1.615E+01 pCi/g
Total Decayed Activity (25.1 to 2035.1 keV) 1.6148779E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst	: HPGE05	Lab ID	: 251449-021	Client ID	: 04-PD-D0034-21
Seqnum	: 1544034938018	Matrix	: Soil	Acct	: ITSI (JG)
File	: 5_20140124_018	Batch	: 207008	Time	: 24-JAN-2014 20:26
Cal	: 24-JAN-2014 06:29:37,29-JUN-2013 15:59:06	Caldate	: 24-JAN-2014, 29-JUN-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 335.96 g	Live Time	: 2700 sec
				Dead Time	: 0.07 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0138	0.172		.20919	.20919	-0.022	u
Bismuth-212	0.801	0.107		.31259	.31526	0.10	u
Bismuth-214	0.250	0.0355		.068477	.069389	-0.014	u
Cesium-137	0.00624	0.0223	0.07	.027798	.027799	0	u
Cobalt-60	-0.00457	0.0282		.034874	.034874	0.00097	u
Europium-152	0.0174	0.0636		.037515	.037525	0.0072	u
Europium-154	0.0336	0.159		.055904	.055931	0.0032	u
Lead-212	0.293	0.0367		.067485	.070727	-0.0076	u
Lead-214	0.286	0.0428		.077452	.078601	0.0075	u
Potassium-40	23.3	0.219		1.4976	1.8986	-0.086	u
Protactinium-234	0.0567	0.0966		.066491	.067968	0.0030	u
Radium-226 (By Bismuth-214)	0.250	0.0355	0.2	.068477	.069389	-0.014	u
Thallium-208	0.0925	0.0201		.033251	.033774	-0.0075	u
Thorium-232 (By Actinium-228)	0.239	0.0901		.118	.11926	0.024	u
Thorium-234	0	1.34		.63694	.63695	0.24	u
Uranium-235	0.0411	0.140		.050409	.050471	0.063	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-21
Sample Description: 251449-021, 207008

Detector: HPGE05 51-TP42242A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:26
Acquisition Time: 1/24/2014 20:26:11
Analysis Time: 1/24/2014 21:11
Analysis Quantity: 3.360E+02 g

Spectrum ID: 5_20140124_018
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.07 %

Efficiency: HPGE05 S22147 5_20130628003_EffCal RA226
Efficiency Cal Date: 6/29/2013 15:59
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		2.389E-01	1.180E-01	1.193E-01	9.010E-02
Am-241	#AB	1.381E-02	2.092E-01	2.092E-01	1.716E-01
Bi-212		8.008E-01	3.126E-01	3.153E-01	1.068E-01
Bi-214		2.495E-01	6.848E-02	6.939E-02	3.552E-02
Co-60	#AB	-4.572E-03	3.487E-02	3.487E-02	2.822E-02
Cs-137	#AB	6.243E-03	2.780E-02	2.780E-02	2.228E-02
Eu-152	#AB	1.741E-02	3.752E-02	3.752E-02	6.360E-02
Eu-154	#AB	3.361E-02	5.590E-02	5.593E-02	1.591E-01
K-40		2.326E+01	1.498E+00	1.899E+00	2.189E-01
Pa-234	#AB	5.669E-02	6.649E-02	6.797E-02	9.662E-02
Pb-212		2.926E-01	6.748E-02	7.073E-02	3.673E-02
Pb-214		2.864E-01	7.745E-02	7.860E-02	4.281E-02
Ra-226	#AB	4.474E-01	5.777E-01	5.782E-01	4.523E-01
Th-234	#AB	0.000E+00	6.369E-01	6.369E-01	1.335E+00
Tl-208	#	9.250E-02	3.325E-02	3.377E-02	2.010E-02
U-235	#AB	4.110E-02	5.041E-02	5.047E-02	1.401E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.584E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:11:20
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_018.An1

Sample description
     251449-021, 207008


Spectrum Filename: C:\User\SPC\Det5\5_20140124_018.An1

Acquisition information
       Start time:                1/24/2014 20:26:11
       Live time:              2700
       Real time:              2702
       Dead time:                 0.07 %
       Detector ID:                   5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                  5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:29:37
            Zero offset:         -0.064 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/29/2013 15:59:06
            Type:                 Polynomial
            Uncertainty:          1.295 %
            Coefficients:        -0.372021  -4.149771   0.439762
                                 -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.95keV )
       Stop channel:           8144 (  2035.00keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3596E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3596E+02) =
                                  8.0447E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:11:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_018.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:26:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2013-12-28_0935.PBC 12/28/2013 09:35:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 14 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0938

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
59.63	2.	757.44	0.97	1.324E-02	59.54	35.920	PBC<MDA	Am241
76.98	56.	31.75	0.48	2.752E-02				
87.16	23.	54.65	0.62	3.407E-02				
122.93	19.	83.17	1.02	4.639E-02	123.07	40.400	PBC<MDA	Eu154
143.72	13.	121.10	1.04	4.817E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	7.215E-02	U235
161.92	11.	121.35	1.06	4.801E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	1.314E-01	U235
186.24	24.	66.81	1.08	4.667E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	4.347E-01	Ra226
					185.72	57.000	2.709E-02	U235
186.25	25.	64.55	1.08	4.663E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	4.474E-01	Ra226
238.63	184.	11.10	0.85	4.195E-02	238.63	43.600	2.889E-01	Pb212
241.59	27.	49.04	0.82	4.164E-02	242.00	7.268	2.698E-01	Pb214
295.20	50.	30.08	0.99	3.705E-02	295.22	18.414	2.189E-01	Pb214
299.84	13.	80.81	1.17	3.667E-02	300.09	3.180	PBC<MDA	Pb212
338.03	46.	29.11	0.72	3.394E-02	338.32	11.400	3.406E-01	Ac228
351.95	124.	12.42	0.77	3.304E-02	351.93	35.600	2.898E-01	Pb214
569.01	13.	62.67	1.40	2.372E-02	569.50	9.300	1.737E-01	Pa234
583.04	62.	16.61	1.41	2.333E-02	583.19	85.000	9.250E-02	Tl208
609.23	86.	11.99	1.43	2.264E-02	609.31	45.490	2.495E-01	Bi214
662.00	4.	222.63	1.48	2.138E-02	661.66	84.990	PBC<MDA	Cs137
727.28	36.	19.52	0.38	2.003E-02	727.33	6.650	8.008E-01	Bi212
873.80	2.	313.40	1.66	1.764E-02	873.18	12.170	PBC<MDA	Eu154
880.15	8.	84.92	1.67	1.754E-02	880.52	10.500	PBC<MDA	Pa234
910.98	35.	26.59	1.70	1.712E-02	911.20	26.200	2.306E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:11:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_018.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
963.99	2.	394.11	1.74	1.646E-02	964.08	14.500	PBC<MDA	Eu152
					964.08	14.500	2.839E-02	Eu152
968.84	16.	49.47	1.75	1.640E-02	968.96	15.900	1.797E-01	Ac228
1111.94	1.	792.17	1.87	1.485E-02	1112.08	13.410	PBC<MDA	Eu152
					1112.08	13.410	1.385E-02	Eu152
1120.31	13.	50.24	1.88	1.477E-02	1120.29	14.910	PBC<MDA	Bi214
1273.41	6.	136.38	2.02	1.343E-02	1274.43	34.900	PBC<MDA	Eu154
1408.23	6.	107.75	2.14	1.243E-02	1408.01	20.850	PBC<MDA	Eu152
					1408.01	20.850	6.639E-02	Eu152
1460.84	1007.	3.18	1.93	1.208E-02	1460.82	10.550	2.326E+01	K40
1765.06	9.	39.63	2.46	1.032E-02	1764.49	15.310	1.787E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
307.97	76.98	116.	56.	2.021E+03	63.51	0.484	- s
348.67	87.16	68.	23.	6.633E+02	109.31	0.623	- s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	238.61	59.63	138.	2.	0.001	1514.88	0.972s
Ac-228	373.41	93.35	154.	-4.	-0.002	1207.19	1.000D
U-235	373.41	93.35	152.	-3.	-0.001	1207.19	1.000D
Eu-154	491.63	122.93	112.	19.	0.007	166.34	1.025s
Pa-234	526.46	131.64	144.	-12.	-0.005	281.49	1.031s
U-235	574.78	143.72	113.	13.	0.005	242.19	1.042s
U-235	647.51	161.92	80.	11.	0.004	242.70	1.058s
U-235	744.75	186.24	118.	24.	0.009	133.63	1.077s
Ra-226	744.78	186.25	117.	25.	0.009	129.11	1.077s
U-235	823.04	205.82	106.	-13.	-0.005	224.87	1.094s
Pb-212	954.19	238.63	94.	177.	0.066	22.20	0.850
Pb-214	966.04	241.59	70.	27.	0.010	98.07	0.815s
Pb-214	1180.39	295.20	85.	50.	0.019	60.16	0.992
Pb-212	1198.96	299.84	67.	13.	0.005	161.61	1.173
Ac-228	1351.63	338.03	51.	44.	0.016	58.23	0.716s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:11:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_018.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Eu-152	1375.42	343.98	66.	-7.	-0.003	315.08	1.211s
Pb-214	1407.32	351.95	53.	114.	0.042	24.85	0.773s
Pa-234	2275.39	569.01	26.	13.	0.005	125.34	1.402s
Tl-208	2331.50	583.04	33.	62.	0.023	33.22	1.414s
Bi-214	2436.26	609.23	28.	86.	0.032	23.98	1.428
Cs-137	2647.32	662.00	34.	4.	0.001	445.26	1.481s
Eu-154	2897.29	724.49	44.	-8.	-0.003	232.25	1.534s
Bi-212	2908.46	727.28	4.	36.	0.013	39.03	0.383s
Eu-152	3117.42	779.51	30.	-3.	-0.001	481.25	1.582s
Bi-212	3136.17	784.20	30.	-6.	-0.002	285.39	1.588s
Eu-154	3494.66	873.80	24.	2.	0.001	626.80	1.664s
Pa-234	3520.10	880.15	18.	8.	0.003	169.85	1.670s
Ac-228	3643.42	910.98	34.	35.	0.013	53.18	1.697s
Pa-234	3781.62	945.51	39.	-3.	-0.001	605.14	1.727s
Eu-152	3855.54	963.99	38.	2.	0.001	788.22	1.743s
Ac-228	3874.97	968.84	40.	16.	0.006	98.95	1.747s
Eu-154	3982.27	995.66	32.	-5.	-0.002	313.23	1.771s
Eu-152	4447.64	1111.94	26.	1.	0.000	1584.33	1.873s
Bi-214	4481.15	1120.31	37.	13.	0.005	100.48	1.880s
Eu-154	5093.95	1273.41	30.	6.	0.002	272.77	2.016s
Co-60	5333.98	1333.37	27.	-2.	-0.001	762.80	2.068s
Eu-152	5633.67	1408.23	16.	6.	0.002	215.51	2.135s
K-40	5844.35	1460.84	16.	995.	0.368	6.36	1.925
Bi-214	7062.62	1765.06	11.	9.	0.004	79.26	2.456s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g		COMMENTS
Ac-228	N	2.3892E-01					5.12E+12	
			911.20	2.306E-01	?(P	9.010E-02	2.66E+01 2.62E+01 G	
			968.96	1.797E-01	?(P	1.685E-01	4.95E+01 1.59E+01 G	
			338.32	3.406E-01	(P	1.280E-01	2.91E+01 1.14E+01 G	
								Energy duplication
			93.35	-8.615E-02	& P	5.628E-01	6.04E+02 4.10E+00 XA	
Am-241	I	1.3809E-02					1.58E+05	
			59.54	1.381E-02	?(	1.716E-01	7.57E+02 3.59E+01 G	
Bi-212	N	8.0080E-01					5.12E+12	
			727.33	8.008E-01	(	1.068E-01	1.95E+01 6.65E+00 G	
			785.37	-7.974E-01	-	1.791E+00	1.43E+02 1.11E+00 G	
			1620.74	0.000E+00	-	4.143E-01	1.00E+03 1.51E+00 G	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:11:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_018.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	2.4953E-01					5.84E+05	
			609.31	2.495E-01	(P	3.552E-02	1.20E+01	4.55E+01 G
			1120.29	1.748E-01	- P	1.906E-01	5.02E+01	1.49E+01 G
			1764.49	1.787E-01	& P	1.451E-01	3.96E+01	1.53E+01 G
Co-60	T	-4.5718E-03					1.93E+03	
			1332.49	-4.572E-03	?(	2.822E-02	3.81E+02	1.00E+02 G
			1173.23	0.000E+00	+	3.092E-02	1.00E+03	9.98E+01 G
Cs-137	I	6.2431E-03					1.10E+04	
			661.66	6.243E-03	?(	2.228E-02	2.23E+02	8.50E+01 G
Eu-152	I	1.7408E-02					4.94E+03	
			344.28	-2.519E-02	?(	6.360E-02	1.58E+02	2.66E+01 G
			121.78	-1.437E-03	&	5.992E-02	2.53E+03	2.84E+01 G
			778.90	-3.979E-02	+	1.536E-01	2.41E+02	1.30E+01 G
			964.08	2.839E-02	&(	1.817E-01	3.94E+02	1.45E+01 G
			1112.08	1.385E-02	?(	1.791E-01	7.92E+02	1.34E+01 G
			1408.01	6.639E-02	?(	1.087E-01	1.08E+02	2.09E+01 G
Eu-154	I	3.3609E-02					3.14E+03	
			873.18	3.153E-02	&(	1.591E-01	3.13E+02	1.22E+01 G
			123.07	3.010E-02	?(	3.962E-02	8.32E+01	4.04E+01 G
			1274.43	3.840E-02	?(	8.231E-02	1.36E+02	3.49E+01 G
			723.30	-6.329E-02	+	1.157E-01	1.16E+02	2.00E+01 G
			1004.72	2.898E-03	%	1.118E-01	2.35E+03	1.79E+01 G
			996.25	-9.468E-02	+	2.347E-01	1.57E+02	1.05E+01 G
K-40	N	2.3264E+01					4.57E+11	
			1460.82	2.326E+01	(P	2.189E-01	3.18E+00	1.06E+01 G
Pa-234	N	5.6694E-02					1.63E+12	
			131.30	-4.255E-02	?(	9.662E-02	1.41E+02	1.82E+01 G
			569.50	1.737E-01	&(	1.606E-01	6.27E+01	9.30E+00 G
			946.00	-3.949E-02	+	1.932E-01	3.03E+02	1.35E+01 G
			880.52	1.251E-01	?(	1.585E-01	8.49E+01	1.05E+01 G
			883.24	0.000E+00	-	1.234E-01	1.00E+03	9.70E+00 G
Pb-212	N	2.9256E-01					5.12E+12	
			238.63	2.889E-01	(P	3.673E-02	1.11E+01	4.36E+01 G
			300.09	3.427E-01	(P	4.874E-01	8.08E+01	3.18E+00 G
Pb-214	N	2.8642E-01					5.84E+05	
			351.93	2.898E-01	(P	4.281E-02	1.24E+01	3.56E+01 G
			295.22	2.189E-01	- P	9.375E-02	3.01E+01	1.84E+01 G
			242.00	2.698E-01	(	1.914E-01	4.90E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:11:20
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_018.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   4.4742E-01                                     5.84E+05
                           186.21 4.474E-01  (  4.523E-01 6.46E+01 3.56E+00 G

Tl-208   N   9.2501E-02                                     5.12E+12
                           583.19 9.250E-02 ?(P 2.010E-02 1.66E+01 8.50E+01 G
                           277.37-3.755E-03 %   2.339E-01 3.79E+03 6.60E+00 G
                           860.53-7.131E-04 %   1.568E-01 1.34E+04 1.24E+01 G

U-235    N   4.1095E-02                                     2.57E+11
                           143.77 7.215E-02 &(  1.401E-01 1.21E+02 1.09E+01 G
                           205.32-1.759E-01 +   3.161E-01 1.12E+02 5.02E+00 G
                           163.36 1.314E-01 &(  2.542E-01 1.21E+02 5.08E+00 G
                           185.72 2.709E-02 &(  2.841E-02 6.68E+01 5.70E+01 G
                                                          Energy duplication
                            93.35-4.028E-02 &   3.986E-01 6.04E+02 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:11:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_018.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.63	138.	2.	0.001	1514.88	1.381E-02
U-235	93.35	152.	-3.	-0.001	1207.19	-4.028E-02
Eu-154	122.93	112.	19.	0.007	166.34	3.010E-02
Pa-234	131.64	144.	-12.	-0.005	281.49	-4.255E-02
U-235	143.72	113.	13.	0.005	242.19	7.215E-02
U-235	161.92	80.	11.	0.004	242.70	1.314E-01
U-235	186.24	118.	24.	0.009	133.63	2.709E-02
Ra-226	186.25	117.	25.	0.009	129.11	4.474E-01
U-235	205.82	106.	-13.	-0.005	224.87	-1.759E-01
Eu-152	343.98	66.	-7.	-0.003	315.08	-2.519E-02
Pa-234	569.01	26.	13.	0.005	125.34	1.737E-01
Cs-137	662.00	34.	4.	0.001	445.26	6.243E-03
Eu-154	724.49	44.	-8.	-0.003	232.25	-6.329E-02
Eu-152	779.51	30.	-3.	-0.001	481.25	-3.979E-02
Eu-154	873.80	24.	2.	0.001	626.80	3.153E-02
Pa-234	880.15	18.	8.	0.003	169.85	1.251E-01
Pa-234	945.51	39.	-3.	-0.001	605.14	-3.949E-02
Eu-152	963.99	38.	2.	0.001	788.22	2.839E-02
Eu-154	995.66	32.	-5.	-0.002	313.23	-9.468E-02
Eu-152	1111.94	26.	1.	0.000	1584.33	1.385E-02
Eu-154	1273.41	30.	6.	0.002	272.77	3.840E-02
Co-60	1333.37	27.	-2.	-0.001	762.80	-4.572E-03
Eu-152	1408.23	16.	6.	0.002	215.51	6.639E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	2.3892E-01	2.3892E-01	1.1800E-01	1.1926E-01	9.010E-02
Am-241 #A	1.3806E-02	1.3809E-02	2.0919E-01	2.0919E-01	1.716E-01
Bi-212	8.0080E-01	8.0080E-01	3.1259E-01	3.1526E-01	1.068E-01
Bi-214	2.4952E-01	2.4953E-01	6.8477E-02	6.9389E-02	3.552E-02
Co-60 #A	-4.4944E-03	-4.5718E-03	3.4874E-02	3.4874E-02	2.822E-02
Cs-137 #A	6.2244E-03	6.2431E-03	2.7798E-02	2.7799E-02	2.228E-02
Eu-152 #A	1.7292E-02	1.7408E-02	3.7515E-02	3.7525E-02	6.360E-02
Eu-154 #A	3.3259E-02	3.3609E-02	5.5904E-02	5.5931E-02	1.591E-01
K-40	2.3264E+01	2.3264E+01	1.4976E+00	1.8986E+00	2.189E-01
Pa-234 #A	5.6694E-02	5.6694E-02	6.6491E-02	6.7968E-02	9.662E-02
Pb-212	2.9256E-01	2.9256E-01	6.7485E-02	7.0727E-02	3.673E-02
Pb-214	2.8640E-01	2.8642E-01	7.7452E-02	7.8601E-02	4.281E-02
Ra-226 #A	4.4740E-01	4.4742E-01	5.7765E-01	5.7822E-01	4.523E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:11:20
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_018.An1

 Th-234 #A    0.0000E+00    0.0000E+00   6.3694E-01    6.3695E-01  1.335E+00
 Tl-208 #     9.2501E-02    9.2501E-02   3.3251E-02    3.3774E-02  2.010E-02
 U-235  #A    4.1095E-02    4.1095E-02   5.0409E-02    5.0471E-02  1.401E-01

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.0 keV)     2.522E+01  pCi/g
 Total Decayed Activity (   25.0 to  2035.0 keV) 2.5224781E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952018
File : 4_20140124_018
Cal : 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13
IDF : 1.0
PDF : 1.0

Lab ID : 251449-022
Matrix : Soil
Batch : 207008
Caldate : 24-JAN-2014, 05-MAR-2013
Sample Amount : 339.12 g

Client ID : 04-PD-D0034-22
Acct : ITSI (JG)
Time : 24-JAN-2014 20:26
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.3 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0000919	0.148		.18015	.18015	-0.022	u
Bismuth-212	0	0.231		.34623	.34623	0.10	u
Bismuth-214	0.247	0.0481		.088865	.089556	-0.014	u
Cesium-137	0.000768	0.0192	0.07	.023354	.023354	0	u
Cobalt-60	-0.00856	0.0239		.030365	.030368	0.00097	u
Europium-152	0.0204	0.0482		.074147	.074154	0.0072	u
Europium-154	0.0181	0.146		.040625	.040636	0.0032	u
Lead-212	0.311	0.0368		.068315	.071929	-0.0076	u
Lead-214	0.313	0.0418		.085236	.086481	0.0075	u
Potassium-40	22.1	0.239		1.4544	1.8301	-0.086	u
Protactinium-234	0.0314	0.0867		.05838	.058899	0.0030	u
Radium-226 (By Bismuth-214)	0.247	0.0481	0.2	.088865	.089556	-0.014	u
Thallium-208	0.0987	0.0232		.042327	.042796	-0.0075	u
Thorium-232 (By Actinium-228)	0.287	0.0846		.10888	.11085	0.024	u
Thorium-234	0.0428	1.16		.21297	.21301	0.24	u
Uranium-235	0.0423	0.129		.029638	.029749	0.063	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-22
Sample Description: 251449-022, 207008

Detector: HPGE04 51-TP32733A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:29
Acquisition Time: 1/24/2014 20:26:49
Analysis Time: 1/24/2014 21:12
Analysis Quantity: 3.391E+02 g

Spectrum ID: 4_20140124_018
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2708 sec
Dead Time: 0.30 %

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		2.874E-01	1.089E-01	1.108E-01	8.455E-02
Am-241	AB	9.191E-05	1.801E-01	1.801E-01	1.484E-01
Bi-212	#AB	0.000E+00	3.462E-01	3.462E-01	2.314E-01
Bi-214		2.471E-01	8.886E-02	8.956E-02	4.811E-02
Co-60	#AB	-8.560E-03	3.037E-02	3.037E-02	2.394E-02
Cs-137	#AB	7.675E-04	2.335E-02	2.335E-02	1.915E-02
Eu-152	#AB	2.042E-02	7.415E-02	7.415E-02	4.817E-02
Eu-154	#AB	1.805E-02	4.062E-02	4.064E-02	1.457E-01
K-40		2.215E+01	1.454E+00	1.830E+00	2.388E-01
Pa-234	#AB	3.139E-02	5.838E-02	5.890E-02	8.668E-02
Pb-212		3.112E-01	6.832E-02	7.193E-02	3.679E-02
Pb-214		3.128E-01	8.524E-02	8.648E-02	4.176E-02
Ra-226	#	6.585E-01	4.654E-01	4.669E-01	3.411E-01
Th-234	AB	4.282E-02	2.130E-01	2.130E-01	1.158E+00
Tl-208		9.874E-02	4.233E-02	4.280E-02	2.315E-02
U-235	#AB	4.226E-02	2.964E-02	2.975E-02	1.287E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.422E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:12:04
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_018.An1

Sample description
     251449-022, 207008


Spectrum Filename: C:\User\SPC\Det4\4_20140124_018.An1

Acquisition information
       Start time:                 1/24/2014 20:26:49
       Live time:               2700
       Real time:               2708
       Dead time:                  0.30 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3912E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3912E+02) =
                                   7.9698E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:04
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_018.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:29:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1027

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
74.74	60.	25.89	0.82	2.759E-02				
76.85	68.	23.93	0.83	2.919E-02				
89.84	23.	54.65	0.42	3.753E-02				
92.49	6.	248.67	0.84	3.899E-02	92.59	4.343	PBC<MDA	Th234
93.18	21.	75.06	0.84	3.937E-02	93.35	5.760	PBC<MDA	U235
					93.35	4.100	3.928E-01	Ac228
93.25	18.	72.49	0.84	3.937E-02	93.35	5.760	PBC<MDA	U235
					93.35	4.100	3.231E-01	Ac228
143.41	5.	319.99	0.89	5.033E-02	143.77	10.940	PBC<MDA	U235
163.55	7.	221.09	0.91	5.004E-02	163.36	5.080	PBC<MDA	U235
185.87	40.	35.07	0.93	4.855E-02	185.72	57.000	4.234E-02	U235
					186.21	3.555	6.794E-01	Ra226
185.97	38.	35.33	0.93	4.851E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	6.585E-01	Ra226
238.68	202.	10.66	1.12	4.347E-02	238.63	43.600	3.055E-01	Pb212
241.92	36.	40.12	1.37	4.315E-02	242.00	7.268	3.349E-01	Pb214
278.17	5.	212.98	1.02	3.983E-02	277.37	6.600	PBC<MDA	Tl208
295.09	97.	17.20	1.21	3.830E-02	295.22	18.414	3.735E-01	Pb214
300.23	16.	59.77	1.04	3.789E-02	300.09	3.180	PBC<MDA	Pb212
338.40	41.	29.58	1.08	3.500E-02	338.32	11.400	3.003E-01	Ac228
344.68	4.	210.19	1.08	3.459E-02	344.28	26.590	PBC<MDA	Eu152
351.90	126.	12.35	1.11	3.408E-02	351.93	35.600	2.768E-01	Pb214
583.35	74.	19.67	0.80	2.394E-02	583.19	85.000	9.874E-02	Tl208
609.40	88.	15.32	1.24	2.322E-02	609.31	45.490	2.471E-01	Bi214
720.14	5.	112.51	1.42	2.059E-02	723.30	20.050	PBC<MDA	Eu154
779.51	4.	181.57	1.47	1.955E-02	778.90	12.970	PBC<MDA	Eu152
860.87	4.	174.12	1.54	1.823E-02	860.53	12.400	PBC<MDA	Tl208

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:04
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_018.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
879.89	3.	284.62	1.56	1.793E-02	880.52	10.500	PBC<MDA	Pa234
					883.24	9.700	4.790E-02	Pa234
					880.52	10.500	4.416E-02	Pa234
880.05	2.	320.11	1.56	1.789E-02	880.52	10.500	PBC<MDA	Pa234
					883.24	9.700	3.568E-02	Pa234
					883.24	9.700	3.568E-02	Pa234
911.14	44.	23.67	1.58	1.750E-02	911.20	26.200	2.818E-01	Ac228
946.09	8.	92.99	1.61	1.704E-02	946.00	13.500	PBC<MDA	Pa234
					946.00	13.500	1.049E-01	Pa234
961.67	1.	826.03	1.63	1.681E-02	964.08	14.500	PBC<MDA	Eu152
969.53	50.	20.34	1.24	1.675E-02	968.96	15.900	5.531E-01	Ac228
1120.78	9.	61.33	1.76	1.507E-02	1120.29	14.910	PBC<MDA	Bi214
1274.49	2.	427.55	1.88	1.368E-02	1274.43	34.900	PBC<MDA	Eu154
1460.84	986.	3.24	1.87	1.229E-02	1460.82	10.550	2.214E+01	K40
1764.38	8.	39.32	2.25	1.048E-02	1764.49	15.310	1.423E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
299.40	74.85	90.	46.	1.667E+03	65.36	0.591	- s
307.82	76.96	121.	63.	2.161E+03	58.54	0.939	-
359.31	89.84	68.	23.	6.022E+02	109.31	0.415	- sM

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Th-234	370.30	92.59	114.	6.	0.002	497.35	0.842D
U-235	373.35	93.35	119.	21.	0.008	150.12	0.843D
Ac-228	373.35	93.35	73.	18.	0.007	144.99	0.842D
Eu-154	491.61	122.94	120.	-13.	-0.005	239.78	0.871s
Pa-234	525.16	131.33	130.	-10.	-0.004	326.91	0.879s
U-235	573.44	143.41	106.	5.	0.002	639.98	0.891s
U-235	653.93	163.55	110.	7.	0.003	442.19	0.910s
U-235	743.17	185.87	77.	40.	0.015	70.14	0.931s
Ra-226	743.57	185.97	73.	38.	0.014	70.67	0.932s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:04
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_018.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	820.40	205.19	76.	-5.	-0.002	478.89	0.950s
Pb-212	954.26	238.68	103.	196.	0.073	21.31	1.118
Pb-214	967.24	241.92	91.	36.	0.013	80.23	1.369s
Tl-208	1112.15	278.17	55.	5.	0.002	425.97	1.018s
Pb-214	1179.80	295.09	67.	89.	0.033	34.40	1.209s
Pb-212	1200.35	300.23	47.	16.	0.006	119.54	1.039
Ac-228	1352.93	338.40	52.	41.	0.015	59.16	1.075
Eu-152	1378.04	344.68	41.	4.	0.002	420.39	1.081s
Pb-214	1406.90	351.90	54.	114.	0.042	24.70	1.109
Pa-234	2276.78	569.45	35.	-2.	-0.001	852.56	1.286s
Tl-208	2332.35	583.35	47.	68.	0.025	39.33	0.803s
Bi-214	2436.56	609.40	55.	88.	0.033	30.63	1.238
Eu-154	2879.44	720.14	16.	5.	0.002	225.02	1.422s
Eu-152	3116.88	779.51	24.	4.	0.001	363.13	1.471s
Bi-212	3139.70	785.21	31.	-2.	-0.001	1000.64	1.476s
Tl-208	3442.34	860.87	27.	4.	0.002	348.23	1.541
Pa-234	3518.42	879.89	31.	3.	0.001	569.24	1.558s
Pa-234	3519.04	880.05	22.	2.	0.001	640.21	1.560s
Ac-228	3643.40	911.14	32.	44.	0.016	47.33	1.584s
Pa-234	3783.23	946.09	25.	8.	0.003	185.98	1.613s
Eu-152	3845.55	961.67	16.	1.	0.000	1652.07	1.628s
Ac-228	3877.01	969.53	16.	50.	0.018	40.68	1.243s
Eu-154	3982.16	995.82	44.	-6.	-0.002	327.42	1.655s
Eu-154	4015.90	1004.25	26.	-2.	-0.001	810.77	1.662s
Bi-214	4482.11	1120.78	36.	9.	0.003	122.66	1.757s
Eu-154	5097.21	1274.49	28.	2.	0.001	855.09	1.880s
Co-60	5327.58	1332.06	20.	-4.	-0.001	354.76	1.926s
K-40	5843.00	1460.84	20.	973.	0.360	6.48	1.869
Bi-214	7058.11	1764.38	9.	8.	0.003	78.65	2.248s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.8742E-01					5.12E+12
			911.20	2.818E-01	?(	8.455E-02 2.37E+01	2.62E+01 G
			968.96	5.531E-01	+	1.036E-01 2.03E+01	1.59E+01 G
			338.32	3.003E-01	?(	1.241E-01 2.96E+01	1.14E+01 G
							Energy duplication
			93.35	3.231E-01		3.645E-01 7.25E+01	4.10E+00 XA
Am-241	I	9.1909E-05					1.58E+05
			59.54	9.191E-05	&(	1.484E-01 9.80E+04	3.59E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:04
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_018.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-214	N	2.4713E-01					5.84E+05	
			609.31	2.471E-01	(P	4.811E-02	1.53E+01	4.55E+01 G
			1120.29	1.193E-01	- P	1.827E-01	6.13E+01	1.49E+01 G
			1764.49	1.423E-01	& P	1.276E-01	3.93E+01	1.53E+01 G
Co-60	T	-8.5595E-03					1.93E+03	
			1332.49	-8.559E-03	?(	2.394E-02	1.77E+02	1.00E+02 G
			1173.23	0.000E+00	&	2.323E-02	1.00E+03	9.98E+01 G
Cs-137	I	7.6754E-04					1.10E+04	
			661.66	7.675E-04	%(	1.915E-02	1.52E+03	8.50E+01 G
Eu-152	I	2.0419E-02					4.94E+03	
			344.28	1.428E-02	&(	4.817E-02	2.10E+02	2.66E+01 G
			121.78	-3.101E-03	&	5.147E-02	1.01E+03	2.84E+01 G
			778.90	4.634E-02	?(	1.332E-01	1.82E+02	1.30E+01 G
			964.08	8.483E-03	?(	1.142E-01	8.26E+02	1.45E+01 G
			1112.08	-6.638E-03	%	2.192E-01	2.01E+03	1.34E+01 G
			1408.01	0.000E+00	-	2.623E-02	1.00E+03	2.09E+01 G
Eu-154	I	1.8054E-02					3.14E+03	
			873.18	3.435E-03	%(	1.457E-01	2.58E+03	1.22E+01 G
			123.07	-2.020E-02	&	3.885E-02	1.20E+02	4.04E+01 G
			1274.43	1.104E-02	?(	7.658E-02	4.28E+02	3.49E+01 G
			723.30	3.913E-02	&(	6.704E-02	1.13E+02	2.00E+01 G
			1004.72	-1.864E-02	&	1.224E-01	4.05E+02	1.79E+01 G
			996.25	-1.030E-01	+	2.688E-01	1.64E+02	1.05E+01 G
K-40	N	2.2145E+01					4.57E+11	
			1460.82	2.214E+01	(P	2.388E-01	3.24E+00	1.06E+01 G
Pa-234	N	3.1391E-02					1.63E+12	
			131.30	-3.281E-02	?(	8.668E-02	1.63E+02	1.82E+01 G
			569.50	-2.578E-02	+	1.786E-01	4.26E+02	9.30E+00 G
			946.00	1.049E-01	*(	1.489E-01	9.30E+01	1.35E+01 G
			880.52	4.416E-02	&(	2.025E-01	2.85E+02	1.05E+01 G
			883.24	3.568E-02	?(	1.838E-01	3.20E+02	9.70E+00 G
Pb-212	N	3.1115E-01					5.12E+12	
			238.63	3.055E-01	(P	3.679E-02	1.07E+01	4.36E+01 G
			300.09	3.892E-01	(P	3.912E-01	5.98E+01	3.18E+00 G
Pb-214	N	3.1276E-01					5.84E+05	
			351.93	2.768E-01	(P	4.176E-02	1.24E+01	3.56E+01 G
			295.22	3.735E-01	*(P	7.970E-02	1.72E+01	1.84E+01 G
			242.00	3.349E-01	(P	2.097E-01	4.01E+01	7.27E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:12:04
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_018.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   6.5853E-01                                     5.84E+05
                           186.21 6.585E-01  (  3.411E-01 3.53E+01 3.56E+00 G

Th-234   N   4.2821E-02                                     1.63E+12
                            63.30-3.175E-02 %(  1.158E+00 2.22E+03 3.75E+00 G
                            92.59 1.072E-01  (  4.334E-01 2.49E+02 4.34E+00 G

Tl-208   N   9.8744E-02                                     5.12E+12
                           583.19 9.874E-02  (P 2.315E-02 1.97E+01 8.50E+01 G
                           277.37 5.376E-02 - P 1.932E-01 2.13E+02 6.60E+00 G
                           860.53 5.765E-02 -   1.591E-01 1.74E+02 1.24E+01 G

U-235    N   4.2259E-02                                     2.57E+11
                           143.77 2.468E-02 &(  1.287E-01 3.20E+02 1.09E+01 G
                           205.32-6.599E-02 +   2.560E-01 2.39E+02 5.02E+00 G
                           163.36 7.923E-02 ?(  2.843E-01 2.21E+02 5.08E+00 G
                           185.72 4.234E-02  (  2.181E-02 3.51E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 2.796E-01 &   3.311E-01 7.51E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:12:04
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_018.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
U-235	93.35	119.	21.	0.008	150.12	2.796E-01
Eu-154	122.94	120.	-13.	-0.005	239.78	-2.020E-02
Pa-234	131.33	130.	-10.	-0.004	326.91	-3.281E-02
U-235	143.41	106.	5.	0.002	639.98	2.468E-02
U-235	163.55	110.	7.	0.003	442.19	7.923E-02
U-235	185.87	77.	40.	0.015	70.14	4.234E-02
Ra-226	185.97	73.	38.	0.014	70.67	6.585E-01
U-235	205.19	76.	-5.	-0.002	478.89	-6.599E-02
Eu-152	344.68	41.	4.	0.002	420.39	1.428E-02
Pa-234	569.45	35.	-2.	-0.001	852.56	-2.578E-02
Eu-154	720.14	16.	5.	0.002	225.02	3.913E-02
Eu-152	779.51	24.	4.	0.001	363.13	4.634E-02
Bi-212	785.21	31.	-2.	-0.001	1000.64	-2.191E-01
Pa-234	879.89	31.	3.	0.001	569.24	4.416E-02
Pa-234	880.05	22.	2.	0.001	640.21	3.568E-02
Pa-234	946.09	25.	8.	0.003	185.98	1.049E-01
Eu-152	961.67	16.	1.	0.000	1652.07	8.483E-03
Eu-154	995.82	44.	-6.	-0.002	327.42	-1.030E-01
Eu-154	1004.25	26.	-2.	-0.001	810.77	-1.864E-02
Eu-154	1274.49	28.	2.	0.001	855.09	1.104E-02
Co-60	1332.06	20.	-4.	-0.001	354.76	-8.559E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	2.8742E-01	2.8742E-01	1.0888E-01	1.1085E-01	8.455E-02
Am-241 A	9.1890E-05	9.1909E-05	1.8015E-01	1.8015E-01	1.484E-01
Bi-212 #A	0.0000E+00	0.0000E+00	3.4623E-01	3.4623E-01	2.314E-01
Bi-214	2.4711E-01	2.4713E-01	8.8865E-02	8.9556E-02	4.811E-02
Co-60 #A	-8.4146E-03	-8.5595E-03	3.0365E-02	3.0368E-02	2.394E-02
Cs-137 #A	7.6524E-04	7.6754E-04	2.3354E-02	2.3354E-02	1.915E-02
Eu-152 #A	2.0283E-02	2.0419E-02	7.4147E-02	7.4154E-02	4.817E-02
Eu-154 #A	1.7866E-02	1.8054E-02	4.0625E-02	4.0636E-02	1.457E-01
K-40	2.2145E+01	2.2145E+01	1.4544E+00	1.8301E+00	2.388E-01
Pa-234 #A	3.1391E-02	3.1391E-02	5.8380E-02	5.8899E-02	8.668E-02
Pb-212	3.1115E-01	3.1115E-01	6.8315E-02	7.1929E-02	3.679E-02
Pb-214	3.1274E-01	3.1276E-01	8.5236E-02	8.6481E-02	4.176E-02
Ra-226 #	6.5850E-01	6.5853E-01	4.6538E-01	4.6690E-01	3.411E-01
Th-234 A	4.2821E-02	4.2821E-02	2.1297E-01	2.1301E-01	1.158E+00
Tl-208	9.8744E-02	9.8744E-02	4.2327E-02	4.2796E-02	2.315E-02

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:12:04
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_018.An1

 U-235  #A    4.2259E-02    4.2259E-02   2.9638E-02    2.9749E-02  1.287E-01

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  238.6 to  2035.6 keV)     2.340E+01  pCi/g
 Total Decayed Activity (  238.6 to  2035.6 keV) 2.3402029E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE01
Seqnum : 1504034935018
File : 1_20140124_018
Cal : 24-JAN-2014 06:26:40,19-JUN-2013 18:43:28
IDF : 1.0
PDF : 1.0

Lab ID : 251449-023
Matrix : Soil
Batch : 207008
Caldate : 24-JAN-2014, 19-JUN-2013
Sample Amount : 301.52 g

Client ID : 04-PD-D0034-23
Acct : ITSI (JG)
Time : 24-JAN-2014 20:28
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.06 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	-0.0290	0.0930		.11584	.11586	-0.022	u
Bismuth-212	0.266	0.314		.46677	.46696	0.10	u
Bismuth-214	0.387	0.0342		.082977	.084779	-0.014	u
Cesium-137	-0.00439	0.0175	0.07	.021996	.021997	0	u
Cobalt-60	0.00403	0.0258		.019071	.019072	0.00097	u
Europium-152	0.0139	0.0611		.038901	.038907	0.0072	u
Europium-154	0.00184	0.168		.035141	.035141	0.0032	u
Lead-212	0.338	0.0392		.073893	.077845	-0.0076	u
Lead-214	0.413	0.0415		.088069	.090163	0.0075	u
Potassium-40	14.5	0.280		1.2528	1.4484	-0.086	u
Protactinium-234	-0.0963	0.104		.1315	.13366	0.0030	u
Radium-226 (By Bismuth-214)	0.387	0.0342	0.2	.082977	.084779	-0.014	u
Thallium-208	0.0993	0.0199		.037236	.037774	-0.0075	u
Thorium-232 (By Actinium-228)	0.424	0.0743		.11623	.12021	0.024	u
Thorium-234	0.789	1.05		1.3303	1.3324	0.24	u
Uranium-235	0.0632	0.161		.033855	.034071	0.063	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-23
Sample Description: 251449-023, 207008

Detector: HPGE01 50-TP42236A
Contract: ITSI
Unit Number: PD-D0034
Sample Time: 12/8/2013 10:32
Acquisition Time: 1/24/2014 20:28:50
Analysis Time: 1/24/2014 21:13
Analysis Quantity: 3.015E+02 g

Spectrum ID: 1_20140124_018
Sample Type: SAMPLE
Matrix: S
Live Time: 2700 sec
Real Time: 2702 sec
Dead Time: 0.06 %

Efficiency: HPGE01 S22147 1_20130619002_EffCal RA226
Efficiency Cal Date: 6/19/2013 18:43
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.239E-01	1.162E-01	1.202E-01	7.430E-02
Am-241	#AB	-2.903E-02	1.158E-01	1.159E-01	9.301E-02
Bi-212	#AB	2.660E-01	4.668E-01	4.670E-01	3.141E-01
Bi-214		3.868E-01	8.298E-02	8.478E-02	3.416E-02
Co-60	#AB	4.029E-03	1.907E-02	1.907E-02	2.581E-02
Cs-137	#AB	-4.395E-03	2.200E-02	2.200E-02	1.753E-02
Eu-152	#AB	1.391E-02	3.890E-02	3.891E-02	6.111E-02
Eu-154	#AB	1.836E-03	3.514E-02	3.514E-02	1.684E-01
K-40		1.449E+01	1.253E+00	1.448E+00	2.804E-01
Pa-234	#AB	-9.629E-02	1.315E-01	1.337E-01	1.038E-01
Pb-212		3.385E-01	7.389E-02	7.785E-02	3.922E-02
Pb-214		4.131E-01	8.807E-02	9.016E-02	4.151E-02
Ra-226	#	1.473E+00	6.662E-01	6.715E-01	3.994E-01
Th-234	#AB	7.887E-01	1.330E+00	1.332E+00	1.051E+00
Tl-208		9.926E-02	3.724E-02	3.777E-02	1.986E-02
U-235	#AB	6.324E-02	3.385E-02	3.407E-02	1.608E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.876E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:13:59
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_018.An1

Sample description
     251449-023, 207008


Spectrum Filename: C:\User\SPC\Det1\1_20140124_018.An1

Acquisition information
       Start time:                1/24/2014 20:28:50
       Live time:              2700
       Real time:              2702
       Dead time:                 0.06 %
       Detector ID:                   1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                  1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:26:40
            Zero offset:          0.000 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/19/2013 18:43:28
            Type:                 Polynomial
            Uncertainty:          1.382 %
            Coefficients:        -0.396420  -4.062121   0.406738
                                 -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.01keV )
       Stop channel:           8144 (  2035.50keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.0152E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.0152E+02) =
                                  8.9636E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:59
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_018.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:32:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	1_2013-12-28_0933.PBC 12/28/2013 09:33:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1289

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
63.54	17.	84.33	0.84	1.951E-02	63.30	3.750	PBC<MDA	Th234
74.66	29.	49.37	0.86	2.909E-02				
77.19	89.	17.81	0.86	3.097E-02				
93.16	21.	70.33	0.88	4.044E-02	93.35	4.100	PBC<MDA	Ac228
					93.35	5.760	3.002E-01	U235
					93.35	5.760	3.002E-01	U235
93.16	21.	70.33	0.88	4.044E-02	93.35	4.100	4.218E-01	Ac228
					93.35	5.760	3.002E-01	U235
121.33	9.	139.87	0.91	4.860E-02	121.78	28.410	PBC<MDA	Eu152
					123.07	40.400	1.608E-02	Eu154
121.42	1.	956.98	0.91	4.878E-02	121.78	28.410	PBC<MDA	Eu152
					123.07	40.400	2.190E-03	Eu154
163.14	10.	131.99	0.95	4.958E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	1.345E-01	U235
186.22	66.	23.74	0.90	4.793E-02	185.72	57.000	7.952E-02	U235
					186.21	3.555	1.276E+00	Ra226
					185.72	57.000	7.952E-02	U235
238.60	191.	10.92	0.85	4.295E-02	238.63	43.600	3.385E-01	Pb212
242.09	72.	23.35	0.56	4.262E-02	242.00	7.268	7.695E-01	Pb214
276.82	8.	115.52	1.07	3.941E-02	277.37	6.600	PBC<MDA	Tl208
295.03	68.	20.46	1.19	3.794E-02	295.22	18.414	3.229E-01	Pb214
299.77	20.	53.48	1.09	3.755E-02	300.09	3.180	5.693E-01	Pb212
338.37	43.	29.06	1.04	3.477E-02	338.32	11.400	3.585E-01	Ac228
352.09	160.	10.00	0.88	3.388E-02	351.93	35.600	4.131E-01	Pb214
583.43	61.	17.38	0.43	2.410E-02	583.19	85.000	9.937E-02	Tl208
609.56	130.	9.84	0.99	2.339E-02	609.31	45.490	3.709E-01	Bi214
727.13	7.	118.20	1.48	2.074E-02	727.33	6.650	PBC<MDA	Bi212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:59
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_018.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
785.74	6.	129.72	1.53	1.968E-02	785.37	1.110	PBC<MDA	Bi212
860.13	1.	628.29	1.59	1.847E-02	860.53	12.400	PBC<MDA	Tl208
883.69	5.	132.40	1.60	1.814E-02	883.24	9.700	PBC<MDA	Pa234
911.21	52.	17.70	0.88	1.775E-02	911.20	26.200	3.716E-01	Ac228
969.23	45.	18.42	0.48	1.700E-02	968.96	15.900	5.570E-01	Ac228
1113.27	1.	805.57	1.77	1.539E-02	1112.08	13.410	PBC<MDA	Eu152
1120.79	18.	38.12	0.34	1.531E-02	1120.29	14.910	2.684E-01	Bi214
1172.67	3.	236.70	1.81	1.479E-02	1173.23	99.850	PBC<MDA	Co60
1460.99	591.	4.20	1.49	1.247E-02	1460.82	10.550	1.449E+01	K40
1764.19	21.	23.48	1.16	1.061E-02	1764.49	15.310	4.341E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
298.78	74.73	90.	29.	9.899E+02	102.59	0.478	- s
308.93	77.27	89.	81.	2.622E+03	40.96	0.928	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	229.14	57.31	48.	-5.	-0.002	399.01	0.839s
Th-234	254.05	63.54	99.	17.	0.006	168.67	0.843s
Th-234	368.62	92.19	134.	-15.	-0.006	220.36	0.875s
Ac-228	373.25	93.35	99.	21.	0.008	140.66	0.875D
U-235	373.25	93.35	99.	21.	0.008	140.66	0.875D
Eu-152	485.14	121.33	83.	9.	0.003	279.74	0.906s
Eu-154	485.49	121.42	75.	1.	0.000	1913.97	0.907
Pa-234	525.06	131.32	147.	-26.	-0.010	136.57	0.916s
U-235	652.29	163.14	86.	10.	0.004	263.98	0.950s
U-235	744.03	186.08	90.	58.	0.021	53.54	0.973s
Ra-226	744.81	186.28	77.	76.	0.028	45.23	0.912s
Pb-212	954.03	238.60	90.	191.	0.071	21.83	0.855
Pb-214	967.99	242.09	72.	72.	0.027	46.71	0.562s
Tl-208	1106.86	276.82	66.	8.	0.003	231.04	1.067
Pb-214	1179.68	295.03	59.	68.	0.025	40.93	1.188
Pb-212	1198.67	299.77	50.	20.	0.008	106.95	1.090

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:59
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_018.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ac-228	1353.01	338.37	44.	43.	0.016	58.12	1.041
Pb-214	1407.89	352.09	42.	150.	0.056	20.00	0.881s
Tl-208	2333.14	583.43	28.	61.	0.023	34.75	0.426s
Bi-214	2437.66	609.56	22.	119.	0.044	19.68	0.988s
Cs-137	2629.65	657.56	18.	-2.	-0.001	500.52	1.425s
Bi-212	2907.90	727.13	31.	7.	0.003	236.39	1.480s
Eu-152	3111.79	778.10	31.	-4.	-0.002	365.10	1.522s
Bi-212	3142.38	785.74	23.	6.	0.002	259.45	1.528s
Tl-208	3439.97	860.13	17.	1.	0.000	1256.58	1.587s
Pa-234	3526.10	881.66	35.	-7.	-0.003	243.47	1.603s
Pa-234	3534.24	883.69	19.	5.	0.002	264.81	1.605s
Ac-228	3644.32	911.21	20.	52.	0.019	35.40	0.879s
Ac-228	3876.43	969.23	11.	45.	0.017	36.85	0.482s
Eu-154	3984.11	996.14	24.	-3.	-0.001	445.92	1.689s
Eu-154	4020.38	1005.21	26.	-4.	-0.002	333.86	1.695s
Eu-152	4452.75	1113.27	29.	1.	0.000	1611.14	1.770s
Bi-214	4482.82	1120.79	21.	18.	0.007	76.24	0.338s
Co-60	4690.43	1172.67	31.	3.	0.001	473.40	1.811s
K-40	5844.24	1460.99	23.	574.	0.213	8.40	1.486s
Bi-214	7057.84	1764.19	7.	21.	0.008	46.96	1.165s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	4.2389E-01					5.12E+12
			911.20	3.716E-01	(P	7.430E-02 1.77E+01 2.62E+01 G	
			968.96	5.570E-01	(P	9.347E-02 1.84E+01 1.59E+01 G	
			338.32	3.585E-01	(P	1.297E-01 2.91E+01 1.14E+01 G	
							Energy duplication
			93.35	4.218E-01		4.647E-01 7.03E+01 4.10E+00 XA	
Am-241	I	-2.9031E-02					1.58E+05
			59.54	-2.903E-02	?(	9.301E-02 2.00E+02 3.59E+01 G	
Bi-212	N	2.6597E-01					5.12E+12
			727.33	1.701E-01	?(	3.141E-01 1.18E+02 6.65E+00 G	
			785.37	8.401E-01	&(	1.696E+00 1.30E+02 1.11E+00 G	
			1620.74	0.000E+00	-	1.928E+00 1.00E+03 1.51E+00 G	
Bi-214	N	3.8683E-01					5.84E+05
			609.31	3.709E-01	(P	3.416E-02 9.84E+00 4.55E+01 G	
			1120.29	2.684E-01	- P	1.537E-01 3.81E+01 1.49E+01 G	
			1764.49	4.341E-01	?(P	1.238E-01 2.35E+01 1.53E+01 G	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:59
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_018.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	4.0286E-03					1.93E+03	
			1332.49	2.704E-04	%(	2.581E-02	5.80E+03	1.00E+02 G
			1173.23	7.792E-03	&(	2.958E-02	2.37E+02	9.98E+01 G
Cs-137	I	-4.3945E-03					1.10E+04	
			661.66	-4.395E-03	?(	1.753E-02	2.50E+02	8.50E+01 G
Eu-152	I	1.3906E-02					4.94E+03	
			344.28	3.611E-03	&(	6.111E-02	1.03E+03	2.66E+01 G
			121.78	2.286E-02	?(	5.124E-02	1.40E+02	2.84E+01 G
			778.90	-5.842E-02	+	1.697E-01	1.83E+02	1.30E+01 G
			964.08	0.000E+00	-	3.221E-01	1.00E+03	1.45E+01 G
			1112.08	1.534E-02	?(	2.020E-01	8.06E+02	1.34E+01 G
			1408.01	0.000E+00	-	1.638E-01	1.00E+03	2.09E+01 G
Eu-154	I	1.8360E-03					3.14E+03	
			873.18	6.593E-04	%(	1.684E-01	1.55E+04	1.22E+01 G
			123.07	2.190E-03	?(	3.439E-02	9.57E+02	4.04E+01 G
			1274.43	-2.318E-03	%	5.742E-02	1.51E+03	3.49E+01 G
			723.30	5.602E-03	%	9.661E-02	1.05E+03	2.00E+01 G
			1004.72	-5.083E-02	+	1.341E-01	1.67E+02	1.79E+01 G
			996.25	-6.188E-02	+	2.201E-01	2.23E+02	1.05E+01 G
K-40	N	1.4490E+01					4.57E+11	
			1460.82	1.449E+01	(P	2.804E-01	4.20E+00	1.06E+01 G
Pa-234	N	-9.6291E-02					1.63E+12	
			131.30	-9.629E-02	?(	1.038E-01	6.83E+01	1.82E+01 G
			569.50	-7.448E-04	%	1.922E-01	1.57E+04	9.30E+00 G
			946.00	2.094E-04	&	1.571E-01	4.55E+04	1.35E+01 G
			880.52	-1.256E-01	&	2.398E-01	1.22E+02	1.05E+01 G
			883.24	9.263E-02	+	1.900E-01	1.32E+02	9.70E+00 G
Pb-212	N	3.3849E-01					5.12E+12	
			238.63	3.385E-01	(	3.922E-02	1.09E+01	4.36E+01 G
			300.09	5.693E-01	+	4.568E-01	5.35E+01	3.18E+00 G
Pb-214	N	4.1312E-01					5.84E+05	
			351.93	4.131E-01	*(P	4.151E-02	1.00E+01	3.56E+01 G
			295.22	3.229E-01	- P	8.509E-02	2.05E+01	1.84E+01 G
			242.00	7.695E-01	+	2.122E-01	2.34E+01	7.27E+00 G
Ra-226	N	1.4730E+00					5.84E+05	
			186.21	1.473E+00	(	3.994E-01	2.26E+01	3.56E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:13:59
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_018.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   7.8870E-01                                     1.63E+12
                            63.30 7.887E-01 ?(  1.051E+00 8.43E+01 3.75E+00 G
                            92.59-2.911E-01 -   5.139E-01 1.10E+02 4.34E+00 G

Tl-208   N   9.9263E-02                                     5.12E+12
                           583.19 9.937E-02  (P 1.986E-02 1.74E+01 8.50E+01 G
                           277.37 9.784E-02  (P 2.407E-01 1.16E+02 6.60E+00 G
                           860.53 1.367E-02 -   1.396E-01 6.28E+02 1.24E+01 G

U-235    N   6.3237E-02                                     2.57E+11
                           143.77-4.777E-03 %(  1.608E-01 2.05E+03 1.09E+01 G
                           205.32-8.130E-03 %   2.919E-01 2.18E+03 5.02E+00 G
                           163.36 1.345E-01 &(  2.841E-01 1.32E+02 5.08E+00 G
                           185.72 6.994E-02 &(  2.685E-02 2.68E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 3.002E-01 ?   3.308E-01 7.03E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 21:13:59
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124_018.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	57.31	48.	-5.	-0.002	399.01	-2.903E-02
U-235	93.35	99.	21.	0.008	140.66	3.002E-01
Eu-152	121.33	83.	9.	0.003	279.74	2.286E-02
Eu-154	121.42	75.	1.	0.000	1913.97	2.190E-03
Pa-234	131.32	147.	-26.	-0.010	136.57	-9.629E-02
U-235	163.14	86.	10.	0.004	263.98	1.345E-01
U-235	186.08	90.	58.	0.021	53.54	6.994E-02
Cs-137	657.56	18.	-2.	-0.001	500.52	-4.395E-03
Bi-212	727.13	31.	7.	0.003	236.39	1.701E-01
Eu-152	778.10	31.	-4.	-0.002	365.10	-5.842E-02
Bi-212	785.74	23.	6.	0.002	259.45	8.401E-01
Pa-234	881.66	35.	-7.	-0.003	243.47	-1.256E-01
Pa-234	883.69	19.	5.	0.002	264.81	9.263E-02
Eu-154	996.14	24.	-3.	-0.001	445.92	-6.188E-02
Eu-154	1005.21	26.	-4.	-0.002	333.86	-5.083E-02
Eu-152	1113.27	29.	1.	0.000	1611.14	1.534E-02
Co-60	1172.67	31.	3.	0.001	473.40	7.792E-03

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.2389E-01	4.2389E-01	1.1623E-01	1.2021E-01	7.430E-02
Am-241 #A	-2.9025E-02	-2.9031E-02	1.1584E-01	1.1586E-01	9.301E-02
Bi-212 #A	2.6597E-01	2.6597E-01	4.6677E-01	4.6696E-01	3.141E-01
Bi-214	3.8680E-01	3.8683E-01	8.2977E-02	8.4779E-02	3.416E-02
Co-60 #A	3.9604E-03	4.0286E-03	1.9071E-02	1.9072E-02	2.581E-02
Cs-137 #A	-4.3814E-03	-4.3945E-03	2.1996E-02	2.1997E-02	1.753E-02
Eu-152 #A	1.3814E-02	1.3906E-02	3.8901E-02	3.8907E-02	6.111E-02
Eu-154 #A	1.8169E-03	1.8360E-03	3.5141E-02	3.5141E-02	1.684E-01
K-40	1.4490E+01	1.4490E+01	1.2528E+00	1.4484E+00	2.804E-01
Pa-234 #A	-9.6291E-02	-9.6291E-02	1.3150E-01	1.3366E-01	1.038E-01
Pb-212	3.3849E-01	3.3849E-01	7.3893E-02	7.7845E-02	3.922E-02
Pb-214	4.1309E-01	4.1312E-01	8.8069E-02	9.0163E-02	4.151E-02
Ra-226 #	1.4729E+00	1.4730E+00	6.6624E-01	6.7153E-01	3.994E-01
Th-234 #A	7.8870E-01	7.8870E-01	1.3303E+00	1.3324E+00	1.051E+00
Tl-208	9.9263E-02	9.9263E-02	3.7236E-02	3.7774E-02	1.986E-02
U-235 #A	6.3237E-02	6.3237E-02	3.3855E-02	3.4071E-02	1.608E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 21:13:59
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124_018.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.5 keV)     1.762E+01  pCi/g
 Total Decayed Activity (   25.0 to  2035.5 keV) 1.7624605E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SAMPLE USER REPORT FOR DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952019
File : 4_20140124_019
Cal : 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13
IDF : 1.0
PDF : 1.0

Lab ID : 251449-024
Matrix : Soil
Batch : 207008
Caldate : 24-JAN-2014, 05-MAR-2013
Sample Amount : 354.56 g

Client ID : 04-PD-D0034-24
Acct : ITSI (JG)
Time : 24-JAN-2014 21:18
Units : pCi/g
Live Time : 2700 sec
Dead Time : 0.31 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Blank	Flags
Americium-241	0.0723	0.135		.16873	.16882	-0.022	u
Bismuth-212	0.403	0.255		.3528	.3534	0.10	u
Bismuth-214	0.445	0.0457		.093714	.095822	-0.014	u
Cesium-137	-0.00417	0.0210	0.07	.025921	.025922	0	u
Cobalt-60	0.00788	0.0177		.022974	.022977	0.00097	u
Europium-152	0.0557	0.0502		.076152	.076199	0.0072	u
Europium-154	0	0.209		.17628	.17628	0.0032	u
Lead-212	0.417	0.0412		.076756	.082476	-0.0076	u
Lead-214	0.574	0.0440		.086759	.090822	0.0075	u
Potassium-40	17.2	0.203		1.2437	1.5137	-0.086	u
Protactinium-234	0.0325	0.0911		.073845	.074287	0.0030	u
Radium-226 (By Bismuth-214)	0.445	0.0457	0.2	.093714	.095822	-0.014	u
Thallium-208	0.172	0.0210		.042802	.044192	-0.0075	u
Thorium-232 (By Actinium-228)	0.590	0.0726		.12023	.12757	0.024	u
Thorium-234	0.533	1.23		.70998	.71177	0.24	u
Uranium-235	0.0772	0.134		.032411	.032748	0.063	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-24
Sample Description: 251449-024, 207008

Detector: HPGE04 51-TP32733A
Spectrum ID: 4_20140124_019
Contract: ITSI
Sample Type: SAMPLE
Unit Number: PD-D0034
Matrix: S
Sample Time: 12/8/2013 10:35
Live Time: 2700 sec
Acquisition Time: 1/24/2014 21:18:39
Real Time: 2708 sec
Analysis Time: 1/24/2014 22:03
Dead Time: 0.31 %
Analysis Quantity: 3.546E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		5.899E-01	1.202E-01	1.276E-01	7.258E-02
Am-241	#AB	7.233E-02	1.687E-01	1.688E-01	1.351E-01
Bi-212	#	4.028E-01	3.528E-01	3.534E-01	2.549E-01
Bi-214		4.447E-01	9.371E-02	9.582E-02	4.567E-02
Co-60	#AB	7.881E-03	2.297E-02	2.298E-02	1.765E-02
Cs-137	#AB	-4.169E-03	2.592E-02	2.592E-02	2.095E-02
Eu-152	#	5.568E-02	7.615E-02	7.620E-02	5.020E-02
Eu-154	#AB	0.000E+00	1.763E-01	1.763E-01	2.092E-01
K-40		1.720E+01	1.244E+00	1.514E+00	2.028E-01
Pa-234	#AB	3.255E-02	7.384E-02	7.429E-02	9.105E-02
Pb-212		4.171E-01	7.676E-02	8.248E-02	4.120E-02
Pb-214		5.744E-01	8.676E-02	9.082E-02	4.397E-02
Ra-226	#	1.673E+00	6.426E-01	6.496E-01	3.979E-01
Th-234	AB	5.330E-01	7.100E-01	7.118E-01	1.231E+00
Tl-208		1.719E-01	4.280E-02	4.419E-02	2.098E-02
U-235	#AB	7.719E-02	3.241E-02	3.275E-02	1.335E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.225E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 22:03:54
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_019.An1

Sample description
     251449-024, 207008


Spectrum Filename: C:\User\SPC\Det4\4_20140124_019.An1

Acquisition information
       Start time:                1/24/2014 21:18:39
       Live time:              2700
       Real time:              2708
       Dead time:                 0.31 %
       Detector ID:                   4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                  4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:44:12
            Zero offset:         -0.059 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:              3/5/2013 18:53:13
            Type:                 Polynomial
            Uncertainty:          1.349 %
            Coefficients:        -0.377104  -4.127613   0.443802
                                 -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.96keV )
       Stop channel:           8144 (  2035.56keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.5456E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.5456E+02) =
                                  7.6227E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 22:03:54
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_019.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/8/2013 10:35:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 16 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0262

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
58.90	13.	116.64	0.81	1.430E-02	59.54	35.920	PBC<MDA	Am241
63.02	16.	113.68	0.81	1.777E-02	63.30	3.750	PBC<MDA	Th234
74.77	65.	28.24	0.82	2.746E-02				
77.04	133.	14.64	0.83	2.919E-02				
92.48	25.	69.45	0.84	3.899E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	3.070E-01	U235
93.23	36.	52.44	0.84	3.937E-02	93.35	4.100	6.352E-01	Ac228
					93.35	5.760	4.522E-01	U235
93.24	34.	48.46	0.84	3.937E-02	93.35	4.100	6.014E-01	Ac228
					93.35	5.760	4.281E-01	U235
131.16	2.	983.32	0.88	4.962E-02	131.30	18.200	PBC<MDA	Pa234
142.64	5.	345.98	0.89	5.033E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	2.364E-02	U235
185.86	102.	19.20	0.80	4.854E-02	185.72	57.000	1.043E-01	U235
					186.21	3.555	1.673E+00	Ra226
					185.72	57.000	1.043E-01	U235
209.44	38.	34.04	0.61	4.637E-02				
238.63	286.	9.01	0.88	4.348E-02	238.63	43.600	4.171E-01	Pb212
241.65	54.	29.15	0.50	4.315E-02	242.00	7.268	4.878E-01	Pb214
277.23	33.	35.60	0.37	3.983E-02	277.37	6.600	3.574E-01	Tl208
295.20	150.	11.96	0.94	3.830E-02	295.22	18.414	5.679E-01	Pb214
300.47	7.	148.57	1.04	3.789E-02	300.09	3.180	PBC<MDA	Pb212
338.50	84.	20.64	1.06	3.500E-02	338.32	11.400	5.922E-01	Ac228
345.44	11.	96.74	1.08	3.459E-02	344.28	26.590	PBC<MDA	Eu152
					344.28	26.590	3.319E-02	Eu152
351.84	260.	7.90	1.13	3.408E-02	351.93	35.600	5.778E-01	Pb214
510.57	142.	12.40	0.56	2.629E-02				

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 22:03:54
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_019.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
583.23	130.	11.87	0.82	2.394E-02	583.19	85.000	1.719E-01	Tl208
609.40	184.	9.65	0.68	2.322E-02	609.31	45.490	4.497E-01	Bi214
727.29	20.	43.79	1.43	2.051E-02	727.33	6.650	4.113E-01	Bi212
785.16	3.	296.50	1.48	1.944E-02	785.37	1.110	PBC<MDA	Bi212
860.89	37.	27.93	0.68	1.823E-02	860.53	12.400	4.572E-01	Tl208
880.95	5.	113.45	1.56	1.793E-02	880.52	10.500	PBC<MDA	Pa234
911.40	84.	16.41	0.54	1.750E-02	911.20	26.200	5.196E-01	Ac228
964.32	10.	99.36	1.63	1.681E-02	964.08	14.500	PBC<MDA	Eu152
					964.08	14.500	1.194E-01	Eu152
969.01	66.	15.47	1.37	1.675E-02	968.96	15.900	7.039E-01	Ac228
1120.68	35.	26.20	1.76	1.507E-02	1120.29	14.910	4.377E-01	Bi214
1332.32	4.	145.75	1.93	1.322E-02	1332.49	99.983	PBC<MDA	Co60
1408.46	4.	151.19	1.98	1.266E-02	1408.01	20.850	PBC<MDA	Eu152
					1408.01	20.850	4.002E-02	Eu152
1460.82	803.	3.56	1.66	1.229E-02	1460.82	10.550	1.720E+01	K40
1764.68	25.	21.73	2.25	1.048E-02	1764.49	15.310	4.368E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
298.71	74.68	146.	54.	1.956E+03	70.76	0.581	-	s
307.79	76.95	166.	111.	3.789E+03	40.16	0.660	-	
837.40	209.44	63.	38.	8.260E+02	68.08	0.611	AC-228	s
2041.32	510.57	48.	142.	5.383E+03	24.80	0.555	TL-208	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	235.64	58.90	111.	13.	0.005	233.27	0.810s
Th-234	252.12	63.02	156.	16.	0.006	227.35	0.813s
Th-234	370.30	92.59	134.	25.	0.009	138.90	0.842D
Ac-228	373.35	93.35	122.	34.	0.013	96.92	0.842D
U-235	373.35	93.35	163.	36.	0.013	104.88	0.843D
Pa-234	524.47	131.16	156.	2.	0.001	1966.64	0.879s
U-235	570.36	142.64	125.	5.	0.002	691.96	0.891s
U-235	654.11	163.59	144.	-10.	-0.004	361.79	0.910s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 22:03:54
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_019.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-235	743.57	185.97	119.	86.	0.032	41.99	0.931s
Ra-226	743.11	185.86	109.	102.	0.038	38.40	0.798s
U-235	820.61	205.25	141.	-16.	-0.006	213.94	0.950s
Pb-212	954.07	238.63	141.	280.	0.104	18.02	0.877
Pb-214	966.14	241.65	106.	54.	0.020	58.30	0.496s
Tl-208	1108.39	277.23	44.	33.	0.012	71.21	0.369s
Pb-214	1180.22	295.20	69.	142.	0.053	23.93	0.941
Pb-212	1201.30	300.47	73.	7.	0.002	297.15	1.040s
Ac-228	1353.33	338.50	69.	84.	0.031	41.29	1.063s
Eu-152	1381.08	345.44	49.	11.	0.004	193.48	1.081s
Pb-214	1406.68	351.84	66.	248.	0.092	15.80	1.128s
Pa-234	2276.20	569.30	47.	-6.	-0.002	362.28	1.286s
Tl-208	2331.89	583.23	42.	124.	0.046	23.73	0.824s
Bi-214	2436.55	609.40	54.	168.	0.062	19.31	0.685s
Cs-137	2643.40	661.13	35.	-3.	-0.001	621.78	1.368s
Eu-154	2894.46	723.90	63.	-10.	-0.004	234.50	1.422s
Bi-212	2908.01	727.29	28.	20.	0.007	87.59	1.426s
Bi-212	3139.49	785.16	30.	3.	0.001	593.01	1.476s
Tl-208	3442.38	860.89	17.	37.	0.014	55.85	0.675s
Pa-234	3522.63	880.95	15.	5.	0.002	226.89	1.558s
Ac-228	3644.46	911.40	26.	84.	0.031	32.83	0.536s
Eu-152	3856.17	964.32	47.	10.	0.004	198.71	1.628s
Ac-228	3874.91	969.01	13.	66.	0.025	30.93	1.371
Eu-154	3983.93	996.26	38.	-5.	-0.002	351.57	1.655s
Eu-154	4013.58	1003.67	38.	-10.	-0.004	182.93	1.662s
Eu-152	4452.06	1113.27	31.	-5.	-0.002	319.54	1.750s
Bi-214	4481.74	1120.68	40.	35.	0.013	52.41	1.757s
Co-60	4691.62	1173.14	33.	-4.	-0.002	409.19	1.799s
Co-60	5328.64	1332.32	12.	4.	0.001	291.50	1.926s
Eu-152	5633.34	1408.46	14.	4.	0.001	302.39	1.984s
K-40	5842.92	1460.82	16.	790.	0.293	7.11	1.661
Bi-214	7059.31	1764.68	9.	25.	0.009	43.46	2.248s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	5.8987E-01					5.12E+12
			911.20	5.196E-01	(	7.258E-02 1.64E+01 2.62E+01	G
			968.96	7.039E-01	(	8.767E-02 1.55E+01 1.59E+01	G
			338.32	5.922E-01	*(	1.372E-01 2.06E+01 1.14E+01	G
							Energy duplication
			93.35	6.014E-01		4.494E-01 4.85E+01 4.10E+00	XA

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 22:03:54
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_019.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Am-241   I   7.2334E-02                                     1.58E+05
                            59.54 7.233E-02  (  1.351E-01 1.17E+02 3.59E+01 G

Bi-212   N   4.0279E-01                                     5.12E+12
                           727.33 4.113E-01  (  2.549E-01 4.38E+01 6.65E+00 G
                           785.37 3.517E-01 ?(  1.681E+00 2.97E+02 1.11E+00 G
                          1620.74 0.000E+00 -   2.394E+00 1.00E+03 1.51E+00 G

Bi-214   N   4.4472E-01                                     5.84E+05
                           609.31 4.497E-01  (P 4.567E-02 9.65E+00 4.55E+01 G
                          1120.29 4.377E-01 ?(P 1.847E-01 2.62E+01 1.49E+01 G
                          1764.49 4.368E-01 ?(P 1.248E-01 2.17E+01 1.53E+01 G

Co-60    T   7.8813E-03                                     1.93E+03
                          1332.49 7.881E-03 ?(  1.765E-02 1.46E+02 1.00E+02 G
                          1173.23-8.071E-03 +   2.640E-02 2.05E+02 9.98E+01 G

Cs-137   I  -4.1689E-03                                     1.10E+04
                           661.66-4.169E-03 ?(  2.095E-02 3.11E+02 8.50E+01 G

Eu-152   I   5.5679E-02                                     4.94E+03
                           344.28 3.319E-02 &(  5.020E-02 9.67E+01 2.66E+01 G
                           121.78-1.182E-03 &   5.118E-02 2.63E+03 2.84E+01 G
                           778.90 6.770E-04 %   1.354E-01 1.21E+04 1.30E+01 G
                           964.08 1.194E-01 ?(  1.856E-01 9.94E+01 1.45E+01 G
                          1112.08-7.156E-02 +   1.810E-01 1.60E+02 1.34E+01 G
                          1408.01 4.002E-02 &(  9.365E-02 1.51E+02 2.09E+01 G

K-40     N   1.7202E+01                                     4.57E+11
                          1460.82 1.720E+01  (P 2.028E-01 3.56E+00 1.06E+01 G

Pa-234   N   3.2546E-02                                     1.63E+12
                           131.30 5.636E-03 ?(  9.105E-02 9.83E+02 1.82E+01 G
                           569.50-6.897E-02 +   2.001E-01 1.81E+02 9.30E+00 G
                           946.00 1.880E-03 %   1.230E-01 3.98E+03 1.35E+01 G
                           880.52 7.919E-02 ?(  1.367E-01 1.13E+02 1.05E+01 G
                           883.24 2.815E-03 %   1.917E-01 4.14E+03 9.70E+00 G

Pb-212   N   4.1711E-01                                     5.12E+12
                           238.63 4.171E-01  (P 4.120E-02 9.01E+00 4.36E+01 G
                           300.09 1.576E-01 - P 4.649E-01 1.49E+02 3.18E+00 G

Pb-214   N   5.7442E-01                                     5.84E+05
                           351.93 5.778E-01 @(P 4.397E-02 7.90E+00 3.56E+01 G
                           295.22 5.679E-01  (P 7.759E-02 1.20E+01 1.84E+01 G
                           242.00 4.878E-01 - P 2.158E-01 2.92E+01 7.27E+00 G
```

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 22:03:54
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_019.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Ra-226   N   1.6732E+00                                     5.84E+05
                           186.21 1.673E+00 *(  3.979E-01 1.92E+01 3.56E+00 G

Th-234   N   5.3297E-01                                     1.63E+12
                            63.30 6.740E-01 ?(  1.231E+00 1.14E+02 3.75E+00 G
                            92.59 4.112E-01  (  4.503E-01 6.94E+01 4.34E+00 G

Tl-208   N   1.7185E-01                                     5.12E+12
                           583.19 1.719E-01  (P 2.098E-02 1.19E+01 8.50E+01 G
                           277.37 3.574E-01 + P 1.655E-01 3.56E+01 6.60E+00 G
                           860.53 4.572E-01 +   1.214E-01 2.79E+01 1.24E+01 G

U-235    N   7.7191E-02                                     2.57E+11
                           143.77 2.364E-02 &(  1.335E-01 3.46E+02 1.09E+01 G
                           205.32-1.939E-01 +   3.324E-01 1.07E+02 5.02E+00 G
                           163.36-1.060E-01 +   3.109E-01 1.81E+02 5.08E+00 G
                           185.72 8.747E-02 *(  2.594E-02 2.10E+01 5.70E+01 G
                                                          Energy duplication
                            93.35 4.522E-01 ?   3.706E-01 5.24E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 22:03:54
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_019.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	58.90	111.	13.	0.005	233.27	7.233E-02
U-235	93.35	163.	36.	0.013	104.88	4.522E-01
Pa-234	131.16	156.	2.	0.001	1966.64	5.636E-03
U-235	142.64	125.	5.	0.002	691.96	2.364E-02
U-235	163.59	144.	-10.	-0.004	361.79	-1.060E-01
U-235	185.97	119.	86.	0.032	41.99	8.747E-02
U-235	205.25	141.	-16.	-0.006	213.94	-1.939E-01
Eu-152	345.44	49.	11.	0.004	193.48	3.319E-02
Pa-234	569.30	47.	-6.	-0.002	362.28	-6.897E-02
Cs-137	661.13	35.	-3.	-0.001	621.78	-4.169E-03
Eu-154	723.90	63.	-10.	-0.004	234.50	-6.886E-02
Bi-212	727.29	28.	20.	0.007	87.59	4.113E-01
Bi-212	785.16	30.	3.	0.001	593.01	3.517E-01
Pa-234	880.95	15.	5.	0.002	226.89	7.919E-02
Eu-152	964.32	47.	10.	0.004	198.71	1.194E-01
Eu-154	996.26	38.	-5.	-0.002	351.57	-8.514E-02
Eu-154	1003.67	38.	-10.	-0.004	182.93	-9.884E-02
Eu-152	1113.27	31.	-5.	-0.002	319.54	-7.156E-02
Co-60	1173.14	33.	-4.	-0.002	409.19	-8.071E-03
Co-60	1332.32	12.	4.	0.001	291.50	7.881E-03
Eu-152	1408.46	14.	4.	0.001	302.39	4.002E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	5.8987E-01	5.8987E-01	1.2023E-01	1.2757E-01	7.258E-02
Am-241 #A	7.2319E-02	7.2334E-02	1.6873E-01	1.6882E-01	1.351E-01
Bi-212 #	4.0279E-01	4.0279E-01	3.5280E-01	3.5340E-01	2.549E-01
Bi-214	4.4470E-01	4.4472E-01	9.3714E-02	9.5822E-02	4.567E-02
Co-60 #A	7.7478E-03	7.8813E-03	2.2974E-02	2.2977E-02	1.765E-02
Cs-137 #A	-4.1564E-03	-4.1689E-03	2.5921E-02	2.5922E-02	2.095E-02
Eu-152 #C	5.5309E-02	5.5679E-02	7.6152E-02	7.6199E-02	5.020E-02
Eu-154 #A	0.0000E+00	0.0000E+00	1.7628E-01	1.7628E-01	2.092E-01
K-40	1.7202E+01	1.7202E+01	1.2437E+00	1.5137E+00	2.028E-01
Pa-234 #A	3.2546E-02	3.2546E-02	7.3845E-02	7.4287E-02	9.105E-02
Pb-212	4.1711E-01	4.1711E-01	7.6756E-02	8.2476E-02	4.120E-02
Pb-214	5.7438E-01	5.7442E-01	8.6759E-02	9.0822E-02	4.397E-02
Ra-226 #	1.6731E+00	1.6732E+00	6.4255E-01	6.4962E-01	3.979E-01
Th-234 A	5.3297E-01	5.3297E-01	7.0998E-01	7.1177E-01	1.231E+00
Tl-208	1.7185E-01	1.7185E-01	4.2802E-02	4.4192E-02	2.098E-02

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 22:03:54
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_019.An1

 U-235  #A    7.7191E-02    7.7191E-02   3.2411E-02    3.2748E-02  1.335E-01

   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  186.1 to  2035.6 keV)     2.107E+01  pCi/g
 Total Decayed Activity (  186.1 to  2035.6 keV) 2.1073500E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

QC Raw Data

CURTIS & TOMPKINS BLANK USER REPORT FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst	: HPGE04	Lab ID	: QC723787		
Seqnum	: 1534034952008.2	Matrix	: Soil		
File	: 4_20140124_008	Batch	: 207004	Time	: 24-JAN-2014 11:49
Cal	: 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13	Caldate	: 24-JAN-2014, 05-MAR-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 323.66 g	Live Time	: 2700 sec
				Dead Time	: 0.24 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Flags
Americium-241	-0.00118	0.0813		.098841	.098841	u
Bismuth-212	0.000310	0.198		.24063	.24063	u
Bismuth-214	-0.0112	0.0381		.064029	.064031	u
Cesium-137	0.00476	0.00993	0.07	.013303	.013305	u
Cobalt-60	0.00155	0.0133		.016599	.016599	u
Europium-152	0.0202	0.0261		.036273	.036286	u
Europium-154	0.0192	0.0843		.10754	.10755	u
Lead-212	-0.00751	0.0221		.19524	.19524	u
Lead-214	-0.0252	0.0390		.47311	.47311	u
Potassium-40	-0.0685	0.256		.38894	.38896	u
Protactinium-234	0.00662	0.0380		.051159	.051186	u
Radium-226 (By Bismuth-214)	-0.0112	0.0381	0.2	.064029	.064031	u
Thallium-208	-0.00422	0.0163		.033312	.033313	u
Thorium-232 (By Actinium-228)	0.0202	0.0504		.065527	.065544	u
Thorium-234	0	0.680		.62949	.6295	u
Uranium-235	0.0620	0.0775		.1012	.10127	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: Prep Blank
Sample Description: QC723787, 207004, BLANK

Detector: HPGE04 51-TP32733A Spectrum ID: 4_20140124_008
Contract: Tetra Tech EC Sample Type: VOID
Unit Number: BLANK Matrix: S
Sample Time: 12/30/2013 14:40 Live Time: 2700 sec
Acquisition Time: 1/24/2014 11:49:08 Real Time: 2706 sec
Analysis Time: 1/27/2014 08:20 Dead Time: 0.24 %
Analysis Quantity: 3.237E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#AB	2.021E-02	6.553E-02	6.554E-02	5.044E-02
Am-241	#AB	-1.184E-03	9.884E-02	9.884E-02	8.130E-02
Bi-212	#AB	3.102E-04	2.406E-01	2.406E-01	1.982E-01
Bi-214	#AB	-1.119E-02	6.403E-02	6.403E-02	3.814E-02
Co-60	#AB	1.550E-03	1.660E-02	1.660E-02	1.331E-02
Cs-137	#AB	4.765E-03	1.330E-02	1.330E-02	9.929E-03
Eu-152	#AB	2.020E-02	3.627E-02	3.629E-02	2.607E-02
Eu-154	#AB	1.918E-02	1.075E-01	1.075E-01	8.433E-02
K-40	#AB	-6.847E-02	3.889E-01	3.890E-01	2.564E-01
Pa-234	#AB	6.620E-03	5.116E-02	5.119E-02	3.795E-02
Pb-212	#AB	-7.512E-03	1.952E-01	1.952E-01	2.213E-02
Pb-214	#AB	-2.519E-02	4.731E-01	4.731E-01	3.896E-02
Ra-226	#	2.077E-01	2.784E-01	2.787E-01	2.061E-01
Th-234	#AB	0.000E+00	6.295E-01	6.295E-01	6.803E-01
Tl-208	#AB	-4.222E-03	3.331E-02	3.331E-02	1.631E-02
U-235	#AB	6.196E-02	1.012E-01	1.013E-01	7.749E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 3.425E-01

Analyst: Chris Fluty

Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Sample description
QC723787, 207004, BLANK

Spectrum Filename: C:\User\SPC\Det4\4_20140124_008.An1

Acquisition information

Start time:	1/24/2014 11:49:08
Live time:	2700
Real time:	2706
Dead time:	0.24 %
Detector ID:	4

Detector system
HPGE04 51-TP32733A

Calibration

Filename:	4_Soil 250ml TunaCan_03-04-2013.Clb

HPGE04 S21603 4_20130304002_EffCal RA226

Energy Calibration

Created:	1/24/2014 06:44:12
Zero offset:	-0.059 keV
Gain:	0.250 keV/channel
Quadratic:	-3.146E-08 keV/channel^2

Efficiency Calibration

Created:	3/5/2013 18:53:13
Type:	Polynomial
Uncertainty:	1.349 %
Coefficients:	-0.377104 -4.127613 0.443802
	-0.053447 0.002385 -0.000047

Library Files

Main analysis library:	GenericAnalysisDDEP.lib
Library Match Width:	0.500
Peak stripping:	Library based

Analysis parameters

Analysis engine:	Env32 G53W4.26
Start channel:	100 (24.96keV)
Stop channel:	8144 (2035.56keV)
Peak rejection level:	1000.000%
Peak search sensitivity:	3
Sample Size:	3.2366E+02
Activity scaling factor:	1.0000E+00/(3.7000E-02* 3.2366E+02) = 8.3504E-02
Detection limit method:	Critical level - ORTEC method
Random error:	1.0000000E+00
Systematic error:	1.0000000E+00
Fraction Limit:	0.000%
Background width:	average of five points.
Half lives decay limit:	12.000

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:40:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 5.00E+01 %

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc

No unknown peaks passed sensitivity test.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Ac-228	373.35	93.35	32.	1.	0.000	1813.47	0.843D
U-235	373.35	93.35	32.	1.	0.000	1813.47	0.843D
Eu-152	487.66	121.95	36.	4.	0.002	409.57	0.870s
Pa-234	524.11	131.07	23.	1.	0.000	1935.30	0.879s
U-235	576.65	144.21	35.	11.	0.004	163.33	0.891s
U-235	653.70	163.49	30.	1.	0.000	1648.60	0.910s
U-235	739.66	184.99	33.	3.	0.001	572.68	0.931s
Ra-226	748.91	187.31	24.	12.	0.004	134.06	0.932s
Pb-214	964.82	241.32	39.	-11.	-0.004	276.88	0.985s
Tl-208	1108.44	277.24	22.	-2.	-0.001	605.54	1.018s
Pb-214	1182.16	295.68	30.	-4.	-0.002	385.85	1.035s
Ac-228	1351.71	338.09	22.	-4.	-0.002	324.53	1.075s
Pb-214	1406.30	351.75	43.	-10.	-0.004	857.93	1.088s
Pa-234	2271.47	568.12	8.	1.	0.000	772.76	1.286s
Bi-214	2436.07	609.28	31.	-4.	-0.001	113.92	1.322s
Cs-137	2645.41	661.63	7.	3.	0.001	279.20	1.368s
Eu-154	2891.50	723.16	13.	-1.	0.000	867.33	1.422s
Eu-152	3115.99	779.29	5.	2.	0.001	362.09	1.471s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-212	3141.44	785.65	14.	-4.	-0.001	319.27	1.476s
Tl-208	3441.63	860.70	12.	1.	0.000	788.93	1.541s
Eu-154	3494.65	873.95	7.	1.	0.001	560.85	1.551s
Pa-234	3533.69	883.71	9.	-2.	-0.001	381.51	1.560s
Ac-228	3645.31	911.62	10.	3.	0.001	324.24	1.584s
Eu-152	3855.20	964.08	13.	-2.	-0.001	583.77	1.628s
Eu-152	4449.22	1112.56	8.	5.	0.002	179.59	1.750s
Eu-154	5092.47	1273.31	7.	-1.	0.000	949.66	1.880s
Co-60	5327.53	1332.05	6.	1.	0.000	1071.00	1.926s
K-40	5844.88	1461.31	21.	-3.	-0.001	103.56	2.024s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g		COMMENTS
Ac-228	N	2.0209E-02					5.12E+12	
			911.20	2.021E-02	&(	5.044E-02	1.62E+02	2.62E+01 G
			968.96	0.000E+00	-	2.706E-02	1.00E+03	1.59E+01 G
			338.32	-3.291E-02	+	8.396E-02	1.62E+02	1.14E+01 G
							Energy duplication	
			93.35	1.703E-02	&	2.527E-01	9.07E+02	4.10E+00 XA
Am-241	I	-1.1840E-03					1.58E+05	
			59.54	-1.184E-03	%(	8.130E-02	4.17E+03	3.59E+01 G
Bi-212	N	3.1016E-04					5.12E+12	
			727.33	3.102E-04	%(	1.982E-01	3.88E+04	6.65E+00 G
			785.37	-5.108E-01	+	1.267E+00	1.60E+02	1.11E+00 G
			1620.74	0.000E+00	-	4.231E-01	1.00E+03	1.51E+00 G
Bi-214	N	-1.1185E-02					5.84E+05	
			609.31	-1.119E-02	?(P	3.814E-02	5.70E+01	4.55E+01 G
			1120.29	-6.976E-02	% P	1.313E-01	1.00E+03	1.49E+01 G
			1764.49	-7.782E-02	% P	2.273E-01	1.00E+03	1.53E+01 G
Co-60	T	1.5499E-03					1.93E+03	
			1332.49	1.550E-03	?(	1.331E-02	5.36E+02	1.00E+02 G
			1173.23	0.000E+00	-	1.708E-02	1.00E+03	9.98E+01 G
Cs-137	I	4.7647E-03					1.10E+04	
			661.66	4.765E-03	?(	9.929E-03	1.40E+02	8.50E+01 G

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Eu-152	I	2.0198E-02					4.94E+03	
			344.28	3.534E-04	&(	2.607E-02	4.49E+03	2.66E+01 G
			121.78	9.648E-03	&(	3.163E-02	2.05E+02	2.84E+01 G
			778.90	2.306E-02	?(	6.296E-02	1.81E+02	1.30E+01 G
			964.08	-2.316E-02	+	1.077E-01	2.92E+02	1.45E+01 G
			1112.08	7.913E-02	&(	1.021E-01	8.98E+01	1.34E+01 G
			1408.01	0.000E+00	-	2.740E-02	1.00E+03	2.09E+01 G
Eu-154	I	1.9175E-02					3.14E+03	
			873.18	1.917E-02	?(	8.433E-02	2.80E+02	1.22E+01 G
			123.07	0.000E+00	-	2.399E-02	1.00E+03	4.04E+01 G
			1274.43	-5.238E-03	+	3.983E-02	4.75E+02	3.49E+01 G
			723.30	-8.936E-03	+	6.240E-02	4.34E+02	2.00E+01 G
			1004.72	-9.703E-04	%	6.008E-02	3.77E+03	1.79E+01 G
			996.25	3.128E-03	%	1.133E-01	2.21E+03	1.05E+01 G
K-40	N	-6.8466E-02					4.57E+11	
			1460.82	-6.847E-02	?(P	2.564E-01	5.18E+01	1.06E+01 G
Pa-234	N	6.6203E-03					1.63E+12	
			131.30	2.399E-03	?(	3.795E-02	9.68E+02	1.82E+01 G
			569.50	1.488E-02	?(	9.178E-02	3.86E+02	9.30E+00 G
			946.00	0.000E+00	-	3.133E-02	1.00E+03	1.35E+01 G
			880.52	0.000E+00	-	1.572E-01	1.00E+03	1.05E+01 G
			883.24	-4.284E-02	+	1.267E-01	1.91E+02	9.70E+00 G
Pb-212	N	-7.5122E-03					5.12E+12	
			238.63	-7.512E-03	%(P	2.213E-02	5.68E+02	4.36E+01 G
			300.09	-3.914E-02	% P	3.059E-01	1.00E+03	3.18E+00 G
Pb-214	N	-2.5188E-02					5.84E+05	
			351.93	-2.519E-02	?(P	3.896E-02	4.29E+02	3.56E+01 G
			295.22	-1.909E-02	+ P	5.643E-02	1.93E+02	1.84E+01 G
			242.00	-1.059E-01	+ P	1.444E-01	1.38E+02	7.27E+00 G
Ra-226	N	2.0767E-01					5.84E+05	
			186.21	2.077E-01	?(	2.061E-01	6.70E+01	3.56E+00 G
Tl-208	N	-4.2224E-03					5.12E+12	
			583.19	-7.399E-03	%(P	1.631E-02	4.49E+02	8.50E+01 G
			277.37	-2.903E-02	+ P	1.294E-01	3.03E+02	6.60E+00 G
			860.53	1.755E-02	?(	1.112E-01	3.94E+02	1.24E+01 G
U-235	N	6.1961E-02					2.57E+11	
			143.77	6.196E-02	&(	7.749E-02	8.17E+01	1.09E+01 G
			205.32	0.000E+00	&	1.892E-01	1.00E+03	5.02E+00 G
			163.36	1.158E-02	-	1.561E-01	8.24E+02	5.08E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		185.72	3.225E-03	&	1.489E-02	2.86E+02	5.70E+01 G Energy duplication
		93.35	1.212E-02	&	1.798E-01	9.07E+02	5.76E+00 X

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Ac-228	93.35	32.	1.	0.000	1813.47	1.703E-02	
U-235	93.35	32.	1.	0.000	1813.47	1.212E-02	
Eu-152	121.95	36.	4.	0.002	409.57	9.648E-03	
Pa-234	131.07	23.	1.	0.000	1935.30	2.399E-03	
U-235	144.21	35.	11.	0.004	163.33	6.196E-02	
U-235	163.49	30.	1.	0.000	1648.60	1.158E-02	
U-235	184.99	33.	3.	0.001	572.68	3.225E-03	
Ra-226	187.31	24.	12.	0.004	134.06	2.077E-01	
Pb-214	241.32	39.	-11.	-0.004	276.88	-1.059E-01	P
Tl-208	277.24	22.	-2.	-0.001	605.54	-2.903E-02	P
Pb-214	295.68	30.	-4.	-0.002	385.85	-1.909E-02	P
Ac-228	338.09	22.	-4.	-0.002	324.53	-3.291E-02	
Pb-214	351.75	43.	-10.	-0.004	857.93	-2.519E-02	P

Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM	
Pa-234	568.12	8.	1.	0.000	772.76	1.488E-02		
Bi-214	609.28	31.	-4.	-0.001	113.92	-1.119E-02		P
Cs-137	661.63	7.	3.	0.001	279.20	4.765E-03		
Eu-154	723.16	13.	-1.	0.000	867.33	-8.936E-03		
Eu-152	779.29	5.	2.	0.001	362.09	2.306E-02		
Bi-212	785.65	14.	-4.	-0.001	319.27	-5.108E-01		
Tl-208	860.70	12.	1.	0.000	788.93	1.755E-02		
Eu-154	873.95	7.	1.	0.001	560.85	1.917E-02		
Pa-234	883.71	9.	-2.	-0.001	381.51	-4.284E-02		
Ac-228	911.62	10.	3.	0.001	324.24	2.021E-02		
Eu-152	964.08	13.	-2.	-0.001	583.77	-2.316E-02		
Eu-152	1112.56	8.	5.	0.002	179.59	7.913E-02		
Eu-154	1273.31	7.	-1.	0.000	949.66	-5.238E-03		
Co-60	1332.05	6.	1.	0.000	1071.00	1.550E-03		
K-40	1461.31	21.	-3.	-0.001	103.56	-6.847E-02		P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#A	2.0209E-02	2.0209E-02	6.5527E-02	6.5544E-02	5.044E-02
Am-241	#A	-1.1839E-03	-1.1840E-03	9.8841E-02	9.8841E-02	8.130E-02
Bi-212	#A	3.1016E-04	3.1016E-04	2.4063E-01	2.4063E-01	1.982E-01
Bi-214	#A	-1.1185E-02	-1.1185E-02	6.4029E-02	6.4031E-02	3.814E-02
Co-60	#A	1.5360E-03	1.5499E-03	1.6599E-02	1.6599E-02	1.331E-02
Cs-137	#A	4.7572E-03	4.7647E-03	1.3303E-02	1.3305E-02	9.929E-03
Eu-152	#A	2.0128E-02	2.0198E-02	3.6273E-02	3.6286E-02	2.607E-02
Eu-154	#A	1.9070E-02	1.9175E-02	1.0754E-01	1.0755E-01	8.433E-02
K-40	#A	-6.8466E-02	-6.8466E-02	3.8894E-01	3.8896E-01	2.564E-01
Pa-234	#A	6.6203E-03	6.6203E-03	5.1159E-02	5.1186E-02	3.795E-02
Pb-212	#A	-7.5122E-03	-7.5122E-03	1.9524E-01	1.9524E-01	2.213E-02
Pb-214	#A	-2.5187E-02	-2.5188E-02	4.7311E-01	4.7311E-01	3.896E-02
Ra-226	#	2.0767E-01	2.0767E-01	2.7841E-01	2.7867E-01	2.061E-01
Th-234	#A	0.0000E+00	0.0000E+00	6.2949E-01	6.2950E-01	6.803E-01
Tl-208	#A	-4.2224E-03	-4.2224E-03	3.3312E-02	3.3313E-02	1.631E-02
U-235	#A	6.1961E-02	6.1961E-02	1.0120E-01	1.0127E-01	7.749E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
-----------------------------   S U M M A R Y   -----------------------------
Total Activity (   25.0 to  2035.6 keV)     0.000E+00  pCi/g
Total Decayed Activity (   25.0 to  2035.6 keV) 0.0000000E+00  pCi/g


The library has energies which are not separable.
```

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/27/2014 08:20:30
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_008.An1

Sample description
     QC723787, 207004, BLANK


Spectrum Filename: C:\User\SPC\Det4\4_20140124_008.An1

Acquisition information
       Start time:                 1/24/2014 11:49:08
       Live time:               2700
       Real time:               2706
       Dead time:                  0.24 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.2366E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.2366E+02) =
                                   8.3504E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/27/2014 08:20:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:40:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 5.00E+01 %

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc

No unknown peaks passed sensitivity test.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Ac-228	373.35	93.35	32.	1.	0.000	1813.47	0.843D
U-235	373.35	93.35	32.	1.	0.000	1813.47	0.843D
Eu-152	487.66	121.95	36.	4.	0.002	409.57	0.870s
Pa-234	524.11	131.07	23.	1.	0.000	1935.30	0.879s
U-235	576.65	144.21	35.	11.	0.004	163.33	0.891s
U-235	653.70	163.49	30.	1.	0.000	1648.60	0.910s
U-235	739.66	184.99	33.	3.	0.001	572.68	0.931s
Ra-226	748.91	187.31	24.	12.	0.004	134.06	0.932s
Pb-214	964.82	241.32	39.	-11.	-0.004	276.88	0.985s
Tl-208	1108.44	277.24	22.	-2.	-0.001	605.54	1.018s
Pb-214	1182.16	295.68	30.	-4.	-0.002	385.85	1.035s
Ac-228	1351.71	338.09	22.	-4.	-0.002	324.53	1.075s
Pb-214	1406.30	351.75	43.	-10.	-0.004	857.93	1.088s
Pa-234	2271.47	568.12	8.	1.	0.000	772.76	1.286s
Bi-214	2436.07	609.28	31.	-4.	-0.001	113.92	1.322s
Cs-137	2645.41	661.63	7.	3.	0.001	279.20	1.368s
Eu-154	2891.50	723.16	13.	-1.	0.000	867.33	1.422s
Eu-152	3115.99	779.29	5.	2.	0.001	362.09	1.471s

ORTEC g v - i (3263) Env32 G53W4.26 1/27/2014 08:20:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-212	3141.44	785.65	14.	-4.	-0.001	319.27	1.476s
Tl-208	3441.63	860.70	12.	1.	0.000	788.93	1.541s
Eu-154	3494.65	873.95	7.	1.	0.001	560.85	1.551s
Pa-234	3533.69	883.71	9.	-2.	-0.001	381.51	1.560s
Ac-228	3645.31	911.62	10.	3.	0.001	324.24	1.584s
Eu-152	3855.20	964.08	13.	-2.	-0.001	583.77	1.628s
Eu-152	4449.22	1112.56	8.	5.	0.002	179.59	1.750s
Eu-154	5092.47	1273.31	7.	-1.	0.000	949.66	1.880s
Co-60	5327.53	1332.05	6.	1.	0.000	1071.00	1.926s
K-40	5844.88	1461.31	21.	-3.	-0.001	103.56	2.024s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.0209E-02					5.12E+12
			911.20	2.021E-02	&(	5.044E-02 1.62E+02	2.62E+01 G
			968.96	0.000E+00	-	2.706E-02 1.00E+03	1.59E+01 G
			338.32	-3.291E-02	+	8.396E-02 1.62E+02	1.14E+01 G
							Energy duplication
			93.35	1.703E-02	&	2.527E-01 9.07E+02	4.10E+00 XA
Am-241	I	-1.1840E-03					1.58E+05
			59.54	-1.184E-03	%(	8.130E-02 4.17E+03	3.59E+01 G
Bi-212	N	3.1016E-04					5.12E+12
			727.33	3.102E-04	%(	1.982E-01 3.88E+04	6.65E+00 G
			785.37	-5.108E-01	+	1.267E+00 1.60E+02	1.11E+00 G
			1620.74	0.000E+00	-	4.231E-01 1.00E+03	1.51E+00 G
Bi-214	N	-1.1185E-02					5.84E+05
			609.31	-1.119E-02	?(P	3.814E-02 5.70E+01	4.55E+01 G
			1120.29	-6.976E-02	% P	1.313E-01 1.00E+03	1.49E+01 G
			1764.49	-7.782E-02	% P	2.273E-01 1.00E+03	1.53E+01 G
Co-60	T	1.5499E-03					1.93E+03
			1332.49	1.550E-03	?(	1.331E-02 5.36E+02	1.00E+02 G
			1173.23	0.000E+00	-	1.708E-02 1.00E+03	9.98E+01 G
Cs-137	I	4.7647E-03					1.10E+04
			661.66	4.765E-03	?(	9.929E-03 1.40E+02	8.50E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/27/2014 08:20:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Eu-152	I	2.0198E-02					4.94E+03	
			344.28	3.534E-04	&(	2.607E-02	4.49E+03	2.66E+01 G
			121.78	9.648E-03	&(	3.163E-02	2.05E+02	2.84E+01 G
			778.90	2.306E-02	?(	6.296E-02	1.81E+02	1.30E+01 G
			964.08	-2.316E-02	+	1.077E-01	2.92E+02	1.45E+01 G
			1112.08	7.913E-02	&(	1.021E-01	8.98E+01	1.34E+01 G
			1408.01	0.000E+00	-	2.740E-02	1.00E+03	2.09E+01 G
Eu-154	I	1.9175E-02					3.14E+03	
			873.18	1.917E-02	?(	8.433E-02	2.80E+02	1.22E+01 G
			123.07	0.000E+00	-	2.399E-02	1.00E+03	4.04E+01 G
			1274.43	-5.238E-03	+	3.983E-02	4.75E+02	3.49E+01 G
			723.30	-8.936E-03	+	6.240E-02	4.34E+02	2.00E+01 G
			1004.72	-9.703E-04	%	6.008E-02	3.77E+03	1.79E+01 G
			996.25	3.128E-03	%	1.133E-01	2.21E+03	1.05E+01 G
K-40	N	-6.8466E-02					4.57E+11	
			1460.82	-6.847E-02	?(P	2.564E-01	5.18E+01	1.06E+01 G
Pa-234	N	6.6203E-03					1.63E+12	
			131.30	2.399E-03	?(	3.795E-02	9.68E+02	1.82E+01 G
			569.50	1.488E-02	?(	9.178E-02	3.86E+02	9.30E+00 G
			946.00	0.000E+00	-	3.133E-02	1.00E+03	1.35E+01 G
			880.52	0.000E+00	-	1.572E-01	1.00E+03	1.05E+01 G
			883.24	-4.284E-02	+	1.267E-01	1.91E+02	9.70E+00 G
Pb-212	N	-7.5122E-03					5.12E+12	
			238.63	-7.512E-03	%(P	2.213E-02	5.68E+02	4.36E+01 G
			300.09	-3.914E-02	% P	3.059E-01	1.00E+03	3.18E+00 G
Pb-214	N	-2.5188E-02					5.84E+05	
			351.93	-2.519E-02	?(P	3.896E-02	4.29E+02	3.56E+01 G
			295.22	-1.909E-02	+ P	5.643E-02	1.93E+02	1.84E+01 G
			242.00	-1.059E-01	+ P	1.444E-01	1.38E+02	7.27E+00 G
Ra-226	N	2.0767E-01					5.84E+05	
			186.21	2.077E-01	?(	2.061E-01	6.70E+01	3.56E+00 G
Tl-208	N	-4.2224E-03					5.12E+12	
			583.19	-7.399E-03	%(P	1.631E-02	4.49E+02	8.50E+01 G
			277.37	-2.903E-02	+ P	1.294E-01	3.03E+02	6.60E+00 G
			860.53	1.755E-02	?(	1.112E-01	3.94E+02	1.24E+01 G
U-235	N	6.1961E-02					2.57E+11	
			143.77	6.196E-02	&(	7.749E-02	8.17E+01	1.09E+01 G
			205.32	0.000E+00	&	1.892E-01	1.00E+03	5.02E+00 G
			163.36	1.158E-02	-	1.561E-01	8.24E+02	5.08E+00 G

ORTEC g v - i (3263) Env32 G53W4.26 1/27/2014 08:20:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		185.72	3.225E-03	&	1.489E-02	2.86E+02	5.70E+01 G Energy duplication
		93.35	1.212E-02	&	1.798E-01	9.07E+02	5.76E+00 X

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Ac-228	93.35	32.	1.	0.000	1813.47	1.703E-02	
U-235	93.35	32.	1.	0.000	1813.47	1.212E-02	
Eu-152	121.95	36.	4.	0.002	409.57	9.648E-03	
Pa-234	131.07	23.	1.	0.000	1935.30	2.399E-03	
U-235	144.21	35.	11.	0.004	163.33	6.196E-02	
U-235	163.49	30.	1.	0.000	1648.60	1.158E-02	
U-235	184.99	33.	3.	0.001	572.68	3.225E-03	
Ra-226	187.31	24.	12.	0.004	134.06	2.077E-01	
Pb-214	241.32	39.	-11.	-0.004	276.88	-1.059E-01	P
Tl-208	277.24	22.	-2.	-0.001	605.54	-2.903E-02	P
Pb-214	295.68	30.	-4.	-0.002	385.85	-1.909E-02	P
Ac-228	338.09	22.	-4.	-0.002	324.53	-3.291E-02	
Pb-214	351.75	43.	-10.	-0.004	857.93	-2.519E-02	P

ORTEC g v - i (3263) Env32 G53W4.26 1/27/2014 08:20:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_008.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM	
Pa-234	568.12	8.	1.	0.000	772.76	1.488E-02		
Bi-214	609.28	31.	-4.	-0.001	113.92	-1.119E-02		P
Cs-137	661.63	7.	3.	0.001	279.20	4.765E-03		
Eu-154	723.16	13.	-1.	0.000	867.33	-8.936E-03		
Eu-152	779.29	5.	2.	0.001	362.09	2.306E-02		
Bi-212	785.65	14.	-4.	-0.001	319.27	-5.108E-01		
Tl-208	860.70	12.	1.	0.000	788.93	1.755E-02		
Eu-154	873.95	7.	1.	0.001	560.85	1.917E-02		
Pa-234	883.71	9.	-2.	-0.001	381.51	-4.284E-02		
Ac-228	911.62	10.	3.	0.001	324.24	2.021E-02		
Eu-152	964.08	13.	-2.	-0.001	583.77	-2.316E-02		
Eu-152	1112.56	8.	5.	0.002	179.59	7.913E-02		
Eu-154	1273.31	7.	-1.	0.000	949.66	-5.238E-03		
Co-60	1332.05	6.	1.	0.000	1071.00	1.550E-03		
K-40	1461.31	21.	-3.	-0.001	103.56	-6.847E-02		P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#A	2.0209E-02	2.0209E-02	6.5527E-02	6.5544E-02	5.044E-02
Am-241	#A	-1.1839E-03	-1.1840E-03	9.8841E-02	9.8841E-02	8.130E-02
Bi-212	#A	3.1016E-04	3.1016E-04	2.4063E-01	2.4063E-01	1.982E-01
Bi-214	#A	-1.1185E-02	-1.1185E-02	6.4029E-02	6.4031E-02	3.814E-02
Co-60	#A	1.5360E-03	1.5499E-03	1.6599E-02	1.6599E-02	1.331E-02
Cs-137	#A	4.7572E-03	4.7647E-03	1.3303E-02	1.3305E-02	9.929E-03
Eu-152	#A	2.0128E-02	2.0198E-02	3.6273E-02	3.6286E-02	2.607E-02
Eu-154	#A	1.9070E-02	1.9175E-02	1.0754E-01	1.0755E-01	8.433E-02
K-40	#A	-6.8466E-02	-6.8466E-02	3.8894E-01	3.8896E-01	2.564E-01
Pa-234	#A	6.6203E-03	6.6203E-03	5.1159E-02	5.1186E-02	3.795E-02
Pb-212	#A	-7.5122E-03	-7.5122E-03	1.9524E-01	1.9524E-01	2.213E-02
Pb-214	#A	-2.5187E-02	-2.5188E-02	4.7311E-01	4.7311E-01	3.896E-02
Ra-226	#	2.0767E-01	2.0767E-01	2.7841E-01	2.7867E-01	2.061E-01
Th-234	#A	0.0000E+00	0.0000E+00	6.2949E-01	6.2950E-01	6.803E-01
Tl-208	#A	-4.2224E-03	-4.2224E-03	3.3312E-02	3.3313E-02	1.631E-02
U-235	#A	6.1961E-02	6.1961E-02	1.0120E-01	1.0127E-01	7.749E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/27/2014 08:20:30
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_008.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.6 keV)     0.000E+00  pCi/g
 Total Decayed Activity (   25.0 to  2035.6 keV) 0.0000000E+00  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS BLANK USER REPORT FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst	: HPGE04	Lab ID	: QC723801		
Seqnum	: 1534034952012.2	Matrix	: Soil		
File	: 4_20140124_012	Batch	: 207008	Time	: 24-JAN-2014 15:21
Cal	: 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13	Caldate	: 24-JAN-2014, 05-MAR-2013		
IDF	: 1.0			Units	: pCi/g
PDF	: 1.0	Sample Amount	: 323.66 g	Live Time	: 2700 sec
				Dead Time	: 0.26 %

Analyte	Result	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Flags
Americium-241	-0.0217	0.0679		.085508	.085523	u
Bismuth-212	0.100	0.144		.17966	.17973	u
Bismuth-214	-0.0144	0.0393		.077363	.077366	u
Cesium-137	0	0.0138	0.07	.0033259	.0033259	u
Cobalt-60	0.000975	0.0136		.016729	.016729	u
Europium-152	0.00723	0.0453		.031297	.031299	u
Europium-154	0.00321	0.114		.040797	.040797	u
Lead-212	-0.00760	0.0242		.10992	.10992	u
Lead-214	0.00745	0.0334		.037631	.037632	u
Potassium-40	-0.0864	0.260		.44446	.44448	u
Protactinium-234	0.00297	0.0533		.012993	.013014	u
Radium-226 (By Bismuth-214)	-0.0144	0.0393	0.2	.077363	.077366	u
Thallium-208	-0.00747	0.0157		.14853	.14853	u
Thorium-232 (By Actinium-228)	0.0237	0.0463		.030497	.030545	u
Thorium-234	0.242	0.509		.65286	.65326	u
Uranium-235	0.0626	0.0609		.079929	.08002	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: Prep Blank
Sample Description: QC723801, 207008, BLANK

Detector: HPGE04 51-TP32733A
Spectrum ID: 4_20140124_012
Contract: Tetra Tech EC
Sample Type: SAMPLE
Unit Number: BLANK
Matrix: S
Sample Time: 12/30/2013 14:40
Live Time: 2700 sec
Acquisition Time: 1/24/2014 15:21:54
Real Time: 2707 sec
Analysis Time: 1/24/2014 16:07
Dead Time: 0.26 %
Analysis Quantity: 3.237E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#AB	2.373E-02	3.050E-02	3.055E-02	4.632E-02
Am-241	#AB	-2.173E-02	8.551E-02	8.552E-02	6.787E-02
Bi-212	#AB	9.998E-02	1.797E-01	1.797E-01	1.436E-01
Bi-214	#AB	-1.443E-02	7.736E-02	7.737E-02	3.934E-02
Co-60	#AB	9.748E-04	1.673E-02	1.673E-02	1.355E-02
Cs-137	#AB	0.000E+00	3.326E-03	3.326E-03	1.375E-02
Eu-152	#AB	7.228E-03	3.130E-02	3.130E-02	4.527E-02
Eu-154	#AB	3.213E-03	4.080E-02	4.080E-02	1.141E-01
K-40	#AB	-8.635E-02	4.445E-01	4.445E-01	2.601E-01
Pa-234	#AB	2.970E-03	1.299E-02	1.301E-02	5.329E-02
Pb-212	#AB	-7.604E-03	1.099E-01	1.099E-01	2.420E-02
Pb-214	#AB	7.452E-03	3.763E-02	3.763E-02	3.342E-02
Ra-226	#AB	5.903E-02	2.308E-01	2.309E-01	1.824E-01
Th-234	#AB	2.418E-01	6.529E-01	6.533E-01	5.087E-01
Tl-208	#AB	-7.474E-03	1.485E-01	1.485E-01	1.569E-02
U-235	#	6.265E-02	7.993E-02	8.002E-02	6.090E-02

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 5.090E-01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 16:07:07
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_012.An1

Sample description
     QC723801, 207008, BLANK


Spectrum Filename: C:\User\SPC\Det4\4_20140124_012.An1

Acquisition information
       Start time:                1/24/2014 15:21:54
       Live time:              2700
       Real time:              2707
       Dead time:                 0.26 %
       Detector ID:                   4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                  4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:44:12
            Zero offset:         -0.059 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:              3/5/2013 18:53:13
            Type:                 Polynomial
            Uncertainty:          1.349 %
            Coefficients:        -0.377104  -4.127613   0.443802
                                 -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.96keV )
       Stop channel:           8144 (  2035.56keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.2366E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.2366E+02) =
                                  8.3504E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 16:07:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_012.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:40:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 3 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc

No unknown peaks passed sensitivity test.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	238.89	59.71	23.	-4.	-0.001	393.46	0.810s
Th-234	251.36	62.83	22.	5.	0.002	270.02	0.813s
Th-234	369.22	92.32	40.	-6.	-0.002	296.41	0.842s
Eu-152	485.44	121.40	30.	-4.	-0.001	444.57	0.870s
Pa-234	526.43	131.65	45.	-3.	-0.001	622.43	0.879s
U-235	573.00	143.30	22.	8.	0.003	174.07	0.891s
U-235	653.78	163.51	24.	8.	0.003	186.58	0.910s
Ra-226	737.10	184.35	19.	3.	0.001	391.06	0.932s
U-235	821.55	205.48	29.	-1.	0.000	1192.91	0.950s
Pb-214	967.07	241.88	38.	-7.	-0.003	568.46	0.985s
Tl-208	1107.52	277.01	29.	-2.	-0.001	767.93	1.018s
Pb-214	1187.89	297.12	23.	-4.	-0.001	266.16	1.035s
Pb-212	1205.66	301.56	18.	1.	0.000	504.06	1.040s
Ac-228	1356.72	339.35	19.	1.	0.000	1400.80	1.075s
Pb-214	1406.19	351.72	32.	3.	0.001	100.59	1.088s
Pa-234	2266.36	566.84	15.	-3.	-0.001	357.77	1.286s
Tl-208	2333.94	583.74	20.	-5.	-0.002	885.52	1.299s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 16:07:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Bi-214	2435.34	609.10	33.	-5.	-0.002	130.12	1.322s
Eu-154	2892.44	723.39	11.	-2.	-0.001	466.11	1.422s
Eu-152	3112.84	778.50	9.	1.	0.000	1539.94	1.471s
Bi-212	3133.89	783.76	7.	5.	0.002	179.70	1.476s
Tl-208	3425.79	856.74	5.	0.	0.000	1458.85	1.541s
Pa-234	3783.08	946.05	11.	2.	0.001	614.85	1.613s
Eu-152	3852.19	963.33	5.	2.	0.001	433.02	1.628s
Ac-228	3881.23	970.59	5.	6.	0.002	128.54	1.632s
Eu-154	3981.35	995.61	12.	-3.	-0.001	301.86	1.655s
Eu-154	5090.74	1272.88	8.	1.	0.000	1269.84	1.880s
Co-60	5333.52	1333.54	6.	0.	0.000	1716.19	1.926s
K-40	5843.27	1460.91	22.	-4.	-0.001	112.96	2.024s
Bi-212	6493.92	1623.46	10.	-2.	-0.001	394.94	2.144s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	2.3726E-02				5.12E+12	
			911.20	0.000E+00	?(	4.632E-02 1.00E+03	2.62E+01 G
			968.96	7.485E-02	?(	6.263E-02 6.43E+01	1.59E+01 G
			338.32	6.949E-03	&(	7.928E-02 7.00E+02	1.14E+01 G Energy duplication
			93.35	0.000E+00	-	2.906E-01 1.00E+03	4.10E+00 XA
Am-241	I	-2.1732E-02				1.58E+05	
			59.54	-2.173E-02	?(	6.787E-02 1.97E+02	3.59E+01 G
Bi-212	N	9.9979E-02				5.12E+12	
			727.33	0.000E+00	?(	1.436E-01 1.00E+03	6.65E+00 G
			785.37	6.990E-01	?(	8.936E-01 8.98E+01	1.11E+00 G
			1620.74	-4.399E-01	+	1.353E+00 1.97E+02	1.51E+00 G
Bi-214	N	-1.4433E-02				5.84E+05	
			609.31	-1.443E-02	(P	3.934E-02 6.51E+01	4.55E+01 G
			1120.29	-6.057E-02	% P	1.388E-01 7.93E+02	1.49E+01 G
			1764.49	1.922E-03	% P	1.206E-01 7.83E+01	1.53E+01 G
Co-60	T	9.7476E-04				1.93E+03	
			1332.49	9.748E-04	?(	1.355E-02 8.58E+02	1.00E+02 G
			1173.23	-1.566E-04	%	9.610E-03 3.74E+03	9.98E+01 G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 16:07:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_012.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Eu-152	I	7.2276E-03					4.94E+03	
			344.28	0.000E+00	?(	4.527E-02	1.00E+03	2.66E+01 G
			121.78	-8.033E-03	+	2.857E-02	2.22E+02	2.84E+01 G
			778.90	6.841E-03	?(	8.547E-02	7.70E+02	1.30E+01 G
			964.08	2.083E-02	?(	6.928E-02	2.17E+02	1.45E+01 G
			1112.08	1.669E-03	%	1.019E-01	3.72E+03	1.34E+01 G
			1408.01	0.000E+00	-	1.068E-01	1.00E+03	2.09E+01 G
Eu-154	I	3.2128E-03					3.14E+03	
			873.18	4.454E-04	%(	1.141E-01	1.56E+04	1.22E+01 G
			123.07	-8.337E-04	&	1.772E-02	1.30E+03	4.04E+01 G
			1274.43	4.178E-03	?(	4.285E-02	6.35E+02	3.49E+01 G
			723.30	-1.600E-02	+	5.872E-02	2.33E+02	2.00E+01 G
			1004.72	0.000E+00	-	2.486E-02	1.00E+03	1.79E+01 G
			996.25	-6.216E-02	+	1.444E-01	1.51E+02	1.05E+01 G
K-40	N	-8.6351E-02					4.57E+11	
			1460.82	-8.635E-02	?(P	2.601E-01	5.65E+01	1.06E+01 G
Pa-234	N	2.9702E-03					1.63E+12	
			131.30	-1.057E-02	?(	5.329E-02	3.11E+02	1.82E+01 G
			569.50	-4.386E-02	&	1.228E-01	1.79E+02	9.30E+00 G
			946.00	2.123E-02	?(	1.039E-01	3.07E+02	1.35E+01 G
			880.52	8.562E-04	%	1.152E-01	8.18E+03	1.05E+01 G
			883.24	0.000E+00	-	1.708E-01	1.00E+03	9.70E+00 G
Pb-212	N	-7.6043E-03					5.12E+12	
			238.63	-9.687E-03	&(P	2.420E-02	1.00E+03	4.36E+01 G
			300.09	2.096E-02	?(P	2.521E-01	2.52E+02	3.18E+00 G
Pb-214	N	7.4519E-03					5.84E+05	
			351.93	7.452E-03	?(P	3.342E-02	5.03E+01	3.56E+01 G
			295.22	-1.564E-02	& P	4.895E-02	1.33E+02	1.84E+01 G
			242.00	-7.257E-02	& P	1.411E-01	2.84E+02	7.27E+00 G
Ra-226	N	5.9027E-02					5.84E+05	
			186.21	5.903E-02	&(	1.824E-01	1.96E+02	3.56E+00 G
Th-234	N	2.4179E-01					1.63E+12	
			63.30	2.418E-01	?(	5.087E-01	1.35E+02	3.75E+00 G
			92.59	-1.140E-01	-	2.681E-01	1.48E+02	4.34E+00 G
Tl-208	N	-7.4742E-03					5.12E+12	
			583.19	-7.474E-03	?(P	1.569E-02	4.43E+02	8.50E+01 G
			277.37	-2.603E-02	+ P	1.464E-01	3.84E+02	6.60E+00 G
			860.53	-6.266E-03	+	7.374E-02	7.29E+02	1.24E+01 G

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 16:07:07
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_012.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

U-235    N   6.2647E-02                                      2.57E+11
                           143.77 4.634E-02 &(  6.090E-02 8.70E+01 1.09E+01 G
                           205.32-1.706E-02 -   1.658E-01 5.96E+02 5.02E+00 G
                           163.36 9.777E-02 ?(  1.391E-01 9.33E+01 5.08E+00 G
                           185.72 0.000E+00 -   2.117E-02 1.00E+03 5.70E+01 G
                                                                Energy duplication
                            93.35 0.000E+00 -   2.068E-01 1.00E+03 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
```

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.71	23.	-4.	-0.001	393.46	-2.173E-02
Th-234	62.83	22.	5.	0.002	270.02	2.418E-01
Th-234	92.32	40.	-6.	-0.002	296.41	-1.140E-01
Eu-152	121.40	30.	-4.	-0.001	444.57	-8.033E-03
Pa-234	131.65	45.	-3.	-0.001	622.43	-1.057E-02
U-235	143.30	22.	8.	0.003	174.07	4.634E-02
U-235	163.51	24.	8.	0.003	186.58	9.777E-02
U-235	205.48	29.	-1.	0.000	1192.91	-1.706E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 16:07:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_012.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM	
Tl-208	277.01	29.	-2.	-0.001	767.93	-2.603E-02		P
Pb-212	301.56	18.	1.	0.000	504.06	2.096E-02		P
Ac-228	339.35	19.	1.	0.000	1400.80	6.949E-03		
Pa-234	566.84	15.	-3.	-0.001	357.77	-4.386E-02		
Tl-208	583.74	20.	-5.	-0.002	885.52	-7.474E-03		P
Bi-214	609.10	33.	-5.	-0.002	130.12	-1.443E-02		P
Eu-154	723.39	11.	-2.	-0.001	466.11	-1.600E-02		
Eu-152	778.50	9.	1.	0.000	1539.94	6.841E-03		
Bi-212	783.76	7.	5.	0.002	179.70	6.990E-01		
Tl-208	856.74	5.	0.	0.000	1458.85	-6.266E-03		
Pa-234	946.05	11.	2.	0.001	614.85	2.123E-02		
Eu-152	963.33	5.	2.	0.001	433.02	2.083E-02		
Ac-228	970.59	5.	6.	0.002	128.54	7.485E-02		
Eu-154	995.61	12.	-3.	-0.001	301.86	-6.216E-02		
Eu-154	1272.88	8.	1.	0.000	1269.84	4.178E-03		
Co-60	1333.54	6.	0.	0.000	1716.19	9.748E-04		
K-40	1460.91	22.	-4.	-0.001	112.96	-8.635E-02		P
Bi-212	1623.46	10.	-2.	-0.001	394.94	-4.399E-01		

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	#A	2.3726E-02	2.3726E-02	3.0497E-02	3.0545E-02	4.632E-02
Am-241	#A	-2.1730E-02	-2.1732E-02	8.5508E-02	8.5523E-02	6.787E-02
Bi-212	#A	9.9979E-02	9.9979E-02	1.7966E-01	1.7973E-01	1.436E-01
Bi-214	#A	-1.4433E-02	-1.4433E-02	7.7363E-02	7.7366E-02	3.934E-02
Co-60	#A	9.6601E-04	9.7476E-04	1.6729E-02	1.6729E-02	1.355E-02
Cs-137	#A	0.0000E+00	0.0000E+00	3.3259E-03	3.3259E-03	1.375E-02
Eu-152	#A	7.2022E-03	7.2276E-03	3.1297E-02	3.1299E-02	4.527E-02
Eu-154	#A	3.1951E-03	3.2128E-03	4.0797E-02	4.0797E-02	1.141E-01
K-40	#A	-8.6351E-02	-8.6351E-02	4.4446E-01	4.4448E-01	2.601E-01
Pa-234	#A	2.9702E-03	2.9702E-03	1.2993E-02	1.3014E-02	5.329E-02
Pb-212	#A	-7.6043E-03	-7.6043E-03	1.0992E-01	1.0992E-01	2.420E-02
Pb-214	#A	7.4517E-03	7.4519E-03	3.7631E-02	3.7632E-02	3.342E-02
Ra-226	#A	5.9025E-02	5.9027E-02	2.3083E-01	2.3086E-01	1.824E-01
Th-234	#A	2.4179E-01	2.4179E-01	6.5286E-01	6.5326E-01	5.087E-01
Tl-208	#A	-7.4742E-03	-7.4742E-03	1.4853E-01	1.4853E-01	1.569E-02
U-235	#C	6.2647E-02	6.2647E-02	7.9929E-02	8.0020E-02	6.090E-02

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 16:07:07
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_012.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.6 keV)     0.000E+00  pCi/g
 Total Decayed Activity (   25.0 to  2035.6 keV) 0.0000000E+00  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SPIKE USER REPORT FOR 251449 RAD-IG Soil
DOE HASL 300 4.5.2.3

Type : LCS
Inst : HPGE02
Seqnum : 1514034951011.1
File : 2_20140124_011
IDF : 1.0
PDF : 1.0
Lab ID : QC723788
Matrix : Soil
Batch : 207004
Time : 24-JAN-2014 14:28
Sample Amount : 330.03 g
Live Time : 2700 sec
Dead Time : 0.21 %
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58
Units : pCi/g

Analyte	Spiked	LCS	%Rec	Limits	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Flags
Radium-226 (By Bismuth-214)	13.00	11.91	92	75-125	.40897	.72282	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: LCS
Sample Description: QC723788, 207004, LCS, S19706

Detector: HPGE02 50-TP42234A
Spectrum ID: 2_20140124_011
Contract: Tetra Tech EC
Sample Type: SAMPLE
Unit Number: LCS
Matrix: S
Sample Time: 12/30/2013 14:35
Live Time: 2700 sec
Acquisition Time: 1/24/2014 14:28:00
Real Time: 2706 sec
Analysis Time: 1/24/2014 15:13
Dead Time: 0.21 %
Analysis Quantity: 3.300E+02 g

Efficiency: HPGE02 S23325 2_20140106002_EffCal RA226
Efficiency Cal Date: 1/7/2014 11:47
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		9.072E-01	2.359E-01	2.454E-01	1.128E-01
Am-241	#AB	7.304E-02	4.029E-01	4.030E-01	3.304E-01
Bi-212		2.749E+00	9.113E-01	9.239E-01	5.694E-01
Bi-214		1.191E+01	4.090E-01	7.228E-01	9.193E-02
Co-60	#AB	2.337E-02	3.289E-02	3.290E-02	3.649E-02
Cs-137	#AB	4.858E-03	6.043E-02	6.043E-02	4.956E-02
Eu-152	#	3.256E-01	9.699E-02	9.842E-02	1.688E-01
Eu-154	#AB	1.900E-01	2.056E-01	2.059E-01	3.401E-01
K-40	#	8.355E+00	1.070E+00	1.149E+00	4.112E-01
Pa-234	#AB	5.278E-02	2.308E-01	2.312E-01	2.153E-01
Pb-212		5.935E-01	1.295E-01	1.366E-01	8.512E-02
Pb-214		1.419E+01	3.748E-01	8.037E-01	1.241E-01
Ra-226		1.359E+01	1.776E+00	1.939E+00	1.081E+00
Th-234	AB	1.026E+00	1.371E+00	1.374E+00	2.653E+00
Tl-208		2.225E-01	6.563E-02	6.733E-02	3.910E-02
U-235	#	6.756E-01	9.009E-02	9.898E-02	3.540E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 5.489E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 15:13:13
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_011.An1

Sample description
     QC723788, 207004, LCS, S19706


Spectrum Filename: C:\User\SPC\Det2\2_20140124_011.An1

Acquisition information
       Start time:                 1/24/2014 14:28:00
       Live time:               2700
       Real time:               2706
       Dead time:                  0.21 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:               1/24/2014 06:52:16
            Zero offset:           0.026 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/7/2014 11:47:58
            Type:                  Polynomial
            Uncertainty:           1.734 %
            Coefficients:         -0.360765  -4.056690   0.335194
                                  -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.06keV )
       Stop channel:            8144 (  2035.12keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                3.3003E+02
       Activity scaling factor:    1.0000E+00/(  3.7000E-02*  3.3003E+02) =
                                   8.1893E-02
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 15:13:13
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_011.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:35:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	2_2014-01-08_0518.PBC 1/8/2014 05:18:15
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 23 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1038

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.62	79.	26.58	0.93	0.000E+00				
59.49	14.	275.83	0.83	1.629E-02	59.54	35.920	PBC<MDA	Am241
63.71	39.	105.89	0.83	2.025E-02	63.30	3.750	PBC<MDA	Th234
74.84	813.	5.96	0.84	3.156E-02				
77.30	1437.	3.69	0.85	3.366E-02				
79.64	75.	47.80	0.85	3.553E-02				
87.36	551.	7.32	0.86	4.076E-02				
90.16	175.	19.73	0.86	4.233E-02				
92.64	36.	81.61	0.86	4.359E-02	92.59	4.343	PBC<MDA	Th234
					93.35	5.760	4.355E-01	U235
93.28	80.	48.08	0.86	4.394E-02	93.35	4.100	1.293E+00	Ac228
					93.35	5.760	9.542E-01	U235
93.40	68.	47.14	0.86	4.394E-02	93.35	4.100	1.144E+00	Ac228
					93.35	5.760	PBC<MDA	U235
106.66	30.	87.61	0.40	4.848E-02				
122.33	13.	300.95	0.89	5.061E-02	121.78	28.410	PBC<MDA	Eu152
					123.07	40.400	1.975E-02	Eu154
					121.78	28.410	2.807E-02	Eu152
124.92	13.	146.23	0.00	5.077E-02				
130.92	18.	218.68	0.90	5.088E-02	131.30	18.200	PBC<MDA	Pa234
					131.30	18.200	6.010E-02	Pa234
143.19	33.	118.64	0.92	5.047E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	1.831E-01	U235
163.71	20.	210.68	0.94	4.882E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	2.442E-01	U235
186.26	737.	6.53	0.81	4.627E-02	185.72	57.000	8.464E-01	U235
					186.21	3.555	1.359E+01	Ra226

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 15:13:13
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_011.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
					185.72	57.000	8.464E-01	U235
205.23	28.	133.11	0.98	4.406E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	3.794E-01	U235
238.73	391.	8.68	1.01	4.043E-02	238.63	43.600	6.597E-01	Pb212
241.99	1325.	3.39	1.02	4.010E-02	242.00	7.268	1.378E+01	Pb214
295.16	3145.	2.14	1.07	3.541E-02	295.22	18.414	1.462E+01	Pb214
299.90	44.	62.11	1.07	3.503E-02	300.09	3.180	1.189E+00	Pb212
313.48	27.	85.69	0.51	3.406E-02				
338.38	74.	32.40	0.43	3.241E-02	338.32	11.400	6.098E-01	Ac228
351.85	5189.	1.54	1.14	3.160E-02	351.93	35.600	1.397E+01	Pb214
583.27	143.	14.03	1.23	2.291E-02	583.19	85.000	2.225E-01	Tl208
609.40	3949.	1.71	1.42	2.230E-02	609.31	45.490	1.178E+01	Bi214
661.26	3.	622.01	1.39	2.119E-02	661.66	84.990	PBC<MDA	Cs137
727.10	29.	55.61	1.44	1.999E-02	727.33	6.650	6.594E-01	Bi212
768.46	370.	7.41	1.37	1.932E-02				
786.04	107.	16.57	1.49	1.907E-02	785.37	1.110	1.527E+01	Bi212
861.11	36.	39.18	1.54	1.801E-02	860.53	12.400	4.951E-01	Tl208
874.51	12.	126.17	1.55	1.785E-02	873.18	12.170	PBC<MDA	Eu154
883.24	2.	723.85	1.56	1.772E-02	883.24	9.700	PBC<MDA	Pa234
					883.24	9.700	3.904E-02	Pa234
911.33	135.	12.77	1.00	1.738E-02	911.20	26.200	9.004E-01	Ac228
934.26	201.	11.32	1.09	1.711E-02				
964.79	26.	61.91	1.61	1.677E-02	964.08	14.500	3.235E-01	Eu152
					964.08	14.500	3.235E-01	Eu152
969.40	80.	24.43	2.01	1.672E-02	968.96	15.900	9.184E-01	Ac228
992.82	14.	77.34	1.64	1.643E-02	996.25	10.500	PBC<MDA	Eu154
1006.36	17.	66.78	1.64	1.634E-02	1004.72	17.860	PBC<MDA	Eu154
1120.38	924.	3.88	1.66	1.522E-02	1120.29	14.910	1.230E+01	Bi214
1173.26	9.	111.51	1.74	1.477E-02	1173.23	99.850	PBC<MDA	Co60
1238.11	378.	6.44	1.64	1.424E-02				
1331.43	12.	85.79	1.83	1.354E-02	1332.49	99.983	PBC<MDA	Co60
1377.67	246.	10.04	1.45	1.322E-02				
1408.06	103.	14.90	1.87	1.302E-02	1408.01	20.850	1.157E+00	Eu152
					1408.01	20.850	1.157E+00	Eu152
1460.66	392.	6.02	1.68	1.268E-02	1460.82	10.550	8.355E+00	K40
1509.56	142.	12.29	0.61	1.238E-02				
1729.11	217.	7.60	0.83	1.115E-02				
1764.22	794.	3.66	2.00	1.097E-02	1764.49	15.310	1.428E+01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
122.22	30.62	181.	79.	0.000E+00	53.16	0.926	-
298.82	74.82	1118.	603.	1.911E+04	18.69	0.757	-
308.67	77.29	876.	1228.	3.649E+04	9.02	0.802	-

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 15:13:13
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_011.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
318.01	79.62	501.	22.	6.108E+02	287.67	0.657	TH-227	c
348.67	87.30	664.	580.	1.424E+04	16.06	1.070	-	s
359.85	90.09	557.	142.	3.359E+03	52.00	1.113	-	sM
426.03	106.66	338.	30.	6.106E+02	175.23	0.395	-	sc
499.00	124.92	232.	13.	2.639E+02	292.46	0.000	-	sc
1252.57	313.48	221.	27.	7.927E+02	171.38	0.512	-	sc
3071.85	768.46	107.	370.	1.917E+04	14.83	1.375	BI-214	M
3735.16	934.26	94.	201.	1.177E+04	22.64	1.090	BI-214	s
4951.24	1238.11	53.	378.	2.656E+04	12.89	1.639	BI-214	s
5509.99	1377.67	74.	246.	1.860E+04	20.07	1.451	BI-214	
6038.16	1509.56	38.	142.	1.144E+04	24.58	0.612	BI-214	s
6917.64	1729.11	11.	217.	1.943E+04	15.21	0.831	BI-214	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	237.55	59.49	748.	14.	0.005	551.66	0.827s
Th-234	254.44	63.71	813.	39.	0.014	211.79	0.831s
Th-234	369.81	92.59	422.	36.	0.013	163.21	0.862D
Ac-228	372.86	93.35	524.	68.	0.025	94.29	0.863D
U-235	372.86	93.35	693.	80.	0.029	96.15	0.863D
Eu-152	488.64	122.33	790.	13.	0.005	601.89	0.893s
Pa-234	522.96	130.92	796.	18.	0.007	437.35	0.903s
U-235	571.99	143.19	765.	33.	0.012	237.27	0.915s
U-235	654.00	163.71	875.	20.	0.007	421.36	0.936s
U-235	744.14	186.27	811.	727.	0.269	13.34	0.959
Ra-226	744.11	186.26	633.	737.	0.273	13.07	0.811
U-235	819.90	205.23	664.	28.	0.010	266.23	0.978s
Pb-212	953.81	238.73	451.	345.	0.128	21.38	0.820
Pb-214	966.86	242.00	548.	1263.	0.468	8.37	1.003
Tl-208	1106.62	276.96	563.	-4.	-0.001	1812.09	1.050s
Pb-214	1179.35	295.16	422.	3142.	1.164	4.28	1.071
Pb-212	1198.29	299.90	346.	44.	0.016	124.21	1.072
Ac-228	1352.08	338.38	383.	72.	0.027	80.20	1.109s
Pb-214	1405.92	351.85	390.	5182.	1.919	3.09	1.143
Tl-208	2331.18	583.27	116.	143.	0.053	28.06	1.229
Bi-214	2435.67	609.40	174.	3940.	1.459	3.43	1.416
Cs-137	2643.06	661.26	159.	3.	0.001	1244.01	1.392s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 15:13:13
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_011.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Eu-154	2887.82	722.46	160.	-20.	-0.008	180.26	1.440s
Bi-212	2906.38	727.10	115.	29.	0.011	111.22	1.444
Bi-212	3142.17	786.04	103.	107.	0.039	33.15	1.488
Tl-208	3442.46	861.11	84.	36.	0.014	78.35	1.543
Eu-154	3496.07	874.51	108.	12.	0.004	252.34	1.552s
Pa-234	3520.21	880.54	109.	-9.	-0.003	324.55	1.557s
Pa-234	3531.01	883.24	127.	2.	0.001	1447.70	1.559s
Ac-228	3643.42	911.33	53.	135.	0.050	25.55	0.997s
Pa-234	3786.49	947.09	83.	-9.	-0.003	304.36	1.602s
Eu-152	3857.32	964.79	115.	26.	0.010	123.83	1.614s
Ac-228	3875.77	969.40	88.	80.	0.030	48.86	2.013s
Eu-154	3969.47	992.82	49.	14.	0.005	154.68	1.635s
Eu-154	4023.67	1006.36	54.	17.	0.006	133.56	1.641s
Bi-214	4479.95	1120.38	83.	921.	0.341	7.77	1.657
Co-60	4691.64	1173.26	49.	9.	0.003	223.02	1.744s
Co-60	5324.86	1331.43	48.	12.	0.004	171.59	1.829s
Eu-152	5631.67	1408.06	67.	103.	0.038	29.79	1.866s
K-40	5842.32	1460.66	61.	368.	0.136	12.04	1.677s
Bi-212	6484.07	1620.88	46.	-6.	-0.002	321.40	1.956s
Bi-214	7058.30	1764.22	14.	791.	0.293	7.32	2.001s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	9.0723E-01					5.12E+12
			911.20	9.004E-01	(P	1.128E-01 1.28E+01 2.62E+01	G
			968.96	9.184E-01	(	2.487E-01 2.44E+01 1.59E+01	G
			338.32	5.929E-01	-	3.745E-01 4.01E+01 1.14E+01	G
							Energy duplication
			93.35	1.144E+00	P	8.979E-01 4.71E+01 4.10E+00	XA
Am-241	I	7.3040E-02					1.58E+05
			59.54	7.304E-02	&(	3.304E-01 2.76E+02 3.59E+01	G
Bi-212	N	2.7493E+00					5.12E+12
			727.33	6.594E-01	?(	5.694E-01 5.56E+01 6.65E+00	G
			785.37	1.527E+01	(	3.383E+00 1.66E+01 1.11E+00	G
			1620.74	-1.059E+00	-	2.716E+00 1.61E+02 1.51E+00	G
Bi-214	N	1.1909E+01					5.84E+05
			609.31	1.178E+01	(P	9.193E-02 1.71E+00 4.55E+01	G
			1120.29	1.230E+01	(P	2.844E-01 3.88E+00 1.49E+01	G
			1764.49	1.428E+01	+ P	1.595E-01 3.66E+00 1.53E+01	G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 15:13:13
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_011.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-60	T	2.3374E-02					1.93E+03	
			1332.49	2.740E-02	(	3.649E-02	8.58E+01	1.00E+02 G
			1173.23	1.935E-02	?(	3.398E-02	1.12E+02	9.98E+01 G
Cs-137	I	4.8577E-03					1.10E+04	
			661.66	4.858E-03	?(	4.956E-02	6.22E+02	8.50E+01 G
Eu-152	I	3.2555E-01					4.94E+03	
			344.28	-7.682E-03	&(	1.688E-01	1.34E+03	2.66E+01 G
			121.78	2.807E-02	?(	1.386E-01	3.01E+02	2.84E+01 G
			778.90	0.000E+00	-	3.163E-01	1.00E+03	1.30E+01 G
			964.08	3.235E-01	?(	3.129E-01	6.19E+01	1.45E+01 G
			1112.08	2.988E-03	%	3.394E-01	6.90E+03	1.34E+01 G
			1408.01	1.157E+00	@(	2.132E-01	1.49E+01	2.09E+01 G
Eu-154	I	1.8998E-01					3.14E+03	
			873.18	1.681E-01	&(	3.401E-01	1.26E+02	1.22E+01 G
			123.07	-4.572E-03	&	8.715E-02	1.16E+03	4.04E+01 G
			1274.43	3.224E-03	%	1.139E-01	2.15E+03	3.49E+01 G
			723.30	-1.553E-01	+	2.235E-01	9.01E+01	2.00E+01 G
			1004.72	1.749E-01	&(	1.791E-01	6.68E+01	1.79E+01 G
			996.25	2.410E-01	?(	2.876E-01	7.73E+01	1.05E+01 G
K-40	N	8.3551E+00					4.57E+11	
			1460.82	8.355E+00	@(P	4.112E-01	6.02E+00	1.06E+01 G
Pa-234	N	5.2776E-02					1.63E+12	
			131.30	6.010E-02	&(	2.153E-01	2.19E+02	1.82E+01 G
			569.50	8.185E-04	&	4.112E-01	3.05E+04	9.30E+00 G
			946.00	-1.151E-01	+	2.812E-01	1.52E+02	1.35E+01 G
			880.52	-1.509E-01	+	3.951E-01	1.62E+02	1.05E+01 G
			883.24	3.904E-02	&(	4.636E-01	7.24E+02	9.70E+00 G
Pb-212	N	5.9348E-01					5.12E+12	
			238.63	5.935E-01	(P	8.512E-02	1.07E+01	4.36E+01 G
			300.09	1.189E+00	+	1.180E+00	6.21E+01	3.18E+00 G
Pb-214	N	1.4192E+01					5.84E+05	
			351.93	1.397E+01	(P	1.241E-01	1.54E+00	3.56E+01 G
			295.22	1.462E+01	(P	2.227E-01	2.14E+00	1.84E+01 G
			242.00	1.314E+01	- P	5.678E-01	4.18E+00	7.27E+00 G
Ra-226	N	1.3589E+01					5.84E+05	
			186.21	1.359E+01	(	1.081E+00	6.53E+00	3.56E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 15:13:13
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_011.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Th-234   N   1.0255E+00                                     1.63E+12
                            63.30 1.539E+00 ?(  2.653E+00 1.06E+02 3.75E+00 G
                            92.59 5.823E-01  (  7.666E-01 8.16E+01 4.34E+00 G

Tl-208   N   2.2252E-01                                     5.12E+12
                           583.19 2.225E-01  (P 3.910E-02 1.40E+01 8.50E+01 G
                           277.37-4.628E-02 -   6.897E-01 9.06E+02 6.60E+00 G
                           860.53 4.951E-01 +   2.896E-01 3.92E+01 1.24E+01 G

U-235    N   6.7562E-01                                     2.57E+11
                           143.77 1.831E-01 &(  3.540E-01 1.19E+02 1.09E+01 G
                           205.32 3.794E-01 ?(  8.235E-01 1.33E+02 5.02E+00 G
                           163.36 2.442E-01 ?(  8.428E-01 2.11E+02 5.08E+00 G
                           185.72 8.347E-01 &(  7.619E-02 6.67E+00 5.70E+01 G
                                                          Energy duplication
                            93.35 9.542E-01 &   7.350E-01 4.81E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 15:13:13
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_011.An1

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.49	748.	14.	0.005	551.66	7.304E-02
U-235	93.35	693.	80.	0.029	96.15	9.542E-01
Eu-152	122.33	790.	13.	0.005	601.89	2.807E-02
Pa-234	130.92	796.	18.	0.007	437.35	6.010E-02
U-235	143.19	765.	33.	0.012	237.27	1.831E-01
U-235	163.71	875.	20.	0.007	421.36	2.442E-01
U-235	186.27	811.	727.	0.269	13.34	8.347E-01
U-235	205.23	664.	28.	0.010	266.23	3.794E-01
Eu-154	722.46	160.	-20.	-0.008	180.26	-1.553E-01
Eu-154	874.51	108.	12.	0.004	252.34	1.681E-01
Pa-234	880.54	109.	-9.	-0.003	324.55	-1.509E-01
Pa-234	883.24	127.	2.	0.001	1447.70	3.904E-02
Pa-234	947.09	83.	-9.	-0.003	304.36	-1.151E-01
Eu-152	964.79	115.	26.	0.010	123.83	3.235E-01
Eu-154	992.82	49.	14.	0.005	154.68	2.410E-01
Eu-154	1006.36	54.	17.	0.006	133.56	1.749E-01
Co-60	1173.26	49.	9.	0.003	223.02	1.935E-02
Co-60	1331.43	48.	12.	0.004	171.59	2.740E-02
Eu-152	1408.06	67.	103.	0.038	29.79	1.157E+00

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	9.0723E-01	9.0723E-01	2.3592E-01	2.4538E-01	1.128E-01
Am-241 #A	7.3032E-02	7.3040E-02	4.0293E-01	4.0297E-01	3.304E-01
Bi-212	2.7493E+00	2.7493E+00	9.1130E-01	9.2390E-01	5.694E-01
Bi-214	1.1909E+01	1.1909E+01	4.0897E-01	7.2282E-01	9.193E-02
Co-60 #A	2.3165E-02	2.3374E-02	3.2886E-02	3.2903E-02	3.649E-02
Cs-137 #A	4.8501E-03	4.8577E-03	6.0431E-02	6.0431E-02	4.956E-02
Eu-152 #C	3.2441E-01	3.2555E-01	9.6994E-02	9.8419E-02	1.688E-01
Eu-154 #A	1.8894E-01	1.8998E-01	2.0563E-01	2.0590E-01	3.401E-01
K-40 #	8.3551E+00	8.3551E+00	1.0696E+00	1.1488E+00	4.112E-01
Pa-234 #A	5.2776E-02	5.2776E-02	2.3081E-01	2.3119E-01	2.153E-01
Pb-212	5.9348E-01	5.9348E-01	1.2952E-01	1.3659E-01	8.512E-02
Pb-214	1.4192E+01	1.4192E+01	3.7481E-01	8.0367E-01	1.241E-01
Ra-226	1.3588E+01	1.3589E+01	1.7760E+00	1.9392E+00	1.081E+00
Th-234 A	1.0255E+00	1.0255E+00	1.3710E+00	1.3745E+00	2.653E+00
Tl-208	2.2252E-01	2.2252E-01	6.5625E-02	6.7331E-02	3.910E-02
U-235 #C	6.7562E-01	6.7562E-01	9.0095E-02	9.8981E-02	3.540E-01

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 15:13:13
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_011.An1


   # - All peaks for activity calculation had bad shape.
   * - Activity omitted from total
   & - Activity omitted from total and all peaks had bad shape.
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  106.7 to  2035.1 keV)     5.252E+01  pCi/g
 Total Decayed Activity (  106.7 to  2035.1 keV) 5.2517605E+01  pCi/g


 The library has energies which are not separable.

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS SPIKE USER REPORT FOR 251449 RAD-IG Soil
DOE HASL 300 4.5.2.3

Type : LCS
Inst : HPGE04
Seqnum : 1534034952007.2
File : 4_20140124_007
IDF : 1.0
PDF : 1.0
Lab ID : QC723802
Matrix : Soil
Batch : 207008
Time : 24-JAN-2014 10:56
Sample Amount : 330.03 g
Live Time : 2700 sec
Dead Time : 0.68 %
Cal : 24-JAN-2014 06:44:12,05-MAR-2013 18:53:13
Units : pCi/g

Analyte	Spiked	LCS	%Rec	Limits	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	Flags
Radium-226 (By Bismuth-214)	13.00	11.28	87	75-125	.39063	.63992	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: LCS
Sample Description: QC723802, 207008, LCS, S19706

Detector: HPGE04 51-TP32733A
Spectrum ID: 4_20140124_007
Contract: Tetra Tech EC
Sample Type: SAMPLE
Unit Number: LCS
Matrix: S
Sample Time: 12/30/2013 14:35
Live Time: 2700 sec
Acquisition Time: 1/24/2014 10:56:15
Real Time: 2719 sec
Analysis Time: 1/24/2014 11:41
Dead Time: 0.68 %
Analysis Quantity: 3.300E+02 g

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Efficiency Cal Date: 3/5/2013 18:53
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		5.856E-01	1.876E-01	1.923E-01	1.599E-01
Am-241	#AB	-9.909E-02	5.006E-01	5.007E-01	4.105E-01
Bi-212		2.448E+00	8.939E-01	9.026E-01	5.482E-01
Bi-214		1.128E+01	3.906E-01	6.399E-01	9.213E-02
Co-60	#AB	1.012E-02	5.277E-02	5.278E-02	4.274E-02
Cs-137		1.434E-01	6.263E-02	6.297E-02	3.505E-02
Eu-152	#	4.123E-01	1.214E-01	1.230E-01	1.238E-01
Eu-154	#AB	0.000E+00	3.644E-01	3.644E-01	4.030E-01
K-40		9.388E+00	1.078E+00	1.177E+00	3.602E-01
Pa-234	#AB	1.275E-01	2.158E-01	2.181E-01	2.379E-01
Pb-212		5.185E-01	1.337E-01	1.388E-01	8.743E-02
Pb-214		1.329E+01	4.001E-01	7.389E-01	1.131E-01
Ra-226		1.382E+01	1.826E+00	1.990E+00	1.090E+00
Th-234	#AB	1.932E+00	3.911E+00	3.916E+00	3.185E+00
Tl-208		1.705E-01	7.079E-02	7.162E-02	4.766E-02
U-235	#	7.205E-01	9.329E-02	1.030E-01	3.699E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 5.484E+01

Analyst: Robin Fluty

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 11:41:41
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_007.An1

Sample description
     QC723802, 207008, LCS, S19706


Spectrum Filename: C:\User\SPC\Det4\4_20140124_007.An1

Acquisition information
       Start time:                1/24/2014 10:56:15
       Live time:              2700
       Real time:              2719
       Dead time:                 0.68 %
       Detector ID:                   4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                  4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:44:12
            Zero offset:         -0.059 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:              3/5/2013 18:53:13
            Type:                 Polynomial
            Uncertainty:          1.349 %
            Coefficients:        -0.377104  -4.127613   0.443802
                                 -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.96keV )
       Stop channel:           8144 (  2035.56keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3003E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3003E+02) =
                                  8.1893E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/30/2013 14:35:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	4_2013-12-28_0936.PBC 12/28/2013 09:36:18
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 26 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0952

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
30.22	7.	215.07	0.00	0.000E+00				
38.91	26.	100.38	0.61	0.000E+00				
52.36	48.	59.89	0.70	7.738E-03				
57.78	64.	48.16	0.59	1.266E-02				
63.09	42.	101.21	0.81	1.777E-02	63.30	3.750	PBC<MDA	Th234
74.63	809.	6.05	0.82	2.743E-02				
77.04	1391.	3.81	0.83	2.927E-02				
79.44	100.	35.55	0.83	3.101E-02				
87.12	540.	7.65	0.84	3.594E-02				
90.04	168.	21.43	0.84	3.760E-02				
92.52	12.	322.18	0.84	3.937E-02	92.59	4.343	PBC<MDA	Th234
					93.35	4.100	2.208E-01	Ac228
					93.35	5.760	1.572E-01	U235
131.30	5.	863.06	0.88	4.962E-02	131.30	18.200	PBC<MDA	Pa234
					131.30	18.200	1.675E-02	Pa234
143.13	30.	135.18	0.89	5.033E-02	143.77	10.940	PBC<MDA	U235
					143.77	10.940	1.676E-01	U235
186.21	786.	6.61	0.94	4.851E-02	185.72	57.000	8.612E-01	U235
					186.21	3.555	1.382E+01	Ra226
					185.72	57.000	8.612E-01	U235
190.33	17.	140.05	0.00	4.816E-02				
232.29	51.	58.80	0.47	4.410E-02				
238.64	358.	9.29	0.98	4.348E-02	238.63	43.600	5.640E-01	Pb212
242.05	1407.	3.35	0.98	4.314E-02	242.00	7.268	1.356E+01	Pb214
295.20	3112.	2.17	1.01	3.830E-02	295.22	18.414	1.335E+01	Pb214
298.08	2.	665.57	1.04	3.789E-02	300.09	3.180	PBC<MDA	Pb212
338.44	93.	27.54	0.41	3.500E-02	338.32	11.400	7.039E-01	Ac228

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
346.54	4.	592.18	1.08	3.459E-02	344.28	26.590	PBC<MDA	Eu152
					344.28	26.590	1.274E-02	Eu152
351.89	5277.	1.52	1.12	3.408E-02	351.93	35.600	1.316E+01	Pb214
583.42	114.	18.99	0.86	2.394E-02	583.19	85.000	1.615E-01	Tl208
609.34	3900.	1.73	1.33	2.322E-02	609.31	45.490	1.115E+01	Bi214
661.12	88.	21.85	1.21	2.192E-02	661.66	84.990	1.433E-01	Cs137
665.56	120.	16.33	0.97	2.183E-02				
727.49	33.	48.38	1.43	2.051E-02	727.33	6.650	7.369E-01	Bi212
768.33	364.	7.87	1.49	1.974E-02				
778.08	5.	269.32	1.47	1.955E-02	778.90	12.970	PBC<MDA	Eu152
					778.90	12.970	6.565E-02	Eu152
785.94	90.	18.26	1.48	1.944E-02	785.37	1.110	1.270E+01	Bi212
860.55	20.	73.85	1.54	1.823E-02	860.53	12.400	PBC<MDA	Tl208
880.80	15.	84.62	1.56	1.793E-02	880.52	10.500	PBC<MDA	Pa234
					880.52	10.500	2.496E-01	Pa234
911.22	81.	21.31	1.58	1.750E-02	911.20	26.200	5.341E-01	Ac228
934.09	250.	8.61	1.66	1.720E-02				
944.79	14.	96.05	1.61	1.704E-02	946.00	13.500	PBC<MDA	Pa234
					946.00	13.500	1.818E-01	Pa234
964.47	21.	78.50	1.63	1.681E-02	964.08	14.500	PBC<MDA	Eu152
					964.08	14.500	2.567E-01	Eu152
969.17	51.	33.10	1.63	1.675E-02	968.96	15.900	5.855E-01	Ac228
1120.40	868.	4.18	1.72	1.507E-02	1120.29	14.910	1.165E+01	Bi214
1238.16	342.	7.66	1.57	1.399E-02				
1332.23	4.	260.81	1.93	1.322E-02	1332.49	99.983	PBC<MDA	Co60
1408.14	108.	14.72	1.98	1.266E-02	1408.01	20.850	1.246E+00	Eu152
					1408.01	20.850	1.246E+00	Eu152
1460.91	401.	5.56	2.25	1.229E-02	1460.82	10.550	9.388E+00	K40
1620.74	7.	130.80	2.14	1.128E-02	1620.74	1.510	PBC<MDA	Bi212
1729.34	189.	8.61	0.83	1.067E-02				
1764.48	806.	3.68	2.17	1.048E-02	1764.49	15.310	1.515E+01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
121.00	30.22	141.	7.	0.000E+00	430.14	0.000	-	
155.74	38.91	364.	26.	0.000E+00	200.77	0.606	-	
209.52	52.36	418.	48.	6.268E+03	119.78	0.699	PB-214	M
231.15	57.78	443.	64.	5.091E+03	95.63	0.591	-	sM
298.56	74.64	1140.	602.	2.194E+04	18.87	0.712	-	
308.22	77.06	998.	1148.	3.921E+04	10.08	0.783	-	
317.82	79.46	496.	43.	1.390E+03	145.66	0.340	TH-227	c
348.16	87.05	765.	565.	1.572E+04	17.62	0.990	-	s
359.83	89.97	596.	181.	4.802E+03	41.05	0.737	-	sM
761.00	190.33	313.	17.	3.572E+02	280.09	0.000	-	sc

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
928.71	232.29	372.	51.	1.161E+03	117.60	0.472	-	s
2661.13	665.56	88.	120.	5.498E+03	32.66	0.967	BI-214	sM
3072.17	768.33	112.	364.	1.846E+04	15.74	1.490	BI-214	sM
3735.21	934.09	64.	250.	1.452E+04	17.23	1.663	BI-214	
4951.81	1238.16	78.	342.	2.444E+04	15.32	1.568	BI-214	
6917.82	1729.34	16.	189.	1.775E+04	17.22	0.828	BI-214	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	238.10	59.51	890.	-17.	-0.006	505.25	0.810
Th-234	252.40	63.09	902.	42.	0.016	202.42	0.813s
U-235	373.35	93.35	812.	-9.	-0.003	909.29	0.843D
Ac-228	373.35	93.35	711.	12.	0.004	644.35	0.843D
Eu-152	487.96	122.02	747.	-17.	-0.006	450.53	0.870s
Eu-154	488.60	122.18	609.	-15.	-0.005	475.43	0.871s
Pa-234	525.03	131.30	924.	5.	0.002	1726.12	0.879s
U-235	572.31	143.13	830.	30.	0.011	270.36	0.891s
U-235	653.47	163.43	946.	-8.	-0.003	1068.24	0.910s
U-235	744.59	186.23	815.	754.	0.279	12.95	0.931
Ra-226	744.51	186.21	707.	786.	0.291	13.21	0.940
Pb-212	954.06	238.63	550.	324.	0.120	25.31	0.850
Pb-214	967.72	242.04	489.	1417.	0.525	7.29	0.981
Tl-208	1116.94	279.37	448.	-31.	-0.011	197.40	1.018s
Pb-214	1180.22	295.20	459.	3104.	1.150	4.34	1.009
Ac-228	1353.11	338.44	232.	93.	0.034	55.08	0.414s
Eu-152	1385.47	346.54	258.	4.	0.001	1184.35	1.081s
Pb-214	1406.86	351.89	377.	5265.	1.950	3.04	1.122
Pa-234	2275.64	569.16	160.	-4.	-0.001	1001.98	1.286s
Tl-208	2332.04	583.27	188.	105.	0.039	39.24	1.299s
Bi-214	2436.32	609.34	190.	3884.	1.439	3.45	1.332
Cs-137	2643.39	661.12	85.	88.	0.033	43.69	1.209
Eu-154	2900.84	725.49	128.	-9.	-0.003	350.20	1.422s
Bi-212	2908.84	727.49	112.	33.	0.012	96.76	1.426s
Eu-152	3111.18	778.08	106.	5.	0.002	538.64	1.471s
Bi-212	3142.59	785.94	91.	90.	0.033	36.51	1.476
Tl-208	3441.05	860.55	97.	20.	0.007	147.71	1.541
Pa-234	3522.03	880.80	78.	15.	0.006	169.24	1.558s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pa-234	3532.00	883.29	103.	-13.	-0.005	228.58	1.560s
Ac-228	3643.72	911.22	108.	81.	0.030	42.63	1.584s
Pa-234	3778.04	944.79	81.	14.	0.005	192.10	1.613s
Eu-152	3856.74	964.47	120.	21.	0.008	156.99	1.628s
Ac-228	3875.55	969.17	119.	51.	0.019	66.20	1.632s
Eu-154	3985.45	996.64	105.	-8.	-0.003	366.14	1.655s
Eu-154	4017.17	1004.57	93.	-2.	-0.001	1312.03	1.662s
Bi-214	4480.60	1120.40	107.	863.	0.320	8.36	1.718
Co-60	4677.43	1169.59	50.	-4.	-0.001	521.93	1.799s
Co-60	5328.26	1332.23	63.	4.	0.002	521.63	1.926s
Eu-152	5632.08	1408.14	72.	108.	0.040	29.44	1.984
K-40	5843.27	1460.91	44.	401.	0.149	11.13	2.249
Bi-212	6483.07	1620.74	33.	7.	0.002	261.60	2.144
Bi-214	7058.53	1764.48	18.	801.	0.297	7.36	2.172

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	5.8557E-01					5.12E+12
			911.20	5.341E-01	?(	1.599E-01 2.13E+01	2.62E+01 G
			968.96	5.855E-01	?(	2.896E-01 3.31E+01	1.59E+01 G
			338.32	7.039E-01	(	2.700E-01 2.75E+01	1.14E+01 G
							Energy duplication
			93.35	2.208E-01	-	1.167E+00 3.22E+02	4.10E+00 XA
Am-241	I	-9.9089E-02					1.58E+05
			59.54	-9.909E-02	(	4.105E-01 2.53E+02	3.59E+01 G
Bi-212	N	2.4482E+00					5.12E+12
			727.33	7.369E-01	?(	5.482E-01 4.84E+01	6.65E+00 G
			785.37	1.270E+01	(	3.122E+00 1.83E+01	1.11E+00 G
			1620.74	1.160E+00	-	2.385E+00 1.31E+02	1.51E+00 G
Bi-214	N	1.1276E+01					5.84E+05
			609.31	1.115E+01	(P	9.213E-02 1.73E+00	4.55E+01 G
			1120.29	1.165E+01	(P	3.254E-01 4.18E+00	1.49E+01 G
			1764.49	1.515E+01	+ P	1.844E-01 3.68E+00	1.53E+01 G
Co-60	T	1.0117E-02					1.93E+03
			1332.49	1.012E-02	?(	4.274E-02 2.61E+02	1.00E+02 G
			1173.23	-8.238E-03	&	3.475E-02 2.61E+02	9.98E+01 G

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 11:41:41
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124_007.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Cs-137   I   1.4335E-01                                     1.10E+04
                          661.66 1.433E-01  (  3.505E-02 2.18E+01 8.50E+01 G

Eu-152   I   4.1228E-01                                     4.94E+03
                          344.28 1.274E-02 &(  1.238E-01 5.92E+02 2.66E+01 G
                          121.78-3.819E-02 +   1.409E-01 2.25E+02 2.84E+01 G
                          778.90 6.565E-02 ?(  2.876E-01 2.69E+02 1.30E+01 G
                          964.08 2.567E-01 ?(  3.185E-01 7.85E+01 1.45E+01 G
                         1112.08 0.000E+00 -   4.297E-01 1.00E+03 1.34E+01 G
                         1408.01 1.246E+00  (  2.286E-01 1.47E+01 2.09E+01 G

K-40     N   9.3881E+00                                     4.57E+11
                         1460.82 9.388E+00  (P 3.602E-01 5.56E+00 1.06E+01 G

Pa-234   N   1.2749E-01                                     1.63E+12
                          131.30 1.675E-02 &(  2.379E-01 8.63E+02 1.82E+01 G
                          569.50-4.814E-02 +   3.952E-01 5.01E+02 9.30E+00 G
                          946.00 1.818E-01 ?(  2.761E-01 9.61E+01 1.35E+01 G
                          880.52 2.496E-01 ?(  3.320E-01 8.46E+01 1.05E+01 G
                          883.24-2.263E-01 +   4.133E-01 1.14E+02 9.70E+00 G

Pb-212   N   5.1852E-01                                     5.12E+12
                          238.63 5.185E-01  (P 8.743E-02 1.27E+01 4.36E+01 G
                          300.09 4.707E-02 % P 9.367E-01 6.66E+02 3.18E+00 G

Pb-214   N   1.3285E+01                                     5.84E+05
                          351.93 1.316E+01  (P 1.131E-01 1.52E+00 3.56E+01 G
                          295.22 1.335E+01  (P 2.147E-01 2.17E+00 1.84E+01 G
                          242.00 1.370E+01  (P 4.985E-01 3.64E+00 7.27E+00 G

Ra-226   N   1.3821E+01                                     5.84E+05
                          186.21 1.382E+01  (  1.090E+00 6.61E+00 3.56E+00 G

Th-234   N   1.9323E+00                                     1.63E+12
                           63.30 1.932E+00 ?(  3.185E+00 1.01E+02 3.75E+00 G
                           92.59 4.285E-02 %   1.249E+00 1.77E+03 4.34E+00 G

Tl-208   N   1.7045E-01                                     5.12E+12
                          583.19 1.565E-01 ?(P 4.766E-02 1.96E+01 8.50E+01 G
                          277.37-3.582E-01 - P 5.688E-01 9.87E+01 6.60E+00 G
                          860.53 2.658E-01  (  3.081E-01 7.39E+01 1.24E+01 G

U-235    N   7.2049E-01                                     2.57E+11
                          143.77 1.676E-01 &(  3.699E-01 1.35E+02 1.09E+01 G
                          205.32-1.843E-02 &   7.967E-01 2.62E+03 5.02E+00 G
                          163.36-9.737E-02 &   8.550E-01 5.34E+02 5.08E+00 G
                          185.72 8.266E-01  (  7.290E-02 6.47E+00 5.70E+01 G
                                                        Energy duplication
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		93.35	-1.189E-01	&	8.883E-01	4.55E+02	5.76E+00 X

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.51	890.	-17.	-0.006	505.25	-9.909E-02
U-235	93.35	812.	-9.	-0.003	909.29	-1.189E-01
Eu-152	122.02	747.	-17.	-0.006	450.53	-3.819E-02
Eu-154	122.18	609.	-15.	-0.005	475.43	-2.293E-02
Pa-234	131.30	924.	5.	0.002	1726.12	1.675E-02
U-235	143.13	830.	30.	0.011	270.36	1.676E-01
U-235	163.43	946.	-8.	-0.003	1068.24	-9.737E-02
U-235	186.23	815.	754.	0.279	12.95	8.266E-01
Eu-152	346.54	258.	4.	0.001	1184.35	1.274E-02
Pa-234	569.16	160.	-4.	-0.001	1001.98	-4.814E-02
Eu-154	725.49	128.	-9.	-0.003	350.20	-6.880E-02
Eu-152	778.08	106.	5.	0.002	538.64	6.565E-02
Pa-234	880.80	78.	15.	0.006	169.24	2.496E-01
Pa-234	883.29	103.	-13.	-0.005	228.58	-2.263E-01

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pa-234	944.79	81.	14.	0.005	192.10	1.818E-01	
Eu-152	964.47	120.	21.	0.008	156.99	2.567E-01	
Eu-154	996.64	105.	-8.	-0.003	366.14	-1.426E-01	
Eu-154	1004.57	93.	-2.	-0.001	1312.03	-2.190E-02	
Co-60	1169.59	50.	-4.	-0.001	521.93	-8.238E-03	
Co-60	1332.23	63.	4.	0.002	521.63	1.012E-02	
Eu-152	1408.14	72.	108.	0.040	29.44	1.246E+00	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	5.8557E-01	5.8557E-01	1.8756E-01	1.9228E-01	1.599E-01
Am-241 #A	-9.9079E-02	-9.9089E-02	5.0065E-01	5.0070E-01	4.105E-01
Bi-212	2.4482E+00	2.4482E+00	8.9386E-01	9.0261E-01	5.482E-01
Bi-214	1.1276E+01	1.1276E+01	3.9063E-01	6.3992E-01	9.213E-02
Co-60 #A	1.0027E-02	1.0117E-02	5.2775E-02	5.2777E-02	4.274E-02
Cs-137	1.4313E-01	1.4335E-01	6.2632E-02	6.2967E-02	3.505E-02
Eu-152 #C	4.1084E-01	4.1228E-01	1.2137E-01	1.2298E-01	1.238E-01
Eu-154 #A	0.0000E+00	0.0000E+00	3.6438E-01	3.6439E-01	4.030E-01
K-40	9.3881E+00	9.3881E+00	1.0783E+00	1.1767E+00	3.602E-01
Pa-234 #A	1.2749E-01	1.2749E-01	2.1577E-01	2.1808E-01	2.379E-01
Pb-212	5.1852E-01	5.1852E-01	1.3366E-01	1.3882E-01	8.743E-02
Pb-214	1.3284E+01	1.3285E+01	4.0014E-01	7.3895E-01	1.131E-01
Ra-226	1.3821E+01	1.3821E+01	1.8262E+00	1.9896E+00	1.090E+00
Th-234 #A	1.9323E+00	1.9323E+00	3.9113E+00	3.9156E+00	3.185E+00
Tl-208	1.7045E-01	1.7045E-01	7.0787E-02	7.1622E-02	4.766E-02
U-235 #C	7.2049E-01	7.2049E-01	9.3288E-02	1.0302E-01	3.699E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (186.1 to 2035.6 keV) 5.163E+01 pCi/g
Total Decayed Activity (186.1 to 2035.6 keV) 5.1636177E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 11:41:41
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124_007.An1

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE02
Seqnum : 1514034951015
File : 2_20140124_015
IDF : 1.0
PDF : 1.0
Lab ID : 251449-007
Matrix : Soil
Batch : 207004
Time : 24-JAN-2014 17:52
Sample Amount : 339.57 g
Live Time : 2700 sec
Dead Time : 0.11 %
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58
Units : pCi/g

Type : IDUP
Inst : HPGE02
Seqnum : 1514034951017.1
File : 2_20140124_017
IDF : 1.0
PDF : 1.0
Lab ID : QC723789
Matrix : Soil
Batch : 207004
Time : 24-JAN-2014 19:35
Sample Amount : 339.57 g
Live Time : 2700 sec
Dead Time : 0.1 %
Cal : 24-JAN-2014 06:52:16,07-JAN-2014 11:47:58

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	0.08599	0.1139		.14439	.14453	0.004416	0.1117		.1359	.1359		40		1	u
Bismuth-212	0.3612	0.2842		.39652	.39702	0.06201	0.2748		.31296	.31298		40		1	u
Bismuth-214	0.3854	0.03589		.084771	.086938	0.3253	0.04163		.080783	.082407	17	40	0.355	1	u
Cesium-137	0.03459	0.01707	0.07	.025627	.025686	0.01683	0.01952	0.07	.02592	.025934		40		1	u
Cobalt-60	0.006142	0.02499		.03122	.031221	0.0009373	0.01942		.023751	.023751		40		1	u
Europium-152	-0.0005315	0.06783		.0011888	.0011891	0.01826	0.05214		.055678	.055686		40		1	u
Europium-154	0.04646	0.1732		.089925	.089961	-0.004395	0.1595		.012471	.012473		40		1	u
Lead-212	0.3606	0.03456		.066107	.071164	0.3876	0.03532		.069056	.074637	7	40	0.185	1	u
Lead-214	0.3824	0.04310		.088425	.090475	0.4559	0.04196		.094275	.097001	18	40	0.392	1	u
Potassium-40	17.34	0.3059		1.302	1.5658	17.30	0.3165		1.306	1.5682	0	40	0.011	1	u
Protactinium-234	0.01568	0.07832		.023166	.023491	0.004751	0.06927		.084441	.08445		40		1	u
Radium-226 (By Bismuth-214)	0.3854	0.03589	0.2	.084771	.086938	0.3253	0.04163	0.2	.080783	.082407	17	20	0.355	1	u
Thallium-208	0.1367	0.02137		.041587	.042603	0.1545	0.01760		.038968	.040347	12	40	0.215	1	u
Thorium-232 (By Actinium-228)	0.4692	0.06490		.11764	.12271	0.3432	0.08242		.11028	.1132	31	40	0.534	1	u
Thorium-234	0.5834	0.9087		.55396	.5567	0.8338	0.8599		.49558	.50181		40		1	u
Uranium-235	0.06481	0.1344		.044404	.044577	0.01795	0.1404		.024784	.024808		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0034-07DUP
Sample Description: QC723789, 207004, IDUP

Detector: HPGE02 50-TP42234A
Spectrum ID: 2_20140124_017
Contract: ITSI
Sample Type: DUP
Unit Number: PD-D0034
Matrix: S
Sample Time: 11/29/2013 13:57
Live Time: 2700 sec
Acquisition Time: 1/24/2014 19:35:54
Real Time: 2703 sec
Analysis Time: 1/24/2014 20:21
Dead Time: 0.10 %
Analysis Quantity: 3.396E+02 g

Efficiency: HPGE02 S23325 2_20140106002_EffCal RA226
Efficiency Cal Date: 1/7/2014 11:47
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228	#	3.432E-01	1.103E-01	1.132E-01	8.242E-02
Am-241	#AB	4.416E-03	1.359E-01	1.359E-01	1.117E-01
Bi-212	#AB	6.201E-02	3.130E-01	3.130E-01	2.748E-01
Bi-214		3.253E-01	8.078E-02	8.241E-02	4.163E-02
Co-60	#AB	9.373E-04	2.375E-02	2.375E-02	1.942E-02
Cs-137	#AB	1.683E-02	2.592E-02	2.593E-02	1.952E-02
Eu-152	#AB	1.826E-02	5.568E-02	5.569E-02	5.214E-02
Eu-154	#AB	-4.395E-03	1.247E-02	1.247E-02	1.595E-01
K-40		1.730E+01	1.306E+00	1.568E+00	3.165E-01
Pa-234	#AB	4.751E-03	8.444E-02	8.445E-02	6.927E-02
Pb-212		3.876E-01	6.906E-02	7.464E-02	3.532E-02
Pb-214		4.559E-01	9.428E-02	9.700E-02	4.196E-02
Ra-226	#AB	4.022E-01	5.737E-01	5.742E-01	4.514E-01
Th-234	#AB	8.338E-01	4.956E-01	5.018E-01	8.599E-01
Tl-208	#	1.545E-01	3.897E-02	4.035E-02	1.760E-02
U-235	#AB	1.795E-02	2.478E-02	2.481E-02	1.404E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 2.033E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:21:04
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_017.An1

Sample description
     QC723789, 207004, IDUP


Spectrum Filename: C:\User\SPC\Det2\2_20140124_017.An1

Acquisition information
       Start time:                1/24/2014 19:35:54
       Live time:              2700
       Real time:              2703
       Dead time:                 0.10 %
       Detector ID:                   2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                  2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:52:16
            Zero offset:          0.026 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:              1/7/2014 11:47:58
            Type:                 Polynomial
            Uncertainty:          1.734 %
            Coefficients:        -0.360765  -4.056690   0.335194
                                 -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.06keV )
       Stop channel:           8144 (  2035.12keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.3957E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.3957E+02) =
                                  7.9592E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:04
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_017.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/29/2013 13:57:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	2_2014-01-08_0518.PBC 1/8/2014 05:18:15
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 12 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0860

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
62.96	21.	68.84	0.83	2.025E-02	63.30	3.750	PBC<MDA	Th234
					63.30	3.750	8.002E-01	Th234
74.90	73.	21.73	0.84	3.162E-02				
77.40	86.	19.29	0.85	3.375E-02				
90.33	30.	44.72	0.58	4.245E-02				
92.99	59.	26.21	0.86	4.394E-02	92.59	4.343	9.220E-01	Th234
					93.35	5.760	6.895E-01	U235
					93.35	4.100	9.229E-01	Ac228
					92.59	4.343	9.220E-01	Th234
					93.35	4.100	9.229E-01	Ac228
					93.35	5.760	6.895E-01	U235
92.99	56.	26.21	0.86	4.394E-02	92.59	4.343	8.784E-01	Th234
					93.35	5.760	6.569E-01	U235
					93.35	4.100	9.229E-01	Ac228
93.00	55.	29.72	0.86	4.359E-02	92.59	4.343	8.628E-01	Th234
					93.35	5.760	6.453E-01	U235
					93.35	4.100	8.607E-01	Ac228
129.19	1.	888.61	0.90	5.088E-02	131.30	18.200	PBC<MDA	Pa234
163.37	12.	105.13	0.94	4.882E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	1.464E-01	U235
186.00	22.	71.32	0.96	4.628E-02	186.21	3.555	PBC<MDA	Ra226
					185.72	57.000	2.505E-02	U235
188.03	10.	135.31	0.96	4.633E-02				
206.08	9.	142.40	0.98	4.406E-02	205.32	5.020	PBC<MDA	U235
					205.32	5.020	1.235E-01	U235
238.66	239.	8.64	0.84	4.044E-02	238.63	43.600	3.875E-01	Pb212
241.78	52.	28.76	1.65	4.010E-02	242.00	7.268	5.250E-01	Pb214

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:04
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_017.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
295.18	110.	14.20	0.91	3.541E-02	295.22	18.414	4.801E-01	Pb214
300.15	19.	59.71	1.07	3.503E-02	300.09	3.180	5.122E-01	Pb212
338.48	58.	20.43	1.11	3.242E-02	338.32	11.400	4.618E-01	Ac228
					338.32	11.400	4.618E-01	Ac228
351.79	171.	9.90	1.14	3.161E-02	351.93	35.600	4.292E-01	Pb214
510.83	108.	18.38	0.80	2.489E-02				
583.39	102.	11.77	1.18	2.291E-02	583.19	85.000	1.545E-01	Tl208
609.42	123.	11.52	1.03	2.230E-02	609.31	45.490	3.319E-01	Bi214
661.66	10.	77.02	1.39	2.119E-02	661.66	84.990	PBC<MDA	Cs137
724.71	2.	559.45	1.44	2.006E-02	723.30	20.050	PBC<MDA	Eu154
779.17	5.	152.44	1.48	1.916E-02	778.90	12.970	PBC<MDA	Eu152
785.55	3.	252.33	1.49	1.907E-02	785.37	1.110	PBC<MDA	Bi212
911.44	63.	16.48	0.49	1.738E-02	911.20	26.200	3.948E-01	Ac228
					911.20	26.200	3.948E-01	Ac228
969.03	24.	38.74	1.62	1.672E-02	968.96	15.900	2.704E-01	Ac228
					968.96	15.900	2.704E-01	Ac228
1004.74	3.	226.32	1.64	1.634E-02	1004.72	17.860	PBC<MDA	Eu154
1120.58	23.	36.19	1.71	1.523E-02	1120.29	14.910	3.050E-01	Bi214
1273.71	1.	893.29	1.80	1.396E-02	1274.43	34.900	PBC<MDA	Eu154
1460.80	808.	3.67	1.66	1.268E-02	1460.82	10.550	1.730E+01	K40
1764.44	10.	42.27	2.00	1.097E-02	1764.49	15.310	1.748E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
299.09	74.89	107.	56.	1.771E+03	58.68	0.386	-	s
309.11	77.40	110.	75.	2.210E+03	47.77	1.154	-	s
360.79	90.33	75.	30.	7.067E+02	89.44	0.576	-	s
2041.51	510.83	72.	108.	4.319E+03	36.75	0.803	TL-208	s
3643.84	911.44	72.	9.	5.359E+02	265.34	0.486	AC-228	sc

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:04
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_017.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Th-234	251.43	62.96	90.	21.	0.008	137.68	0.831s
Th-234	371.47	93.00	108.	55.	0.021	59.44	0.862s
U-235	372.86	93.35	91.	59.	0.022	52.42	0.863D
Ac-228	372.86	93.35	94.	56.	0.021	52.42	0.863D
Eu-152	493.49	123.54	113.	-12.	-0.004	259.37	0.893s
Eu-154	493.39	123.52	152.	-10.	-0.004	353.28	0.894s
Pa-234	516.06	129.19	87.	1.	0.001	1777.23	0.903s
U-235	574.43	143.80	127.	-10.	-0.004	326.31	0.915s
U-235	652.62	163.37	78.	12.	0.005	210.26	0.936s
U-235	751.18	188.03	82.	10.	0.004	270.62	0.959s
Ra-226	743.07	186.00	117.	22.	0.008	142.64	0.959s
U-235	823.32	206.08	82.	9.	0.003	284.81	0.978s
Pb-212	953.51	238.66	82.	232.	0.086	17.28	0.836
Pb-214	965.98	241.78	79.	52.	0.019	57.53	1.655s
Pb-214	1179.44	295.18	53.	106.	0.039	28.41	0.908
Pb-212	1199.29	300.15	57.	19.	0.007	119.41	1.072s
Ac-228	1352.49	338.48	41.	58.	0.021	40.86	1.109
Pb-214	1405.71	351.79	47.	164.	0.061	19.80	1.144
Tl-208	2331.67	583.39	25.	102.	0.038	23.53	1.176s
Bi-214	2435.76	609.42	38.	114.	0.042	23.04	1.026s
Cs-137	2644.68	661.66	26.	10.	0.004	154.05	1.392s
Eu-154	2896.86	724.71	39.	2.	0.001	1118.91	1.440s
Eu-152	3114.68	779.17	24.	5.	0.002	304.88	1.483s
Bi-212	3140.21	785.55	25.	3.	0.001	504.67	1.488s
Tl-208	3429.10	857.77	28.	-3.	-0.001	490.18	1.543s
Eu-154	3488.81	872.69	25.	-4.	-0.002	342.29	1.552s
Pa-234	3520.36	880.58	29.	-3.	-0.001	501.91	1.557s
Ac-228	3643.70	911.40	30.	52.	0.019	38.50	1.578s
Pa-234	3783.61	946.37	26.	-4.	-0.001	395.46	1.602s
Eu-152	3851.20	963.26	41.	-2.	-0.001	1178.85	1.614s
Ac-228	3874.26	969.03	32.	24.	0.009	77.47	1.617s
Eu-154	3985.31	996.78	20.	-1.	0.000	1695.90	1.635s
Eu-154	4017.16	1004.74	25.	3.	0.001	452.63	1.641s
Bi-214	4480.77	1120.58	36.	23.	0.009	72.39	1.713s
Co-60	4689.99	1172.85	36.	-5.	-0.002	357.53	1.744s
Eu-154	5093.74	1273.71	25.	1.	0.000	1786.58	1.800s
K-40	5842.90	1460.80	38.	785.	0.291	7.33	1.659
Bi-214	7059.18	1764.44	13.	10.	0.004	84.54	2.004s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:04
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_017.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	Peak MDA Value pCi/g	COMMENTS
Ac-228	N	3.4317E-01				5.12E+12	
			911.20	3.357E-01	?(P	8.242E-02 1.93E+01	2.62E+01 G
			968.96	2.704E-01	?(	1.471E-01 3.87E+01	1.59E+01 G
			338.32	4.618E-01	(	1.190E-01 2.04E+01	1.14E+01 G
							Energy duplication
			93.35	9.229E-01	+ P	3.688E-01 2.62E+01	4.10E+00 XA
Am-241	I	4.4155E-03				1.58E+05	
			59.54	4.415E-03	%(	1.117E-01 1.54E+03	3.59E+01 G
Bi-212	N	6.2013E-02				5.12E+12	
			727.33	4.817E-03	%(	2.748E-01 3.47E+03	6.65E+00 G
			785.37	4.047E-01	?(	1.636E+00 2.52E+02	1.11E+00 G
			1620.74	0.000E+00	&	3.878E-01 1.00E+03	1.51E+00 G
Bi-214	N	3.2527E-01				5.84E+05	
			609.31	3.319E-01	(P	4.163E-02 1.15E+01	4.55E+01 G
			1120.29	3.050E-01	?(P	1.805E-01 3.62E+01	1.49E+01 G
			1764.49	1.748E-01	- P	1.483E-01 4.23E+01	1.53E+01 G
Co-60	T	9.3734E-04				1.93E+03	
			1332.49	9.373E-04	%(	1.942E-02 1.27E+03	1.00E+02 G
			1173.23	-1.007E-02	+	2.869E-02 1.79E+02	9.98E+01 G
Cs-137	I	1.6826E-02				1.10E+04	
			661.66	1.683E-02	?(	1.952E-02 7.70E+01	8.50E+01 G
Eu-152	I	1.8262E-02				4.94E+03	
			344.28	-8.578E-04	&(	5.214E-02 3.69E+03	2.66E+01 G
			121.78	-2.460E-02	+	5.124E-02 1.30E+02	2.84E+01 G
			778.90	5.746E-02	?(	1.377E-01 1.52E+02	1.30E+01 G
			964.08	-1.899E-02	+	1.827E-01 5.89E+02	1.45E+01 G
			1112.08	-2.084E-03	&	1.887E-01 5.50E+03	1.34E+01 G
			1408.01	-4.075E-03	%	1.001E-01 1.50E+03	2.09E+01 G
Eu-154	I	-4.3950E-03				3.14E+03	
			873.18	-5.895E-02	?(	1.595E-01 1.71E+02	1.22E+01 G
			123.07	-1.462E-02	+	4.187E-02 1.77E+02	4.04E+01 G
			1274.43	4.880E-03	+	7.126E-02 8.93E+02	3.49E+01 G
			723.30	1.179E-02	&	1.076E-01 5.59E+02	2.00E+01 G
			1004.72	3.278E-02	?(	1.185E-01 2.26E+02	1.79E+01 G
			996.25	-1.300E-02	+	1.800E-01 8.48E+02	1.05E+01 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 20:21:04
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124_017.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

K-40     N   1.7303E+01                                     4.57E+11
                         1460.82 1.730E+01  (P 3.165E-01 3.67E+00 1.06E+01 G

Pa-234   N   4.7513E-03                                     1.63E+12
                          131.30 4.751E-03  (  6.927E-02 8.89E+02 1.82E+01 G
                          569.50 0.000E+00 -   1.454E-01 1.00E+03 9.30E+00 G
                          946.00-4.840E-02 +   1.522E-01 1.98E+02 1.35E+01 G
                          880.52-4.926E-02 +   1.984E-01 2.51E+02 1.05E+01 G
                          883.24 0.000E+00 &   1.885E-01 1.00E+03 9.70E+00 G

Pb-212   N   3.8755E-01                                     5.12E+12
                          238.63 3.875E-01  (P 3.532E-02 8.64E+00 4.36E+01 G
                          300.09 5.122E-01 +   4.659E-01 5.97E+01 3.18E+00 G

Pb-214   N   4.5588E-01                                     5.84E+05
                          351.93 4.292E-01  (P 4.196E-02 9.90E+00 3.56E+01 G
                          295.22 4.801E-01  (P 7.659E-02 1.42E+01 1.84E+01 G
                          242.00 5.250E-01  (P 2.096E-01 2.88E+01 7.27E+00 G

Ra-226   N   4.0218E-01                                     5.84E+05
                          186.21 4.022E-01 &(  4.514E-01 7.13E+01 3.56E+00 G

Th-234   N   8.3382E-01                                     1.63E+12
                           63.30 8.002E-01 ?(  8.599E-01 6.88E+01 3.75E+00 G
                           92.59 8.628E-01  (  3.768E-01 2.97E+01 4.34E+00 G

Tl-208   N   1.5451E-01                                     5.12E+12
                          583.19 1.545E-01 *(P 1.760E-02 1.18E+01 8.50E+01 G
                          277.37-1.328E-02 %   2.467E-01 1.13E+03 6.60E+00 G
                          860.53-4.156E-02 -   1.633E-01 2.45E+02 1.24E+01 G

U-235    N   1.7950E-02                                     2.57E+11
                          143.77-5.324E-02 &(  1.404E-01 1.63E+02 1.09E+01 G
                          205.32 1.235E-01 ?(  2.820E-01 1.42E+02 5.02E+00 G
                          163.36 1.464E-01  (  2.441E-01 1.05E+02 5.08E+00 G
                          185.72 1.087E-02 ?(  2.353E-02 1.35E+02 5.70E+01 G
                                                          Energy duplication
                           93.35 6.895E-01     2.586E-01 2.62E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
```

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity	
Th-234	62.96	90.	21.	0.008	137.68	8.002E-01	
Th-234	93.00	108.	55.	0.021	59.44	8.628E-01	
U-235	93.35	91.	59.	0.022	52.42	6.895E-01	
Ac-228	93.35	94.	56.	0.021	52.42	9.229E-01	P
Eu-152	123.54	113.	-12.	-0.004	259.37	-2.460E-02	
Eu-154	123.52	152.	-10.	-0.004	353.28	-1.462E-02	
Pa-234	129.19	87.	1.	0.001	1777.23	4.751E-03	
U-235	143.80	127.	-10.	-0.004	326.31	-5.324E-02	
U-235	163.37	78.	12.	0.005	210.26	1.464E-01	
U-235	188.03	82.	10.	0.004	270.62	1.087E-02	
Ra-226	186.00	117.	22.	0.008	142.64	4.022E-01	
U-235	206.08	82.	9.	0.003	284.81	1.235E-01	
Ac-228	338.48	41.	58.	0.021	40.86	4.618E-01	
Cs-137	661.66	26.	10.	0.004	154.05	1.683E-02	
Eu-154	724.71	39.	2.	0.001	1118.91	1.179E-02	
Eu-152	779.17	24.	5.	0.002	304.88	5.746E-02	
Bi-212	785.55	25.	3.	0.001	504.67	4.047E-01	
Eu-154	872.69	25.	-4.	-0.002	342.29	-5.895E-02	
Pa-234	880.58	29.	-3.	-0.001	501.91	-4.926E-02	
Ac-228	911.40	30.	52.	0.019	38.50	3.357E-01	P
Pa-234	946.37	26.	-4.	-0.001	395.46	-4.840E-02	
Eu-152	963.26	41.	-2.	-0.001	1178.85	-1.899E-02	
Ac-228	969.03	32.	24.	0.009	77.47	2.704E-01	
Eu-154	996.78	20.	-1.	0.000	1695.90	-1.300E-02	
Eu-154	1004.74	25.	3.	0.001	452.63	3.278E-02	
Co-60	1172.85	36.	-5.	-0.002	357.53	-1.007E-02	

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 20:21:04
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124_017.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Eu-154	1273.71	25.	1.	0.000	1786.58	4.880E-03	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228 #	3.4317E-01	3.4317E-01	1.1028E-01	1.1320E-01	8.242E-02
Am-241 #A	4.4144E-03	4.4155E-03	1.3590E-01	1.3590E-01	1.117E-01
Bi-212 #A	6.2013E-02	6.2013E-02	3.1296E-01	3.1298E-01	2.748E-01
Bi-214	3.2525E-01	3.2527E-01	8.0783E-02	8.2407E-02	4.163E-02
Co-60 #A	9.1855E-04	9.3734E-04	2.3751E-02	2.3751E-02	1.942E-02
Cs-137 #A	1.6767E-02	1.6826E-02	2.5920E-02	2.5934E-02	1.952E-02
Eu-152 #A	1.8119E-02	1.8262E-02	5.5678E-02	5.5686E-02	5.214E-02
Eu-154 #A	-4.3408E-03	-4.3950E-03	1.2471E-02	1.2473E-02	1.595E-01
K-40	1.7303E+01	1.7303E+01	1.3060E+00	1.5682E+00	3.165E-01
Pa-234 #A	4.7513E-03	4.7513E-03	8.4441E-02	8.4450E-02	6.927E-02
Pb-212	3.8755E-01	3.8755E-01	6.9056E-02	7.4637E-02	3.532E-02
Pb-214	4.5585E-01	4.5588E-01	9.4275E-02	9.7001E-02	4.196E-02
Ra-226 #A	4.0216E-01	4.0218E-01	5.7369E-01	5.7415E-01	4.514E-01
Th-234 #A	8.3382E-01	8.3382E-01	4.9558E-01	5.0181E-01	8.599E-01
Tl-208 #	1.5451E-01	1.5451E-01	3.8968E-02	4.0347E-02	1.760E-02
U-235 #A	1.7950E-02	1.7950E-02	2.4784E-02	2.4808E-02	1.404E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.1 to 2035.1 keV) 1.863E+01 pCi/g
Total Decayed Activity (25.1 to 2035.1 keV) 1.8625721E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS INSTRUMENT SAMPLE DUPLICATE FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Type : MSS
Inst : HPGE05
Seqnum : 1544034938013
File : 5_20140124_013
IDF : 1.0
PDF : 1.0
Lab ID : 251445-021
Matrix : Soil
Batch : 207008
Time : 24-JAN-2014 16:11
Sample Amount : 372.95 g
Live Time : 2700 sec
Dead Time : 0.08 %
Cal : 24-JAN-2014 06:29:37,29-JUN-2013 15:59:06
Units : pCi/g

Type : IDUP
Inst : HPGE05
Seqnum : 1544034938015.2
File : 5_20140124_015
IDF : 1.0
PDF : 1.0
Lab ID : QC723803
Matrix : Soil
Batch : 207008
Time : 24-JAN-2014 17:54
Sample Amount : 372.95 g
Live Time : 2700 sec
Dead Time : 0.08 %
Cal : 24-JAN-2014 06:29:37,29-JUN-2013 15:59:06

Analyte	MSS	MDA	Proj MDA	MSS 2 sigma Uncert pCi/g Counting	MSS 2 sigma Uncert pCi/g Total	IDUP	MDA	Proj MDA	2 sigma Uncert pCi/g Counting	2 sigma Uncert pCi/g Total	RPD	Lim	RER	Lim	Flags
Americium-241	-0.03894	0.1572		.19306	.19308	-0.02823	0.1574		.1927	.19271		40		1	u
Bismuth-212	0.3559	0.2481		.41501	.41541	0.3295	0.2576		.4368	.43712	8	40	0.031	1	u
Bismuth-214	0.4186	0.03165		.079534	.081729	0.3309	0.03892		.081158	.082509	23	40	0.534	1	u
Cesium-137	0.01149	0.01889	0.07	.024375	.024381	-0.002224	0.02050	0.07	.025143	.025143		40		1	u
Cobalt-60	-0.001389	0.01942		.023826	.023826	0.005488	0.01894		.016421	.016423		40		1	u
Europium-152	0.04649	0.05458		.06298	.06302	-0.001255	0.05823		.0026331	.0026338		40		1	u
Europium-154	-0.06683	0.1623		.20546	.20549	-0.05958	0.1627		.20497	.20499		40		1	u
Lead-212	0.3655	0.04030		.074941	.079469	0.3206	0.03934		.070914	.074611	13	40	0.291	1	u
Lead-214	0.4609	0.03680		.076378	.079361	0.3879	0.04190		.08157	.083562	17	40	0.448	1	u
Potassium-40	14.61	0.1724		1.1194	1.338	14.87	0.1724		1.1289	1.3529	2	40	0.094	1	u
Protactinium-234	0.03312	0.09351		.075413	.075861	-0.002414	0.09027		.10972	.10972		40		1	u
Radium-226 (By Bismuth-214)	0.4186	0.03165	0.2	.079534	.081729	0.3309	0.03892	0.2	.081158	.082509	23	20	0.534	1	u
Thallium-208	0.1028	0.01484		.031267	.031952	0.1372	0.01791		.036987	.038015	29	40	0.491	1	u
Thorium-232 (By Actinium-228)	0.4068	0.07831		.10979	.11366	0.4452	0.05183		.11261	.11713	9	40	0.166	1	u
Thorium-234	1.277	1.220		1.5542	1.5589	0.1156	1.342		.10105	.10164		40		1	u
Uranium-235	0.03961	0.1384		.034751	.034834	0.07305	0.1426		.042113	.042346		40		1	u

u=use

Curtis & Tompkins Hunters Point Lab

Sample ID: 04-PD-D0039-21DUP
Sample Description: QC723803, 207008, IDUP

Detector: HPGE05 51-TP42242A
Spectrum ID: 5_20140124_015
Contract: ITSI
Sample Type: DUP
Unit Number: PD-D0039
Matrix: S
Sample Time: 12/7/2013 09:30
Live Time: 2700 sec
Acquisition Time: 1/24/2014 17:54:20
Real Time: 2702 sec
Analysis Time: 1/24/2014 18:39
Dead Time: 0.08 %
Analysis Quantity: 3.730E+02 g

Efficiency: HPGE05 S22147 5_20130628003_EffCal RA226
Efficiency Cal Date: 6/29/2013 15:59
Library: GenericAnalysisDDEP.lib
Analysis Engine: Env32 G53W4.26

Nuclide	Flags	Activity pCi/g	2-Sigma Counting Uncert pCi/g	2-Sigma Total Uncert pCi/g	Minimum Detectable Activity pCi/g
Ac-228		4.452E-01	1.126E-01	1.171E-01	5.183E-02
Am-241	#AB	-2.823E-02	1.927E-01	1.927E-01	1.574E-01
Bi-212	#	3.295E-01	4.368E-01	4.371E-01	2.576E-01
Bi-214		3.309E-01	8.116E-02	8.251E-02	3.892E-02
Co-60	#AB	5.488E-03	1.642E-02	1.642E-02	1.894E-02
Cs-137	#AB	-2.224E-03	2.514E-02	2.514E-02	2.050E-02
Eu-152	#AB	-1.255E-03	2.633E-03	2.634E-03	5.823E-02
Eu-154	#AB	-5.958E-02	2.050E-01	2.050E-01	1.627E-01
K-40		1.487E+01	1.129E+00	1.353E+00	1.724E-01
Pa-234	#AB	-2.414E-03	1.097E-01	1.097E-01	9.027E-02
Pb-212		3.206E-01	7.091E-02	7.461E-02	3.934E-02
Pb-214		3.879E-01	8.157E-02	8.356E-02	4.190E-02
Ra-226		1.153E+00	5.867E-01	5.903E-01	3.614E-01
Th-234	#AB	1.156E-01	1.011E-01	1.016E-01	1.342E+00
Tl-208		1.372E-01	3.699E-02	3.801E-02	1.791E-02
U-235	#AB	7.305E-02	4.211E-02	4.235E-02	1.426E-01

- All peaks for activity calculation had bad shape.
A - Activity < MDA
B - Activity < Critical Level

Total Activity 1.816E+01

Analyst: Chanthachone Alexander

```
     ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:39:29
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_015.An1

Sample description
     QC723803, 207008, IDUP


Spectrum Filename: C:\User\SPC\Det5\5_20140124_015.An1

Acquisition information
       Start time:                1/24/2014 17:54:20
       Live time:              2700
       Real time:              2702
       Dead time:                 0.08 %
       Detector ID:                   5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                  5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:              1/24/2014 06:29:37
            Zero offset:         -0.064 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/29/2013 15:59:06
            Type:                 Polynomial
            Uncertainty:          1.295 %
            Coefficients:        -0.372021  -4.149771   0.439762
                                 -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:     GenericAnalysisDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    24.95keV )
       Stop channel:           8144 (  2035.00keV )
       Peak rejection level:   1000.000%
       Peak search sensitivity:   3
       Sample Size:               3.7295E+02
       Activity scaling factor:   1.0000E+00/(  3.7000E-02*  3.7295E+02) =
                                  7.2468E-02
       Detection limit method:    Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:          average of five points.
       Half lives decay limit:   12.000
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:39:29
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_015.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	12/7/2013 09:30:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2013-12-28_0935.PBC 12/28/2013 09:35:39
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 17 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1145

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
77.28	96.	22.44	0.95	2.773E-02				
92.63	50.	37.24	1.00	3.733E-02	92.59	4.343	8.387E-01	Th234
					93.35	5.760	6.261E-01	U235
					93.35	4.100	8.530E-01	Ac228
					92.59	4.343	8.387E-01	Th234
					93.35	5.760	6.261E-01	U235
92.63	49.	37.24	1.00	3.733E-02	92.59	4.343	8.134E-01	Th234
					93.35	5.760	6.071E-01	U235
					93.35	4.100	8.530E-01	Ac228
92.66	46.	43.70	1.00	3.696E-02	92.59	4.343	7.696E-01	Th234
					93.35	5.760	5.745E-01	U235
					93.35	4.100	7.805E-01	Ac228
122.28	11.	156.61	1.02	4.618E-02	121.78	28.410	PBC<MDA	Eu152
163.16	15.	101.15	1.06	4.801E-02	163.36	5.080	PBC<MDA	U235
					163.36	5.080	1.701E-01	U235
185.95	71.	25.45	1.07	4.663E-02	185.72	57.000	PBC<MDA	U235
					186.21	3.555	1.153E+00	Ra226
					185.72	57.000	7.183E-02	U235
186.13	57.	28.83	1.08	4.667E-02	185.72	57.000	5.769E-02	U235
					186.21	3.555	9.258E-01	Ra226
205.12	29.	48.51	1.09	4.503E-02	205.32	5.020	3.435E-01	U235
					205.32	5.020	3.435E-01	U235
238.62	227.	10.72	1.18	4.195E-02	238.63	43.600	3.223E-01	Pb212
241.74	40.	38.18	0.56	4.164E-02	242.00	7.268	3.565E-01	Pb214
277.52	35.	32.95	1.15	3.851E-02	277.37	6.600	3.735E-01	Tl208
295.23	95.	16.68	1.24	3.705E-02	295.22	18.414	3.742E-01	Pb214
300.52	13.	79.43	1.17	3.667E-02	300.09	3.180	PBC<MDA	Pb212

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:39:29
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_015.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
338.17	64.	23.80	0.67	3.393E-02	338.32	11.400	4.290E-01	Ac228
351.82	186.	9.94	1.04	3.305E-02	351.93	35.600	4.014E-01	Pb214
583.26	99.	12.83	0.39	2.333E-02	583.19	85.000	1.336E-01	Tl208
609.44	127.	11.17	1.33	2.264E-02	609.31	45.490	3.309E-01	Bi214
727.12	13.	66.27	1.54	2.003E-02	727.33	6.650	2.600E-01	Bi212
860.61	13.	65.40	1.65	1.782E-02	860.53	12.400	1.615E-01	Tl208
910.92	81.	13.00	1.30	1.712E-02	911.20	26.200	4.856E-01	Ac228
968.87	42.	23.01	0.57	1.640E-02	968.96	15.900	4.336E-01	Ac228
1120.13	9.	60.42	1.88	1.477E-02	1120.29	14.910	PBC<MDA	Bi214
1173.50	6.	149.60	1.93	1.428E-02	1173.23	99.850	PBC<MDA	Co60
					1173.23	99.850	1.098E-02	Co60
1272.64	1.	443.93	2.02	1.343E-02	1274.43	34.900	PBC<MDA	Eu154
1460.85	718.	3.73	2.12	1.208E-02	1460.82	10.550	1.486E+01	K40
1620.85	4.	124.66	2.33	1.110E-02	1620.74	1.510	PBC<MDA	Bi212
1764.46	27.	19.73	2.46	1.032E-02	1764.49	15.310	4.609E-01	Bi214

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
309.15	77.28	146.	96.	3.444E+03	44.88	0.946	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: GenericAnalysisDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Am-241	238.67	59.65	143.	-5.	-0.002	682.56	0.972s
Th-234	250.33	62.56	177.	-15.	-0.005	259.13	0.975s
Th-234	370.65	92.66	179.	46.	0.017	87.41	0.999s
U-235	373.41	93.35	149.	50.	0.019	74.47	1.000D
Ac-228	373.41	93.35	151.	49.	0.018	74.47	1.000D
Eu-152	489.05	122.28	134.	11.	0.004	313.21	1.024s
Eu-154	492.29	123.09	154.	-4.	-0.001	1004.13	1.025s
U-235	573.82	143.48	144.	-3.	-0.001	1080.93	1.042s
U-235	652.48	163.16	115.	15.	0.006	202.31	1.058s
U-235	744.31	186.13	107.	57.	0.021	57.65	1.077
Ra-226	743.60	185.95	92.	71.	0.026	50.89	1.072
U-235	820.23	205.12	84.	29.	0.011	97.03	1.094s

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:39:29
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_015.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Pb-212	954.17	238.62	132.	220.	0.081	21.44	1.175
Pb-214	966.65	241.74	89.	40.	0.015	76.36	0.558s
Tl-208	1109.69	277.52	50.	35.	0.013	65.91	1.154
Pb-214	1180.49	295.23	72.	95.	0.035	33.35	1.243
Pb-212	1201.68	300.52	60.	13.	0.005	158.87	1.173s
Ac-228	1352.75	338.31	64.	53.	0.020	48.31	1.205s
Eu-152	1377.97	344.61	68.	-9.	-0.003	279.50	1.211s
Pb-214	1406.77	351.82	62.	176.	0.065	19.89	1.041s
Tl-208	2332.37	583.26	32.	99.	0.037	25.65	0.386s
Bi-214	2437.08	609.44	41.	127.	0.047	22.34	1.329
Cs-137	2646.40	661.77	35.	-2.	-0.001	1130.68	1.481s
Bi-212	2907.83	727.12	30.	13.	0.005	132.55	1.538s
Eu-152	3116.28	779.22	34.	-3.	-0.001	547.59	1.582s
Tl-208	3441.90	860.61	31.	13.	0.005	130.81	1.653
Eu-154	3490.24	872.69	31.	-5.	-0.002	344.01	1.664s
Pa-234	3523.02	880.89	32.	-1.	0.000	1903.23	1.670s
Ac-228	3643.20	910.92	14.	81.	0.030	25.99	1.295s
Eu-152	3864.64	966.26	65.	-9.	-0.003	271.36	1.743s
Ac-228	3875.08	968.87	23.	42.	0.016	46.02	0.570s
Eu-154	3990.47	997.70	28.	-4.	-0.002	375.20	1.771s
Eu-154	4021.16	1005.37	28.	-6.	-0.002	265.08	1.779s
Bi-214	4480.43	1120.13	33.	9.	0.003	120.84	1.880s
Co-60	4694.02	1173.50	34.	6.	0.002	299.20	1.927s
Eu-154	5090.89	1272.64	17.	1.	0.000	887.86	2.016s
K-40	5844.35	1460.85	12.	706.	0.261	7.46	2.124
Bi-212	6485.06	1620.85	10.	4.	0.001	249.31	2.326s
Bi-214	7060.23	1764.46	7.	27.	0.010	39.46	2.456s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Peak Energy keV	Peak Activity pCi/g	Peak Code	MDA Value pCi/g	COMMENTS
Ac-228	N	4.4520E-01					5.12E+12
			911.20	4.856E-01	(P	5.183E-02 1.30E+01 2.62E+01	G
			968.96	4.336E-01	(P	1.147E-01 2.30E+01 1.59E+01	G
			338.32	3.685E-01	?(P	1.291E-01 2.42E+01 1.14E+01	G
							Energy duplication
			93.35	8.530E-01	& P	5.019E-01 3.72E+01 4.10E+00	XA
Am-241	I	-2.8232E-02					1.58E+05
			59.54	-2.823E-02	?(	1.574E-01 3.41E+02 3.59E+01	G

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:39:29
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_015.An1

Nuclide		Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Bi-212	N	3.2954E-01					5.12E+12	
			727.33	2.600E-01	@(	2.576E-01	6.63E+01	6.65E+00 G
			785.37	0.000E+00	-	8.322E-01	1.00E+03	1.11E+00 G
			1620.74	6.359E-01	?(	1.195E+00	1.25E+02	1.51E+00 G
Bi-214	N	3.3087E-01					5.84E+05	
			609.31	3.309E-01	(P	3.892E-02	1.12E+01	4.55E+01 G
			1120.29	1.075E-01	- P	1.630E-01	6.04E+01	1.49E+01 G
			1764.49	4.609E-01	+ P	1.039E-01	1.97E+01	1.53E+01 G
Co-60	T	5.4883E-03					1.93E+03	
			1332.49	0.000E+00	?(	1.894E-02	1.00E+03	1.00E+02 G
			1173.23	1.098E-02	&(	2.600E-02	1.50E+02	9.98E+01 G
Cs-137	I	-2.2237E-03					1.10E+04	
			661.66	-2.224E-03	?(	2.050E-02	5.65E+02	8.50E+01 G
Eu-152	I	-1.2545E-03					4.94E+03	
			344.28	-2.608E-02	?(	5.823E-02	1.40E+02	2.66E+01 G
			121.78	2.198E-02	&(	5.561E-02	1.57E+02	2.84E+01 G
			778.90	-3.345E-02	+	1.476E-01	2.74E+02	1.30E+01 G
			964.08	-9.835E-02	+	2.129E-01	1.36E+02	1.45E+01 G
			1112.08	-3.064E-03	%	1.362E-01	2.71E+03	1.34E+01 G
			1408.01	2.575E-03	&	4.262E-02	1.02E+03	2.09E+01 G
Eu-154	I	-5.9583E-02					3.14E+03	
			873.18	-5.958E-02	?(	1.627E-01	1.72E+02	1.22E+01 G
			123.07	-5.094E-03	+	4.190E-02	5.02E+02	4.04E+01 G
			1274.43	7.675E-03	+	5.505E-02	4.44E+02	3.49E+01 G
			723.30	-7.518E-04	&	9.341E-02	7.55E+03	2.00E+01 G
			1004.72	-5.610E-02	+	1.165E-01	1.33E+02	1.79E+01 G
			996.25	-6.669E-02	&	1.989E-01	1.88E+02	1.05E+01 G
K-40	N	1.4865E+01					4.57E+11	
			1460.82	1.486E+01	(P	1.724E-01	3.73E+00	1.06E+01 G
Pa-234	N	-2.4135E-03					1.63E+12	
			131.30	-2.414E-03	%(	9.027E-02	2.27E+03	1.82E+01 G
			569.50	-2.442E-03	%	1.581E-01	3.94E+03	9.30E+00 G
			946.00	0.000E+00	&	1.397E-01	1.00E+03	1.35E+01 G
			880.52	-1.239E-02	+	1.930E-01	9.52E+02	1.05E+01 G
			883.24	0.000E+00	+	2.116E-01	1.00E+03	9.70E+00 G
Pb-212	N	3.2056E-01					5.12E+12	
			238.63	3.223E-01	(P	3.934E-02	1.07E+01	4.36E+01 G
			300.09	2.964E-01	?(P	4.150E-01	7.94E+01	3.18E+00 G

```
      ORTEC g v - i (3263) Env32  G53W4.26  1/24/2014 18:39:29
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124_015.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Pb-214   N   3.8793E-01                                     5.84E+05
                           351.93 4.014E-01 @(P 4.190E-02 9.94E+00 3.56E+01 G
                           295.22 3.742E-01  (P 7.771E-02 1.67E+01 1.84E+01 G
                           242.00 3.565E-01  (  1.947E-01 3.82E+01 7.27E+00 G

Ra-226   N   1.1528E+00                                     5.84E+05
                           186.21 1.153E+00  (  3.614E-01 2.54E+01 3.56E+00 G

Th-234   N   1.1561E-01                                     1.63E+12
                            63.30-6.418E-01 ?(  1.342E+00 1.30E+02 3.75E+00 G
                            92.59 7.696E-01  (  5.217E-01 4.37E+01 4.34E+00 G

Tl-208   N   1.3718E-01                                     5.12E+12
                           583.19 1.336E-01  (P 1.791E-02 1.28E+01 8.50E+01 G
                           277.37 3.735E-01 +   1.744E-01 3.30E+01 6.60E+00 G
                           860.53 1.615E-01 ?(  1.580E-01 6.54E+01 1.24E+01 G

U-235    N   7.3049E-02                                     2.57E+11
                           143.77-1.610E-02 &(  1.426E-01 5.40E+02 1.09E+01 G
                           205.32 3.435E-01  (  2.536E-01 4.85E+01 5.02E+00 G
                           163.36 1.701E-01 ?(  2.744E-01 1.01E+02 5.08E+00 G
                           185.72 5.769E-02  (  2.434E-02 2.88E+01 5.70E+01 G
                                                            Energy duplication
                            93.35 6.261E-01     3.554E-01 3.72E+01 5.76E+00 X
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:39:29
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_015.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
Am-241	59.65	143.	-5.	-0.002	682.56	-2.823E-02
Th-234	62.56	177.	-15.	-0.005	259.13	-6.418E-01
Th-234	92.66	179.	46.	0.017	87.41	7.696E-01
U-235	93.35	149.	50.	0.019	74.47	6.261E-01
Eu-152	122.28	134.	11.	0.004	313.21	2.198E-02
Eu-154	123.09	154.	-4.	-0.001	1004.13	-5.094E-03
U-235	143.48	144.	-3.	-0.001	1080.93	-1.610E-02
U-235	163.16	115.	15.	0.006	202.31	1.701E-01
U-235	186.13	107.	57.	0.021	57.65	5.769E-02
U-235	205.12	84.	29.	0.011	97.03	3.435E-01
Eu-152	344.61	68.	-9.	-0.003	279.50	-2.608E-02
Cs-137	661.77	35.	-2.	-0.001	1130.68	-2.224E-03
Bi-212	727.12	30.	13.	0.005	132.55	2.600E-01
Eu-152	779.22	34.	-3.	-0.001	547.59	-3.345E-02
Eu-154	872.69	31.	-5.	-0.002	344.01	-5.958E-02
Pa-234	880.89	32.	-1.	0.000	1903.23	-1.239E-02
Eu-152	966.26	65.	-9.	-0.003	271.36	-9.835E-02
Eu-154	997.70	28.	-4.	-0.002	375.20	-6.669E-02
Eu-154	1005.37	28.	-6.	-0.002	265.08	-5.610E-02
Co-60	1173.50	34.	6.	0.002	299.20	1.098E-02
Eu-154	1272.64	17.	1.	0.000	887.86	7.675E-03
Bi-212	1620.85	10.	4.	0.001	249.31	6.359E-01

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
Ac-228	4.4520E-01	4.4520E-01	1.1261E-01	1.1713E-01	5.183E-02
Am-241 #A	-2.8226E-02	-2.8232E-02	1.9270E-01	1.9271E-01	1.574E-01
Bi-212 #	3.2954E-01	3.2954E-01	4.3680E-01	4.3712E-01	2.576E-01
Bi-214	3.3085E-01	3.3087E-01	8.1158E-02	8.2509E-02	3.892E-02
Co-60 #A	5.3936E-03	5.4883E-03	1.6421E-02	1.6423E-02	1.894E-02
Cs-137 #A	-2.2169E-03	-2.2237E-03	2.5143E-02	2.5143E-02	2.050E-02
Eu-152 #A	-1.2460E-03	-1.2545E-03	2.6331E-03	2.6338E-03	5.823E-02
Eu-154 #A	-5.8950E-02	-5.9583E-02	2.0497E-01	2.0499E-01	1.627E-01
K-40	1.4865E+01	1.4865E+01	1.1289E+00	1.3529E+00	1.724E-01
Pa-234 #A	-2.4135E-03	-2.4135E-03	1.0972E-01	1.0972E-01	9.027E-02

ORTEC g v - i (3263) Env32 G53W4.26 1/24/2014 18:39:29
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124_015.An1

Pb-212	3.2056E-01	3.2056E-01	7.0914E-02	7.4611E-02	3.934E-02
Pb-214	3.8791E-01	3.8793E-01	8.1570E-02	8.3562E-02	4.190E-02
Ra-226	1.1527E+00	1.1528E+00	5.8666E-01	5.9035E-01	3.614E-01
Th-234 #A	1.1561E-01	1.1561E-01	1.0105E-01	1.0164E-01	1.342E+00
Tl-208	1.3718E-01	1.3718E-01	3.6987E-02	3.8015E-02	1.791E-02
U-235 #A	7.3049E-02	7.3049E-02	4.2113E-02	4.2346E-02	1.426E-01

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (25.0 to 2035.0 keV) 1.764E+01 pCi/g
Total Decayed Activity (25.0 to 2035.0 keV) 1.7639177E+01 pCi/g

The library has energies which are not separable.

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Initial Calibration Raw Data

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/19/2013 18:56:44
Curtis & Tompkins HPS Lab       Spectrum name: 1_20130619001_Energy.An1

Sample description
     RICAL,S19582,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\1_20130619001_Energy.An1

Acquisition information
       Start time:                 6/19/2013 14:27:35
       Live time:                600
       Real time:                630
       Dead time:                  4.77 %
       Detector ID:                    1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                   1_QC.Clb
     HPGE01 S19582 1_20130619001_Energy RA226


       Energy Calibration
            Created:               6/19/2013 14:56:50
            Zero offset:          -0.008 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.943E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/19/2013 14:52:15
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.00keV )
       Stop channel:            8144 (  2035.72keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:56:44
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0244

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
40.03	11985.	1.36	0.81	1.866E-02				
45.54	6474.	1.84	0.82	1.848E-02				
46.85	1760.	6.86	0.82	1.844E-02				
121.82	87757.	0.37	0.89	1.592E-02	121.78	28.410	1.000E+00	QA122
244.65	17291.	0.92	1.03	1.181E-02	244.70	7.550	1.000E+00	Qa245
295.95	868.	7.91	1.10	1.069E-02				
329.15	281.	18.18	1.10	9.967E-03				
344.28	49711.	0.47	1.11	9.637E-03	344.28	26.590	1.000E+00	Qa344
367.72	1673.	4.63	1.18	9.396E-03				
411.18	3535.	2.04	1.18	8.948E-03				
444.04	4734.	1.94	1.24	8.610E-03				
488.81	541.	11.35	1.15	8.150E-03				
503.43	236.	19.94	0.80	7.999E-03				
564.05	504.	12.53	1.25	7.375E-03				
586.45	582.	9.07	1.32	7.144E-03				
674.65	242.	17.09	1.41	6.237E-03				
678.68	516.	9.02	1.42	6.196E-03				
688.71	908.	8.04	1.53	6.092E-03				
719.14	447.	13.50	1.13	5.778E-03				
778.98	12990.	0.93	1.50	5.163E-03	778.90	12.970	1.000E+00	Qa779
810.57	449.	14.40	1.42	5.043E-03				
867.40	4013.	2.37	1.55	4.829E-03				
964.04	12554.	1.02	1.63	4.463E-03	964.08	14.500	1.000E+00	Qa964
1005.10	647.	6.79	1.71	4.360E-03				
1085.91	8058.	1.21	1.74	4.156E-03				
1089.85	1284.	4.24	1.74	4.146E-03				
1112.08	10647.	1.10	1.77	4.089E-03				

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:56:44
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1212.95	1030.	5.26	1.64	3.835E-03				
1299.15	1160.	3.41	1.75	3.617E-03				
1408.01	13518.	0.88	1.96	3.342E-03	1408.01	20.850	1.000E+00	Qa1408
1457.73	329.	6.23	1.16	3.217E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
159.86	39.98	7416.	14082.	7.545E+05	2.59	1.131	-	s
181.85	45.49	3919.	6407.	3.467E+05	3.73	0.819	-	D
187.06	46.79	6293.	1886.	1.023E+05	12.76	0.820	-	D
1183.37	295.95	1480.	868.	8.120E+04	15.82	1.096	-	
1316.15	329.16	1188.	327.	3.281E+04	35.12	1.366	-	s
1470.36	367.72	1351.	1673.	1.781E+05	9.26	1.180	-	s
1644.16	411.20	836.	3535.	3.950E+05	4.08	1.180	-	D
1775.57	444.04	1186.	4734.	5.497E+05	3.88	1.243	-	
1954.58	488.81	1076.	541.	6.638E+04	22.70	1.145	-	
2013.05	503.43	788.	236.	2.944E+04	39.87	0.805	-	s
2255.51	564.05	1246.	504.	6.839E+04	25.05	1.253	-	s
2345.07	586.45	846.	582.	8.141E+04	18.14	1.324	-	
2697.57	674.58	699.	226.	3.624E+04	39.31	0.935	-	s
2713.70	678.61	777.	524.	8.459E+04	19.54	1.093	-	
2754.07	688.71	1227.	908.	1.490E+05	16.08	1.526	-	
2875.80	719.14	999.	447.	7.739E+04	26.99	1.129	-	s
3241.51	810.57	1010.	449.	8.907E+04	28.80	1.423	-	s
3468.85	867.40	1231.	4013.	8.312E+05	4.74	1.552	-	
4019.70	1005.10	389.	647.	1.485E+05	13.57	1.712	-	
4342.95	1085.84	685.	8058.	1.939E+06	2.41	1.737	-	D
4358.73	1089.78	842.	1284.	3.098E+05	8.48	1.740	-	D
4447.67	1112.08	694.	10647.	2.604E+06	2.20	1.773	-	
4851.23	1212.95	424.	1030.	2.685E+05	10.53	1.636	-	
5196.13	1299.15	102.	1160.	3.207E+05	6.83	1.749	-	
5830.68	1457.73	23.	329.	1.022E+05	12.46	1.163	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:56:44
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619001_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.07	121.82	5445.	87757.	146.261	0.73	0.888
Qa-245	978.20	244.65	2706.	17291.	28.819	1.83	1.035
Qa-344	1376.60	344.28	1729.	49711.	82.851	0.95	1.112
Qa-779	3115.05	778.95	1238.	13056.	21.760	2.05	1.514
Qa-964	3855.42	964.04	826.	12554.	20.923	2.03	1.632
Qa-1408	5631.73	1408.01	120.	13518.	22.529	1.76	1.960

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Peak Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	1.959E-03 3.67E-01 2.84E+01	G
Qa-245		1.0000E+00				4.94E+03	
			244.70	1.000E+00	(	7.009E-03 9.17E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	1.949E-03 4.73E-01 2.66E+01	G
Qa-779		1.0050E+00				4.94E+03	
			778.90	1.005E+00	(	6.312E-03 1.02E+00 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	5.334E-03 1.02E+00 1.45E+01	G
Qa-1408		1.0000E+00				4.94E+03	
			1408.01	1.000E+00	(	1.891E-03 8.80E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:56:44
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619001_Energy.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.7382E-01	1.0000E+00	7.3337E-03	1.1440E-01	1.959E-03
Qa-245	8.7382E-01	1.0000E+00	1.8338E-02	1.1563E-01	7.009E-03
Qa-344	8.7382E-01	1.0000E+00	9.4564E-03	1.1455E-01	1.949E-03
Qa-779	8.7821E-01	1.0050E+00	2.0590E-02	1.1657E-01	6.312E-03
Qa-964	8.7382E-01	1.0000E+00	2.0322E-02	1.1596E-01	5.334E-03
Qa-1408	8.7382E-01	1.0000E+00	1.7603E-02	1.1551E-01	1.891E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1111.9 to 2035.7 keV) 5.247E+00 µCi
Total Decayed Activity (1111.9 to 2035.7 keV) 6.0050511E+00 µCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:56:44
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619001_Energy.An1

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 1_Soil 250ml TunaCan_06-19-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:26:40
Efficiency Calibration Date: 6/19/2013 Time: 18:43:28

Calibration Description:
HPGE01 S22147 1_20130619002_EffCal RA226

Energy Calibration Fit
Energy = -0.0004 +0.250115*Channel -2.16189e-008*Channel**2
FWHM (ch) = 3.0904 +0.001116*Channel -4.89856e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
487.04	121.78	121.81	-0.02%	0.90	0.91	-0.89%
978.23	244.70	244.65	0.02%	1.05	1.03	1.90%
1376.68	344.28	344.29	-0.00%	1.12	1.13	-0.93%
3115.17	778.90	778.94	-0.00%	1.51	1.52	-0.72%
3855.73	964.08	964.05	0.00%	1.68	1.67	0.66%
5632.22	1408.01	1408.01	-0.00%	1.95	1.95	-0.09%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3817 %
Coefficients:
-0.396420 -4.062121 0.406738 -0.047391 0.002018 -0.000039

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	4.3971E-003	4.3896E-003	0.17%
59.54	1.5942E-002	1.6035E-002	-0.59%
88.03	3.8766E-002	3.7758E-002	2.60%
122.06	4.8209E-002	4.8639E-002	-0.89%
165.86	4.8734E-002	4.9439E-002	-1.45%
279.20	3.8981E-002	3.9259E-002	-0.71%
391.70	3.1390E-002	3.1557E-002	-0.53%
514.00	2.7261E-002	2.6262E-002	3.67%
661.66	2.2917E-002	2.2122E-002	3.47%
898.04	1.7275E-002	1.7931E-002	-3.80%
1173.23	1.4414E-002	1.4791E-002	-2.61%
1332.49	1.3034E-002	1.3421E-002	-2.97%
1836.05	1.0588E-002	1.0233E-002	3.35%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14132.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1111.90	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	14837.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.51	2.72E+002	340.90	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1016.20	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	874.56	568.20	3.90%	1/1/2013 09:00:00
Sr-85	514.00	98.50	6.48E+001	1061.90	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	443.82	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1480.30	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	702.25	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	701.42	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1481.10	1471.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/19/2013 18:51:48
Curtis & Tompkins HPS Lab       Spectrum name: 1_20130619002_EffCal.An1

Sample description
     RICAL|S22147|TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\1_20130619002_EffCal.An1

Acquisition information
       Start time:                 6/19/2013 15:23:28
       Live time:              10800
       Real time:              10979
       Dead time:                  1.63 %
       Detector ID:                    1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                   1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:               6/19/2013 14:56:50
            Zero offset:          -0.008 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.943E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/19/2013 18:43:28
            Type:                  Polynomial
            Uncertainty:           1.382 %
            Coefficients:         -0.396420  -4.062121   0.406738
                                  -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:      EfficiencyCalibrationDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.00keV )
       Stop channel:            8144 (  2035.72keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:51:48
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0414

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
46.56	28127.	1.24	0.86	4.408E-03	46.54	4.252	1.416E+04	Pb210
59.57	68714.	0.62	0.86	1.607E-02	59.54	35.920	1.105E+03	AM241
88.07	174655.	0.33	0.87	3.778E-02	88.03	3.626	1.523E+04	CD109
122.08	98549.	0.43	0.89	4.864E-02	122.06	85.510	3.378E+02	Co57
136.49	12286.	2.11	0.88	4.990E-02				
165.85	91511.	0.45	0.92	4.944E-02	165.86	79.900	5.031E+02	Ce139
238.58	1620.	12.07	1.06	4.295E-02				
255.09	2749.	6.51	0.97	4.139E-02				
279.16	28075.	0.99	1.05	3.926E-02	279.20	81.480	1.008E+03	Hg203
352.14	916.	16.53	0.79	3.387E-02				
391.75	69473.	0.46	1.17	3.155E-02	391.70	64.970	8.696E+02	SN113
511.01	1399.	9.15	1.27	2.637E-02				
514.14	50588.	0.50	1.27	2.626E-02	514.00	98.500	1.106E+03	Sr85
583.34	782.	18.39	1.28	2.410E-02				
609.18	773.	16.27	1.42	2.340E-02				
661.77	92364.	0.40	1.42	2.212E-02	661.66	84.990	4.598E+02	CS137
814.21	932.	13.07	1.81	1.919E-02				
898.08	86262.	0.42	1.60	1.793E-02	898.04	93.900	1.426E+03	Y898
1173.31	102702.	0.35	1.80	1.479E-02	1173.23	99.850	6.843E+02	Co1173
1332.58	92882.	0.35	1.91	1.342E-02	1332.49	99.983	6.812E+02	Co1332
1460.88	808.	10.26	1.89	1.247E-02				
1836.09	55898.	0.45	2.28	1.023E-02	1836.05	99.320	1.530E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:51:48
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
545.73	136.49	22048.	12286.	2.462E+05	4.23	0.884	-	
953.94	238.58	14648.	1620.	3.773E+04	24.13	1.061	-	s
1019.97	255.09	12207.	2749.	6.642E+04	13.02	0.971	-	
1408.03	352.14	8816.	916.	2.706E+04	33.06	0.788	-	s
2043.84	511.00	7485.	1411.	5.351E+04	18.14	1.271	-	D
2332.65	583.34	6422.	782.	3.246E+04	36.78	1.284	-	s
2436.02	609.18	5569.	773.	3.302E+04	32.54	1.423	-	
3256.08	814.21	4632.	932.	4.856E+04	26.13	1.809	-	
5843.30	1460.88	1685.	808.	6.481E+04	20.52	1.894	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibrationDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	186.20	46.56	35862.	28127.	2.604	2.48	0.861
AM-241	238.21	59.57	40824.	68714.	6.362	1.23	0.862
CD-109	352.13	88.07	51458.	174655.	16.172	0.65	0.867
Co-57	488.14	122.08	30007.	98549.	9.125	0.86	0.892
Ce-139	663.14	165.85	25308.	91511.	8.473	0.89	0.924
Hg-203	1116.20	279.16	16092.	28075.	2.600	1.99	1.045
SN-113	1566.45	391.75	10872.	69473.	6.433	0.92	1.168
Sr-85	2055.35	514.00	6273.	50606.	4.686	0.99	1.274D
CS-137	2646.33	661.77	10019.	92364.	8.552	0.79	1.419
Y-898	3591.57	898.08	9173.	86262.	7.987	0.83	1.595
Co-1173	4692.66	1173.31	5104.	102702.	9.509	0.70	1.801
Co-1332	5329.91	1332.58	3218.	92882.	8.600	0.71	1.910
Y-1836	7344.91	1836.09	1135.	55898.	5.176	0.90	2.277

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:51:48
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210		1.4156E+04				8.12E+03	
			46.54	1.416E+04	(	2.221E+02 1.24E+00 4.25E+00	G
AM-241		1.1054E+03				1.58E+05	
			59.54	1.105E+03	(	7.573E+00 6.16E-01 3.59E+01	G
CD-109		1.5232E+04				4.61E+02	
			88.03	1.523E+04	(	4.609E+01 3.26E-01 3.63E+00	G
Co-57		3.3783E+02				2.72E+02	
			122.06	3.378E+02	(	1.384E+00 4.30E-01 8.55E+01	G
Ce-139		5.0307E+02				1.38E+02	
			165.86	5.031E+02	(	2.038E+00 4.47E-01 7.99E+01	G
Hg-203		1.0080E+03				4.66E+01	
			279.20	1.008E+03	(	1.061E+01 9.95E-01 8.15E+01	G
SN-113		8.6959E+02				1.15E+02	
			391.70	8.696E+02	(	3.041E+00 4.62E-01 6.50E+01	G
Sr-85		1.1060E+03				6.48E+01	
			514.00	1.106E+03	(	4.033E+00 4.97E-01 9.85E+01	G
CS-137		4.5975E+02				1.10E+04	
			661.66	4.598E+02	(	1.161E+00 3.95E-01 8.50E+01	G
Y-898		1.4256E+03				1.07E+02	
			898.04	1.426E+03	(	3.688E+00 4.15E-01 9.39E+01	G
Co-1173		6.8435E+02				1.93E+03	
			1173.23	6.843E+02	(	1.109E+00 3.49E-01 9.98E+01	G
Co-1332		6.8119E+02				1.93E+03	
			1332.49	6.812E+02	(	9.693E-01 3.55E-01 1.00E+02	G
Y-1836		1.5305E+03				1.07E+02	
			1836.05	1.530E+03	(	2.149E+00 4.48E-01 9.93E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 6/19/2013 18:51:48
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	1.3953E+04	1.4156E+04	2.4772E+00%	8.8673E+00%	2.221E+02
AM-241	1.1046E+03	1.1054E+03	1.2312E+00%	7.9799E+00%	7.573E+00
CD-109	1.1812E+04	1.5232E+04	6.5169E-01%	8.2858E+00%	4.609E+01
Co-57	2.1939E+02	3.3783E+02	8.5998E-01%	6.6379E+00%	1.384E+00
Ce-139	2.1450E+02	5.0307E+02	8.9429E-01%	6.2627E+00%	2.038E+00
Hg-203	8.1265E+01	1.0080E+03	1.9891E+00%	6.2458E+00%	1.061E+01
SN-113	3.1375E+02	8.6959E+02	9.2470E-01%	5.2088E+00%	3.041E+00
Sr-85	1.8114E+02	1.1060E+03	9.9316E-01%	5.1683E+00%	4.033E+00
CS-137	4.5487E+02	4.5975E+02	7.9100E-01%	5.4760E+00%	1.161E+00
Y-898	4.7439E+02	1.4256E+03	8.3098E-01%	5.3056E+00%	3.688E+00
Co-1173	6.4389E+02	6.8435E+02	6.9871E-01%	5.1681E+00%	1.109E+00
Co-1332	6.4092E+02	6.8119E+02	7.0976E-01%	5.2986E+00%	9.693E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/19/2013 18:51:48
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20130619002_EffCal.An1

 Y-1836       5.0927E+02    1.5305E+03   8.9597E-01%   7.8784E+00% 2.149E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (  563.2 to  2035.7 keV)     3.060E+04  Bq
 Total Decayed Activity (  563.2 to  2035.7 keV) 3.9099711E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins Hunters Point Lab

Sample Description: RICV
Detector: HPGE01 50-TP42236A
Spectrum: 1_20130619003_EffVerif

Source Date: 7/1/2012 09:00
Acquired: 6/19/2013 19:14:43
Report Date: 6/27/2013 16:46

Analyst: Philip Smith
Reviewer:
Review Date:

Efficiency: HPGE01 S22147 1_20130619002_EffCal RA226
Library: EfficiencyVerificationDDEP.lib

Nuclide	Activity GPS	Uncertainty %
Pb-210	6.385E+02	8.80
AM-241	4.291E+02	7.96
CD-109	5.891E+02	8.29
Co-57	3.028E+02	6.67
Ce-139	4.305E+02	6.32
Hg-203	8.325E+02	16.74
SN-113	6.000E+02	5.46
Sr-85	1.033E+03	6.75
CS-137	3.936E+02	5.47
Y-898	1.377E+03	5.53
Co-1173	6.872E+02	5.17
Co-1332	6.994E+02	5.30
Y-1836	1.571E+03	7.99
Total	9.584E+03	

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/27/2013 16:41:54
Curtis & Tompkins HPS Lab       Spectrum name: 1_20130619003_EffVerif.An1

Sample description
     RICV|S20633|Eff Verification


Spectrum Filename: C:\User\SPC\Det1\1_20130619003_EffVerif.An1

Acquisition information
       Start time:                 6/19/2013 19:14:43
       Live time:              10800
       Real time:              10925
       Dead time:                  1.14 %
       Detector ID:                    1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                   1_Soil 250ml TunaCan_06-19-2013.Clb
     HPGE01 S22147 1_20130619002_EffCal RA226


       Energy Calibration
            Created:               6/19/2013 19:12:11
            Zero offset:          -0.020 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.043E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/19/2013 18:43:28
            Type:                  Polynomial
            Uncertainty:           1.382 %
            Coefficients:         -0.396420  -4.062121   0.406738
                                  -0.047391   0.002018  -0.000039

Library Files
       Main analysis library:      EfficiencyVerificationDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.99keV )
       Stop channel:            8144 (  2035.69keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 6/27/2013 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619003_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0364

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
25.49	824.	13.44	0.00	0.000E+00				
46.55	29371.	1.10	0.89	4.396E-03	46.54	100.000	6.385E+02	Pb210
59.57	74204.	0.54	0.86	1.606E-02	59.54	100.000	4.291E+02	AM241
88.05	141260.	0.35	0.86	3.777E-02	88.03	100.000	5.891E+02	CD109
122.07	64591.	0.54	0.88	4.864E-02	122.06	100.000	3.028E+02	Co57
136.47	8212.	2.54	0.86	4.990E-02				
165.85	38769.	0.62	0.94	4.944E-02	165.86	100.000	4.305E+02	Ce139
238.58	1683.	9.32	1.20	4.295E-02				
255.02	1077.	12.92	1.23	4.140E-02				
279.10	1838.	7.83	0.99	3.927E-02	279.20	100.000	8.325E+02	Hg203
351.90	989.	10.97	1.12	3.389E-02				
391.74	24335.	0.95	1.16	3.156E-02	391.70	100.000	6.000E+02	SN113
514.12	6703.	2.23	1.18	2.626E-02	514.00	100.000	1.033E+03	Sr85
583.26	696.	16.97	1.54	2.410E-02				
609.43	776.	13.27	1.21	2.339E-02				
661.76	91951.	0.36	1.41	2.212E-02	661.66	100.000	3.935E+02	CS137
898.10	26326.	0.72	1.60	1.793E-02	898.04	100.000	1.353E+03	Y898
1173.35	95408.	0.34	1.81	1.479E-02	1173.23	100.000	6.783E+02	Co1173
1332.55	89264.	0.35	1.93	1.342E-02	1332.49	100.000	6.994E+02	Co1332
1836.04	17453.	0.81	2.22	1.023E-02	1836.05	100.000	1.571E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
102.00	25.49	6727.	824.	0.000E+00	26.87	0.000	-	s

ORTEC g v - i (1087) Env32 G53W4.26 6/27/2013 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619003_EffVerif.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
545.68	136.47	13616.	8212.	1.646E+05	5.09	0.860	-
953.99	238.58	9171.	1683.	3.919E+04	18.64	1.202	-
1019.69	255.02	7617.	1077.	2.600E+04	25.85	1.226	-
1407.22	351.93	6147.	952.	2.809E+04	27.34	0.902	-
2332.33	583.26	4416.	696.	2.888E+04	33.93	1.538	- s
2437.02	609.43	3645.	776.	3.318E+04	26.55	1.209	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerificationDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	186.18	46.55	29026.	29371.	2.720	2.20	0.886
AM-241	238.23	59.57	32156.	74204.	6.871	1.08	0.865
CD-109	352.11	88.05	35692.	141260.	13.080	0.70	0.864
Co-57	488.14	122.07	19732.	64591.	5.981	1.07	0.884
Ce-139	663.20	165.86	9046.	38769.	3.590	1.23	0.938D
Hg-203	1116.01	279.10	7545.	1838.	0.170	15.66	0.993
SN-113	1566.42	391.74	8419.	24335.	2.253	1.89	1.160
Sr-85	2055.84	514.12	5564.	6703.	0.621	4.45	1.182
CS-137	2646.30	661.76	5445.	91951.	8.514	0.72	1.406
Y-898	3591.54	898.07	6755.	26795.	2.481	1.76	1.609
Co-1173	4692.61	1173.30	3532.	96658.	8.950	0.69	1.816
Co-1332	5329.83	1332.55	1767.	89264.	8.265	0.70	1.926
Y-1836	7344.81	1836.04	441.	17453.	1.616	1.61	2.217

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Peak Code	MDA Value GPS/Source	COMMENTS
Pb-210		6.3853E+02				8.12E+03	
			46.54	6.385E+02	(	8.630E+00 1.10E+00 1.00E+02	G
AM-241		4.2914E+02				1.58E+05	
			59.54	4.291E+02	(	2.416E+00 5.41E-01 1.00E+02	G

ORTEC g v - i (1087) Env32 G53W4.26 6/27/2013 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619003_EffVerif.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CD-109	5.8908E+02					4.61E+02	
		88.03	5.891E+02	(	1.836E+00	3.50E-01	1.00E+02 G
Co-57	3.0283E+02					2.72E+02	
		122.06	3.028E+02	(	1.534E+00	5.36E-01	1.00E+02 G
Ce-139	4.3049E+02					1.38E+02	
		165.86	4.305E+02	(	2.461E+00	6.15E-01	1.00E+02 G
Hg-203	8.3247E+02					4.66E+01	
		279.20	8.325E+02	(	9.167E+01	7.83E+00	1.00E+02 G
SN-113	5.9997E+02					1.15E+02	
		391.70	6.000E+02	(	5.271E+00	9.46E-01	1.00E+02 G
Sr-85	1.0331E+03					6.48E+01	
		514.00	1.033E+03	(	2.678E+01	2.23E+00	1.00E+02 G
CS-137	3.9355E+02					1.10E+04	
		661.66	3.935E+02	(	7.359E-01	3.62E-01	1.00E+02 G
Y-898	1.3767E+03					1.07E+02	
		898.04	1.377E+03	(	9.839E+00	8.82E-01	1.00E+02 G
Co-1173	6.8719E+02					1.93E+03	
		1173.23	6.872E+02	(	9.844E-01	3.47E-01	1.00E+02 G
Co-1332	6.9942E+02					1.93E+03	
		1332.49	6.994E+02	(	7.674E-01	3.51E-01	1.00E+02 G
Y-1836	1.5713E+03					1.07E+02	
		1836.05	1.571E+03	(	4.405E+00	8.05E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.1955E+02	6.3853E+02	2.2048E+00%	8.7951E+00%	8.630E+00
AM-241	4.2847E+02	4.2914E+02	1.0816E+00%	7.9582E+00%	2.416E+00
CD-109	3.4641E+02	5.8908E+02	7.0046E-01%	8.2898E+00%	1.836E+00
Co-57	1.2296E+02	3.0283E+02	1.0719E+00%	6.6686E+00%	1.534E+00
Ce-139	7.2609E+01	4.3049E+02	1.2301E+00%	6.3194E+00%	2.461E+00
Hg-203	4.3349E+00	8.3247E+02	1.5656E+01%	1.6738E+01%	9.167E+01
SN-113	7.1401E+01	5.9997E+02	1.8914E+00%	5.4639E+00%	5.271E+00
Sr-85	2.3634E+01	1.0331E+03	4.4537E+00%	6.7499E+00%	2.678E+01
CS-137	3.8486E+02	3.9355E+02	7.2469E-01%	5.4668E+00%	7.359E-01
Y-898	1.3837E+02	1.3767E+03	1.7638E+00%	5.5291E+00%	9.839E+00
Co-1173	6.0508E+02	6.8719E+02	6.9417E-01%	5.1675E+00%	9.844E-01
Co-1332	6.1585E+02	6.9942E+02	7.0112E-01%	5.2974E+00%	7.674E-01
Y-1836	1.5793E+02	1.5713E+03	1.6103E+00%	7.9912E+00%	4.405E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (227.8 to 2035.7 keV) 3.591E+03 GPS/Source
Total Decayed Activity (227.8 to 2035.7 keV) 9.5837275E+03 GPS/Source

ORTEC g v - i (1087) Env32 G53W4.26 6/27/2013 16:41:54
Curtis & Tompkins HPS Lab Spectrum name: 1_20130619003_EffVerif.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/6/2014 18:38:06
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140106001_Energy.An1

Sample description
     RICAL,S19582,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\2_20140106001_Energy.An1

Acquisition information
       Start time:                 1/6/2014 17:57:37
       Live time:               1200
       Real time:               1253
       Dead time:                  4.25 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_QC.Clb
     HPGE02 S19582 2_20140106001_Energy RA226


       Energy Calibration
            Created:               1/6/2014 18:37:12
            Zero offset:           0.003 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.210E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 18:36:56
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.03keV )
       Stop channel:            8144 (  2034.94keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:      Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:            average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 18:38:06
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0605

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
40.01	18296.	1.08	0.83	1.792E-02				
45.56	10459.	1.45	0.83	1.776E-02				
46.82	3013.	5.60	0.83	1.772E-02				
121.88	167402.	0.26	0.88	1.562E-02	121.78	28.410	1.000E+00	QA122
244.65	34678.	0.64	1.03	1.218E-02	244.70	7.550	1.000E+00	Qa245
295.80	1820.	5.67	1.00	1.093E-02				
329.42	493.	17.23	1.22	1.010E-02				
344.15	97671.	0.34	1.13	9.742E-03	344.28	26.590	1.000E+00	Qa344
367.58	3177.	3.59	1.15	9.499E-03				
411.04	7141.	1.78	1.14	9.051E-03				
443.89	9437.	1.41	1.18	8.712E-03				
488.67	1090.	8.11	1.11	8.251E-03				
563.89	938.	8.35	1.26	7.476E-03				
586.21	1284.	7.19	1.25	7.245E-03				
674.82	468.	12.63	1.38	6.333E-03				
678.68	1017.	6.48	1.39	6.293E-03				
688.68	2049.	4.95	1.33	6.189E-03				
719.44	673.	9.40	1.42	5.872E-03				
778.99	25730.	0.74	1.46	5.259E-03	778.90	12.970	1.000E+00	Qa779
810.59	742.	10.52	1.28	5.132E-03				
867.44	7772.	1.83	1.52	4.902E-03				
919.33	752.	9.27	1.45	4.692E-03				
926.28	456.	12.13	1.64	4.664E-03				
964.07	24671.	0.72	1.59	4.511E-03	964.08	14.500	1.000E+00	Qa964
1005.09	1308.	5.03	1.52	4.412E-03				
1085.90	15857.	0.86	1.69	4.216E-03				
1089.92	2628.	2.78	1.69	4.206E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 18:38:06
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1112.01	21385.	0.77	1.68	4.152E-03				
1122.96	290.	19.99	1.03	4.125E-03				
1212.91	2050.	3.84	1.87	3.907E-03				
1299.14	2299.	2.52	1.95	3.698E-03				
1407.95	27002.	0.63	1.91	3.434E-03	1408.01	20.850	1.000E+00	Qa1408
1457.48	658.	4.58	1.65	3.314E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
159.71	39.98	11616.	20998.	1.172E+06	2.18	1.108	-	s
181.68	45.52	6427.	10354.	5.830E+05	2.94	0.831	PB-210	D
186.72	46.78	12509.	3237.	1.826E+05	10.39	0.832	TH-227	D
1182.09	295.80	3155.	1820.	1.665E+05	11.35	0.997	PB-214	
1316.47	329.42	2582.	493.	4.876E+04	34.47	1.223	TH-227	
1469.04	367.58	2882.	3177.	3.344E+05	7.17	1.153	-	s
1642.76	411.04	2638.	7141.	7.890E+05	3.55	1.137	AC-228	
1774.11	443.89	2460.	9437.	1.083E+06	2.83	1.179	RA-223	
1953.18	488.67	2174.	1090.	1.322E+05	16.23	1.108	PB-214	
2253.95	563.89	2076.	938.	1.255E+05	16.69	1.257	-	
2343.24	586.21	2264.	1284.	1.772E+05	14.38	1.252	-	
2697.40	674.77	1474.	412.	6.512E+04	31.59	1.026	-	s
2712.85	678.63	1714.	956.	1.520E+05	15.86	1.335	-	
2753.07	688.68	2288.	2049.	3.311E+05	9.90	1.326	-	s
2876.21	719.47	1740.	696.	1.185E+05	21.79	1.776	-	s
3240.71	810.59	1672.	742.	1.446E+05	21.04	1.283	-	
3468.18	867.44	2819.	7772.	1.586E+06	3.65	1.521	-	
3675.80	919.33	1285.	752.	1.603E+05	18.54	1.454	-	
3703.61	926.28	966.	456.	9.786E+04	24.25	1.641	-	
4018.99	1005.09	837.	1308.	2.965E+05	10.05	1.522	-	
4342.41	1085.82	1322.	15857.	3.762E+06	1.72	1.687	-	D
4358.51	1089.85	1354.	2628.	6.249E+05	5.56	1.690	-	D
4446.94	1112.01	1337.	21385.	5.150E+06	1.55	1.681	-	
4490.77	1122.96	905.	290.	7.034E+04	39.99	1.033	-	s
4850.82	1212.91	900.	2050.	5.247E+05	7.68	1.867	-	
5196.05	1299.14	260.	2299.	6.216E+05	5.05	1.953	-	
5830.14	1457.48	47.	658.	1.985E+05	9.17	1.646	K-40	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 18:38:06
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106001_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.00	121.88	9656.	167402.	139.502	0.53	0.881
Qa-245	977.65	244.65	5183.	34678.	28.898	1.29	1.031
Qa-344	1375.38	344.15	3900.	97671.	81.393	0.68	1.128
Qa-779	3114.29	778.99	2585.	25730.	21.441	1.48	1.462
Qa-964	3854.82	964.07	1575.	24671.	20.559	1.43	1.591
Qa-1408	5631.79	1407.95	383.	27002.	22.502	1.26	1.912

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Peak Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	2.752E-03 2.64E-01 2.84E+01	G
Qa-245		1.0000E+00				4.94E+03	
			244.70	1.000E+00	(	9.753E-03 6.43E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	3.007E-03 3.42E-01 2.66E+01	G
Qa-779		1.0000E+00				4.94E+03	
			778.90	1.000E+00	(	9.314E-03 7.41E-01 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	7.606E-03 7.15E-01 1.45E+01	G
Qa-1408		1.0000E+00				4.94E+03	
			1408.01	1.000E+00	(	3.476E-03 6.31E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 18:38:06
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106001_Energy.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.4949E-01	1.0000E+00	5.2813E-03	1.1429E-01	2.752E-03
Qa-245	8.4949E-01	1.0000E+00	1.2859E-02	1.1489E-01	9.753E-03
Qa-344	8.4949E-01	1.0000E+00	6.8321E-03	1.1437E-01	3.007E-03
Qa-779	8.4949E-01	1.0000E+00	1.4816E-02	1.1512E-01	9.314E-03
Qa-964	8.4949E-01	1.0000E+00	1.4303E-02	1.1506E-01	7.606E-03
Qa-1408	8.4949E-01	1.0000E+00	1.2620E-02	1.1486E-01	3.476E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1098.5 to 2034.9 keV) 5.097E+00 µCi
Total Decayed Activity (1098.5 to 2034.9 keV) 6.0000181E+00 µCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/6/2014 18:38:06
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106001_Energy.An1

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 2_Soil 250ml TunaCan_01-06-2014.Clb
Energy Calibration Date: 1/24/2014 Time: 06:52:16
Efficiency Calibration Date: 1/7/2014 Time: 11:47:58

Calibration Description:
HPGE02 S23325 2_20140106002_EffCal RA226

Energy Calibration Fit
Energy = 0.0262 +0.250315*Channel -5.2385e-008*Channel**2
FWHM (ch) = 3.0438 +0.001102*Channel -5.60292e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
486.85	121.78	121.88	-0.08%	0.88	0.89	-1.82%
977.50	244.70	244.66	0.02%	1.05	1.02	2.83%
1375.17	344.28	344.15	0.04%	1.10	1.11	-1.39%
3113.96	778.90	778.99	-0.01%	1.51	1.48	1.48%
3854.46	964.08	964.08	0.00%	1.59	1.61	-1.65%
5631.42	1408.01	1408.00	0.00%	1.87	1.87	0.30%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.7336 %
Coefficients:
-0.360765 -4.056690 0.335194 -0.029735 0.000757 -0.000011

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	4.4606E-003	4.4507E-003	0.22%
59.54	1.6152E-002	1.6287E-002	-0.83%
88.03	4.3356E-002	4.1188E-002	5.00%
122.06	4.8149E-002	5.0630E-002	-5.15%
165.86	4.8765E-002	4.8560E-002	0.42%
279.20	3.8025E-002	3.6688E-002	3.52%
391.70	2.8614E-002	2.9483E-002	-3.04%
661.66	2.1785E-002	2.1191E-002	2.72%
898.04	1.7355E-002	1.7540E-002	-1.06%
1173.23	1.4601E-002	1.4767E-002	-1.13%
1332.49	1.3385E-002	1.3538E-002	-1.14%
1836.05	1.0755E-002	1.0618E-002	1.28%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14214.00	604.40	4.10%	7/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1137.20	408.50	3.50%	7/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	15378.00	557.60	4.70%	7/1/2013 09:00:00
Co-122	122.06	85.51	2.72E+002	352.36	301.30	4.10%	7/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	528.54	422.30	3.90%	7/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1095.70	892.80	3.80%	7/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	908.42	590.20	3.90%	7/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	447.94	380.70	4.00%	7/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1519.70	1427.00	3.90%	7/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	705.86	704.80	4.00%	7/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	705.12	705.00	4.00%	7/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1520.30	1510.00	4.00%	7/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 11:52:49
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140106002_EffCal.An1

Sample description
     RICAL,S23325,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\2_20140106002_EffCal.An1

Acquisition information
       Start time:                 1/6/2014 18:46:10
       Live time:              10800
       Real time:              10963
       Dead time:                  1.49 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:               1/7/2014 11:51:19
            Zero offset:          -0.025 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -4.203E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/7/2014 11:47:58
            Type:                  Polynomial
            Uncertainty:           1.734 %
            Coefficients:         -0.360765  -4.056690   0.335194
                                  -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:      EfficiencyCalibrationDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.00keV )
       Stop channel:            8144 (  2035.23keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 11:52:49
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0527

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
46.54	27364.	1.17	0.81	4.451E-03	46.54	4.252	1.361E+04	Pb210
59.56	68456.	0.58	0.82	1.631E-02	59.54	35.920	1.084E+03	AM241
88.08	172232.	0.31	0.85	4.121E-02	88.03	3.626	1.419E+04	CD109
122.10	96395.	0.44	0.87	5.063E-02	122.06	85.510	3.342E+02	Co57
136.51	12258.	2.03	0.93	5.080E-02				
165.85	85657.	0.45	0.91	4.856E-02	165.86	79.900	5.306E+02	Ce139
238.46	1039.	15.54	0.92	4.046E-02				
255.01	2613.	7.03	1.05	3.884E-02				
279.04	22790.	1.13	1.05	3.670E-02	279.20	81.480	1.182E+03	Hg203
351.83	1136.	14.38	1.21	3.161E-02				
391.52	64939.	0.50	1.13	2.949E-02	391.70	64.970	9.822E+02	SN113
513.89	41681.	0.69	1.24	2.480E-02	514.00	98.500	1.197E+03	Sr85
609.38	1085.	11.72	1.31	2.230E-02				
661.63	93116.	0.38	1.41	2.119E-02	661.66	84.990	4.845E+02	CS137
814.13	585.	15.22	1.49	1.864E-02				
898.03	78476.	0.42	1.58	1.754E-02	898.04	93.900	1.511E+03	Y898
1173.20	103199.	0.35	1.75	1.477E-02	1173.23	99.850	6.938E+02	Co1173
1332.49	93420.	0.36	1.85	1.354E-02	1332.49	99.983	6.842E+02	Co1332
1461.00	700.	13.09	1.52	1.268E-02				
1835.82	50302.	0.48	2.18	1.062E-02	1836.05	99.320	1.513E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
545.66	136.51	19766.	12258.	2.413E+05	4.05	0.926	-

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 11:52:49
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106002_EffCal.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
953.15	238.46	11372.	1039.	2.567E+04	31.09	0.923	PB-212	
1019.28	255.01	12471.	2613.	6.728E+04	14.07	1.046	TH-227	
1406.33	351.83	9469.	1136.	3.594E+04	28.77	1.212	PB-214	
2436.18	609.38	5391.	1085.	4.866E+04	23.45	1.314	BI-214	
3255.12	814.36	3668.	585.	3.138E+04	30.43	1.485	-	D
5843.99	1461.00	1879.	700.	5.525E+04	26.18	1.523	K-40	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibrationDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	186.08	46.54	28690.	27364.	2.534	2.33	0.811
AM-241	238.11	59.56	33594.	68456.	6.339	1.15	0.825
CD-109	352.09	88.08	41551.	172232.	15.947	0.62	0.845
Co-57	488.05	122.10	28471.	96395.	8.925	0.87	0.874
Ce-139	662.93	165.85	22198.	85657.	7.931	0.90	0.906
Hg-203	1115.33	279.04	14432.	22790.	2.110	2.26	1.052
SN-113	1565.02	391.52	12048.	64939.	6.013	1.00	1.133
Sr-85	2054.31	513.89	11466.	41681.	3.859	1.38	1.244
CS-137	2645.16	661.63	8529.	93116.	8.622	0.76	1.409
Y-898	3590.77	898.03	7314.	78476.	7.266	0.83	1.577
Co-1173	4691.91	1173.20	5092.	103199.	9.555	0.70	1.750
Co-1332	5329.47	1332.49	3853.	93420.	8.650	0.72	1.849
Y-1836	7345.07	1835.82	1306.	50302.	4.658	0.96	2.177

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Peak Code	MDA Value Bq	COMMENTS
Pb-210		1.3607E+04					8.12E+03
			46.54	1.361E+04	(	3.938E+02	1.17E+00 4.25E+00 G
AM-241		1.0844E+03					1.58E+05
			59.54	1.084E+03	(	1.357E+01	5.77E-01 3.59E+01 G

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 11:52:49
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106002_EffCal.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CD-109	1.4193E+04					4.61E+02	
		88.03	1.419E+04	(	7.850E+01	3.10E-01	3.63E+00 G
Co-57	3.3418E+02					2.72E+02	
		122.06	3.342E+02	(	2.735E+00	4.35E-01	8.55E+01 G
Ce-139	5.3059E+02					1.38E+02	
		165.86	5.306E+02	(	4.317E+00	4.52E-01	7.99E+01 G
Hg-203	1.1815E+03					4.66E+01	
		279.20	1.182E+03	(	2.916E+01	1.13E+00	8.15E+01 G
SN-113	9.8221E+02					1.15E+02	
		391.70	9.822E+02	(	7.777E+00	5.01E-01	6.50E+01 G
Sr-85	1.1966E+03					6.48E+01	
		514.00	1.197E+03	(	1.440E+01	6.91E-01	9.85E+01 G
CS-137	4.8447E+02					1.10E+04	
		661.66	4.845E+02	(	2.253E+00	3.79E-01	8.50E+01 G
Y-898	1.5113E+03					1.07E+02	
		898.04	1.511E+03	(	7.727E+00	4.17E-01	9.39E+01 G
Co-1173	6.9381E+02					1.93E+03	
		1173.23	6.938E+02	(	2.254E+00	3.48E-01	9.98E+01 G
Co-1332	6.8417E+02					1.93E+03	
		1332.49	6.842E+02	(	2.138E+00	3.61E-01	1.00E+02 G
Y-1836	1.5130E+03					1.07E+02	
		1836.05	1.513E+03	(	5.146E+00	4.78E-01	9.93E+01 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting Bq	2 Sigma Total Bq	MDA
Pb-210	1.3389E+04	1.3607E+04	3.1755E+02	1.2013E+03	3.938E+02
AM-241	1.0835E+03	1.0844E+03	1.2505E+01	8.6415E+01	1.357E+01
CD-109	1.0678E+04	1.4193E+04	8.7895E+01	1.1764E+03	7.850E+01
Co-57	2.0616E+02	3.3418E+02	2.9097E+00	2.2204E+01	2.735E+00
Ce-139	2.0442E+02	5.3059E+02	4.7986E+00	3.3257E+01	4.317E+00
Hg-203	7.0591E+01	1.1815E+03	2.6656E+01	7.6584E+01	2.916E+01
SN-113	3.1390E+02	9.8221E+02	9.8442E+00	5.4764E+01	7.777E+00
Sr-85	1.5802E+02	1.1966E+03	1.6537E+01	6.8128E+01	1.440E+01
CS-137	4.7871E+02	4.8447E+02	3.6742E+00	2.8507E+01	2.253E+00
Y-898	4.4118E+02	1.5113E+03	1.2599E+01	8.4540E+01	7.727E+00
Co-1173	6.4807E+02	6.9381E+02	4.8325E+00	3.6568E+01	2.254E+00
Co-1332	6.3907E+02	6.8417E+02	4.9420E+00	3.6449E+01	2.138E+00
Y-1836	4.4166E+02	1.5130E+03	1.4472E+01	1.2072E+02	5.146E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (897.8 to 2035.2 keV) 2.875E+04 Bq
Total Decayed Activity (897.8 to 2035.2 keV) 3.7995891E+04 Bq

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 11:52:49
Curtis & Tompkins HPS Lab Spectrum name: 2_20140106002_EffCal.An1

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 15:58:56
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140107002_EffVerif.An1

Sample description
     RICV||S22147||Eff Verification


Spectrum Filename: C:\User\SPC\Det2\2_20140107002_EffVerif.An1

Acquisition information
       Start time:                 1/7/2014 12:56:57
       Live time:              10800
       Real time:              10913
       Dead time:                  1.04 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_Soil 250ml TunaCan_01-06-2014.Clb
     HPGE02 S23325 2_20140106002_EffCal RA226


       Energy Calibration
            Created:               1/7/2014 12:17:05
            Zero offset:          -0.001 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.279E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/7/2014 11:47:58
            Type:                  Polynomial
            Uncertainty:           1.734 %
            Coefficients:         -0.360765  -4.056690   0.335194
                                  -0.029735   0.000757  -0.000011

Library Files
       Main analysis library:      EfficiencyVerificationDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.03keV )
       Stop channel:            8144 (  2034.94keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 15:58:56
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0716

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
30.53	512.	16.56	0.00	0.000E+00				
46.56	25301.	1.08	0.84	4.464E-03	46.54	100.000	5.433E+02	Pb210
59.60	65455.	0.55	0.83	1.634E-02	59.54	100.000	3.727E+02	AM241
88.11	125881.	0.37	0.84	4.123E-02	88.03	100.000	4.942E+02	CD109
122.14	58076.	0.58	0.88	5.063E-02	122.06	100.000	2.737E+02	Co57
136.55	7550.	2.78	0.88	5.080E-02				
165.91	33013.	0.81	0.92	4.856E-02	165.86	100.000	4.081E+02	Ce139
238.47	1252.	12.50	0.94	4.046E-02				
255.09	925.	13.42	1.15	3.883E-02				
279.00	1351.	9.92	0.95	3.670E-02	279.20	100.000	8.526E+02	Hg203
295.16	747.	15.00	1.06	3.540E-02				
351.82	1264.	10.32	1.38	3.161E-02				
391.60	21271.	1.03	1.18	2.949E-02	391.70	100.000	6.246E+02	SN113
513.98	5459.	2.71	1.25	2.480E-02	514.00	100.000	1.077E+03	Sr85
609.36	932.	12.13	1.32	2.230E-02				
661.71	90889.	0.37	1.39	2.119E-02	661.66	100.000	4.065E+02	CS137
898.09	23607.	0.96	1.58	1.754E-02	898.04	100.000	1.391E+03	Y898
1173.21	96135.	0.36	1.77	1.477E-02	1173.23	100.000	6.890E+02	Co1173
1332.44	87855.	0.35	1.87	1.354E-02	1332.49	100.000	6.868E+02	Co1332
1460.65	886.	8.39	1.88	1.268E-02				
1835.59	15038.	0.91	2.21	1.062E-02	1836.05	100.000	1.464E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 15:58:56
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107002_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
122.00	30.53	3933.	512.	0.000E+00	33.11	0.000	-	s
545.62	136.55	13542.	7550.	1.486E+05	5.56	0.882	-	
952.94	238.47	9303.	1252.	3.095E+04	25.01	0.942	-	
1019.37	255.09	6587.	925.	2.383E+04	26.84	1.149	-	
1179.72	295.21	5927.	710.	2.006E+04	33.72	0.861	-	
1406.03	351.82	6061.	1264.	4.000E+04	20.64	1.381	-	s
2435.79	609.36	4089.	932.	4.181E+04	24.26	1.323	-	
5842.79	1460.65	948.	886.	6.991E+04	16.78	1.876	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerificationDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	186.02	46.56	19905.	25301.	2.343	2.17	0.841
AM-241	238.12	59.60	24848.	65455.	6.061	1.10	0.828
CD-109	352.05	88.11	31593.	125881.	11.656	0.74	0.843
Co-57	488.04	122.14	19228.	58076.	5.377	1.16	0.883
Ce-139	662.92	165.91	13416.	33013.	3.057	1.62	0.921
Hg-203	1114.92	279.00	6919.	1351.	0.125	19.83	0.947
SN-113	1565.06	391.60	8174.	21271.	1.970	2.07	1.185
Sr-85	2054.36	513.98	5643.	5459.	0.505	5.41	1.248
CS-137	2645.13	661.71	6189.	90889.	8.416	0.75	1.394
Y-898	3590.76	898.09	6538.	23607.	2.186	1.91	1.575
Co-1173	4691.85	1173.21	4268.	96135.	8.901	0.71	1.773
Co-1332	5329.37	1332.44	1767.	87855.	8.135	0.71	1.865
Y-1836	7344.95	1835.59	634.	15038.	1.392	1.82	2.213

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 15:58:56
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107002_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source			COMMENTS
Pb-210		5.4330E+02						8.12E+03	
			46.54	5.433E+02	(	7.059E+00	1.08E+00	1.00E+02	G
AM-241		3.7273E+02						1.58E+05	
			59.54	3.727E+02	(	2.091E+00	5.51E-01	1.00E+02	G
CD-109		4.9423E+02						4.61E+02	
			88.03	4.942E+02	(	1.626E+00	3.70E-01	1.00E+02	G
Co-57		2.7368E+02						2.72E+02	
			122.06	2.737E+02	(	1.523E+00	5.81E-01	1.00E+02	G
Ce-139		4.0808E+02						1.38E+02	
			165.86	4.081E+02	(	3.336E+00	8.12E-01	1.00E+02	G
Hg-203		8.5262E+02						4.66E+01	
			279.20	8.526E+02	(	1.223E+02	9.92E+00	1.00E+02	G
SN-113		6.2460E+02						1.15E+02	
			391.70	6.246E+02	(	6.186E+00	1.03E+00	1.00E+02	G
Sr-85		1.0771E+03						6.48E+01	
			514.00	1.077E+03	(	3.453E+01	2.71E+00	1.00E+02	G
CS-137		4.0655E+02						1.10E+04	
			661.66	4.065E+02	(	8.199E-01	3.73E-01	1.00E+02	G
Y-898		1.3915E+03						1.07E+02	
			898.04	1.391E+03	(	1.110E+01	9.57E-01	1.00E+02	G
Co-1173		6.8899E+02						1.93E+03	
			1173.23	6.890E+02	(	1.091E+00	3.57E-01	1.00E+02	G
Co-1332		6.8681E+02						1.93E+03	
			1332.49	6.868E+02	(	7.657E-01	3.53E-01	1.00E+02	G
Y-1836		1.4642E+03						1.07E+02	
			1836.05	1.464E+03	(	5.715E+00	9.08E-01	1.00E+02	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 15:58:56
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107002_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	5.2636E+02	5.4330E+02	2.1657E+00%	8.7855E+00%	7.059E+00
AM-241	3.7212E+02	3.7273E+02	1.1019E+00%	7.9618E+00%	2.091E+00
CD-109	2.8299E+02	4.9423E+02	7.4097E-01%	8.2990E+00%	1.626E+00
Co-57	1.0621E+02	2.7368E+02	1.1619E+00%	6.6887E+00%	1.523E+00
Ce-139	6.2948E+01	4.0808E+02	1.6247E+00%	6.4117E+00%	3.336E+00
Hg-203	3.4102E+00	8.5262E+02	1.9834E+01%	2.0744E+01%	1.223E+02
SN-113	6.6801E+01	6.2460E+02	2.0653E+00%	5.8607E+00%	6.186E+00
Sr-85	2.0386E+01	1.0771E+03	5.4123E+00%	7.7330E+00%	3.453E+01
CS-137	3.9713E+02	4.0655E+02	7.4630E-01%	5.8827E+00%	8.199E-01
Y-898	1.2462E+02	1.3915E+03	1.9145E+00%	5.8533E+00%	1.110E+01
Co-1173	6.0280E+02	6.8899E+02	7.1435E-01%	5.2730E+00%	1.091E+00
Co-1332	6.0090E+02	6.8681E+02	7.0658E-01%	5.3254E+00%	7.657E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 15:58:56
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140107002_EffVerif.An1

 Y-1836       1.3113E+02    1.4642E+03   1.8165E+00%   8.1272E+00% 5.715E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2034.9 keV)     3.298E+03  GPS/Source
 Total Decayed Activity (   25.0 to  2034.9 keV) 9.2843467E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/28/2013 14:13:51
Curtis & Tompkins HPS Lab       Spectrum name: 3_20130428001_Energy.An1

Sample description
     RICAL,S19583,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\3_20130428001_Energy.An1

Acquisition information
       Start time:                 4/28/2013 13:39:14
       Live time:                600
       Real time:                629
       Dead time:                  4.54 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_QC.Clb
     HPGE03 S19583 3_20130428001_Energy RA226


       Energy Calibration
            Created:               4/28/2013 14:12:37
            Zero offset:          -0.101 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.758E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/28/2013 14:09:55
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.92keV )
       Stop channel:            8144 (  2035.36keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 4/28/2013 14:13:51
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0221

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
30.79	1324.	6.59	1.41	1.695E-02				
39.76	7971.	2.02	1.18	1.673E-02				
45.28	4298.	2.46	0.83	1.660E-02				
46.66	1170.	9.45	0.83	1.656E-02				
121.75	81721.	0.38	0.90	1.472E-02	121.78	28.410	1.000E+00	QA122
244.69	17272.	0.96	1.04	1.171E-02	244.70	7.550	1.000E+00	Qa245
295.98	948.	7.09	1.18	1.046E-02				
344.33	48239.	0.48	1.12	9.283E-03	344.28	26.590	1.000E+00	Qa344
367.66	1496.	5.12	1.24	9.054E-03				
411.07	3589.	2.44	1.23	8.628E-03				
443.89	4714.	1.94	1.28	8.305E-03				
488.64	647.	9.55	0.99	7.866E-03				
563.99	622.	8.16	1.31	7.123E-03				
586.15	550.	11.72	1.31	6.908E-03				
678.64	500.	10.81	1.09	5.999E-03				
688.55	956.	6.60	1.39	5.902E-03				
719.20	390.	16.04	0.70	5.601E-03				
778.89	12709.	1.05	1.45	5.015E-03	778.90	12.970	1.000E+00	Qa779
810.55	327.	14.12	1.25	4.898E-03				
867.35	3945.	2.49	1.52	4.690E-03				
919.51	461.	11.05	1.29	4.499E-03				
964.05	12285.	1.01	1.66	4.336E-03	964.08	14.500	1.000E+00	Qa964
1005.07	652.	6.45	1.58	4.237E-03				
1085.85	7965.	1.21	1.71	4.043E-03				
1089.89	1314.	4.05	1.72	4.033E-03				
1112.08	10183.	1.06	1.73	3.980E-03				
1212.82	1006.	5.97	1.76	3.737E-03				

ORTEC g v - i (1087) Env32 G53W4.26 4/28/2013 14:13:51
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1275.02	162.	17.57	0.40	3.587E-03				
1299.12	1142.	3.68	1.80	3.529E-03				
1407.99	13311.	0.90	1.93	3.267E-03	1408.01	20.850	1.000E+00	Qa1408
1457.53	339.	5.95	1.52	3.148E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
123.43	30.79	2730.	1324.	7.811E+04	13.17	1.414	-	s
159.29	39.76	6644.	7971.	4.764E+05	4.04	1.182	-	s
181.34	45.22	3436.	4298.	2.590E+05	4.92	0.831	-	D
186.88	46.60	5534.	1170.	7.066E+04	18.90	0.833	-	D
1183.39	295.98	1371.	948.	9.062E+04	14.18	1.178	-	
1469.94	367.66	1407.	1496.	1.652E+05	10.23	1.244	-	s
1643.53	411.07	1228.	3589.	4.160E+05	4.87	1.230	-	
1774.74	443.89	1137.	4714.	5.675E+05	3.88	1.279	-	
1953.68	488.64	1023.	647.	8.229E+04	19.09	0.992	-	s
2254.96	564.22	976.	622.	8.729E+04	16.32	1.309	-	D
2343.59	586.15	1166.	550.	7.969E+04	23.44	1.315	-	
2713.44	678.64	834.	500.	8.332E+04	21.61	1.091	-	
2753.09	688.55	946.	956.	1.620E+05	13.20	1.391	-	s
2875.69	719.20	1067.	390.	6.960E+04	32.09	0.699	-	s
3241.06	810.55	668.	327.	6.674E+04	28.24	1.247	-	
3468.27	867.35	1327.	3945.	8.412E+05	4.98	1.524	-	
3676.94	919.51	626.	461.	1.024E+05	22.10	1.292	-	
4019.27	1005.07	338.	652.	1.539E+05	12.90	1.575	-	
4342.45	1085.79	687.	7965.	1.970E+06	2.43	1.713	-	D
4358.64	1089.84	761.	1314.	3.259E+05	8.10	1.716	-	D
4447.02	1111.98	751.	10620.	2.669E+06	2.24	1.763	-	
4850.57	1212.82	508.	1006.	2.691E+05	11.93	1.757	-	
5099.50	1275.02	162.	162.	4.516E+04	35.14	0.404	-	s
5195.95	1299.12	137.	1142.	3.237E+05	7.37	1.797	-	
5830.03	1457.53	13.	339.	1.077E+05	11.91	1.519	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

ORTEC g v - i (1087) Env32 G53W4.26 4/28/2013 14:13:51
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428001_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	486.97	121.75	4907.	81721.	136.202	0.76	0.898
Qa-245	978.38	244.69	3167.	17272.	28.787	1.93	1.038
Qa-344	1376.71	344.33	1848.	48239.	80.398	0.97	1.120
Qa-779	3114.42	778.89	1212.	12709.	21.182	2.09	1.450
Qa-964	3855.13	964.05	722.	12285.	20.475	2.01	1.663
Qa-1408	5631.71	1407.99	180.	13311.	22.184	1.79	1.930

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Peak Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	1.997E-03 3.78E-01 2.84E+01	G
Qa-245		1.0000E+00				4.94E+03	
			244.70	1.000E+00	(	7.592E-03 9.64E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	2.076E-03 4.84E-01 2.66E+01	G
Qa-779		1.0000E+00				4.94E+03	
			778.90	1.000E+00	(	6.383E-03 1.05E+00 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	5.097E-03 1.01E+00 1.45E+01	G
Qa-1408		1.0000E+00				4.94E+03	
			1408.01	1.000E+00	(	2.351E-03 8.96E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 4/28/2013 14:13:51
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428001_Energy.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.8022E-01	1.0000E+00	7.5615E-03	1.1441E-01	1.997E-03
Qa-245	8.8022E-01	1.0000E+00	1.9280E-02	1.1578E-01	7.592E-03
Qa-344	8.8022E-01	1.0000E+00	9.6810E-03	1.1457E-01	2.076E-03
Qa-779	8.8022E-01	1.0000E+00	2.0924E-02	1.1607E-01	6.383E-03
Qa-964	8.8022E-01	1.0000E+00	2.0102E-02	1.1592E-01	5.097E-03
Qa-1408	8.8022E-01	1.0000E+00	1.7924E-02	1.1556E-01	2.351E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1112.0 to 2035.4 keV) 5.281E+00 µCi
Total Decayed Activity (1112.0 to 2035.4 keV) 6.0000162E+00 µCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 4/28/2013 14:13:51
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428001_Energy.An1

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 3_Soil 250ml TunaCan_04-28-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:28:35
Efficiency Calibration Date: 4/29/2013 Time: 08:26:15

Calibration Description:
HPGE03 S22147 3_20130428002_EffCal RA226

Energy Calibration Fit
Energy = -0.1412 +0.250224*Channel -3.78401e-008*Channel**2
FWHM (ch) = 3.2488 +0.000854*Channel -2.80059e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
487.18	121.78	121.75	0.02%	0.90	0.92	-1.61%
978.61	244.70	244.69	0.00%	1.04	1.02	1.43%
1376.94	344.28	344.33	-0.02%	1.12	1.11	1.04%
3114.78	778.90	778.88	0.00%	1.43	1.47	-2.54%
3855.64	964.08	964.07	0.00%	1.65	1.62	1.65%
5632.40	1408.01	1408.02	-0.00%	1.99	1.99	-0.13%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.2731 %
Coefficients:
-0.381561 -4.120787 0.430562 -0.052380 0.002340 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.0672E-003	3.0621E-003	0.16%
59.54	1.3375E-002	1.3450E-002	-0.56%
88.03	3.5336E-002	3.4452E-002	2.50%
122.06	4.5653E-002	4.6015E-002	-0.79%
165.86	4.7017E-002	4.7791E-002	-1.65%
279.20	3.8377E-002	3.8493E-002	-0.30%
391.70	3.1054E-002	3.0947E-002	0.34%
514.00	2.6250E-002	2.5708E-002	2.07%
661.66	2.2460E-002	2.1616E-002	3.76%
898.04	1.6884E-002	1.7496E-002	-3.63%
1173.23	1.4141E-002	1.4435E-002	-2.08%
1332.49	1.2786E-002	1.3107E-002	-2.51%
1836.05	1.0328E-002	1.0032E-002	2.87%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14132.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1111.90	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	14837.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.51	2.72E+002	340.90	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1016.20	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	874.56	568.20	3.90%	1/1/2013 09:00:00
Sr-85	514.00	98.50	6.48E+001	1061.90	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	443.82	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1480.30	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	702.25	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	701.42	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1481.10	1471.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/29/2013 08:39:50
Curtis & Tompkins HPS Lab       Spectrum name: 3_20130428002_EffCal.An1

Sample description
     RICAL||S22147||TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\3_20130428002_EffCal.An1

Acquisition information
       Start time:                 4/28/2013 14:17:10
       Live time:              10800
       Real time:              11012
       Dead time:                  1.92 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:               4/29/2013 08:35:28
            Zero offset:          -0.007 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.377E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/29/2013 08:26:15
            Type:                  Polynomial
            Uncertainty:           1.273 %
            Coefficients:         -0.381561  -4.120787   0.430562
                                  -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:      EfficiencyCalibrationDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.01keV )
       Stop channel:            8144 (  2035.37keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 08:39:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2014 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0380

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
30.52	920.	13.05	0.00	0.000E+00				
46.48	19707.	1.60	0.84	3.018E-03	46.54	4.252	1.372E+04	Pb210
59.51	57664.	0.70	0.84	1.342E-02	59.54	35.920	1.104E+03	AM241
72.91	2773.	9.19	0.86	2.450E-02				
88.01	172147.	0.34	0.86	3.444E-02	88.03	3.626	8.794E+03	CD109
122.08	106570.	0.43	0.90	4.602E-02	122.06	85.510	1.333E+02	Co57
136.52	13818.	2.07	0.93	4.765E-02				
165.92	114743.	0.40	0.96	4.779E-02	165.86	79.900	7.989E+01	Ce139
238.68	1282.	17.04	0.80	4.202E-02				
255.21	3980.	5.36	1.07	4.054E-02				
279.26	59949.	0.59	1.08	3.849E-02	279.20	81.480	4.437E+00	Hg203
352.04	1158.	15.06	1.06	3.324E-02				
391.75	94031.	0.40	1.17	3.094E-02	391.70	64.970	9.737E+01	SN113
513.94	84658.	0.44	1.27	2.571E-02	514.00	98.500	2.191E+01	Sr85
609.12	844.	17.33	1.31	2.288E-02				
661.61	90820.	0.39	1.39	2.162E-02	661.66	84.990	4.506E+02	CS137
814.24	1197.	11.49	1.64	1.873E-02				
898.06	118249.	0.34	1.58	1.750E-02	898.04	93.900	1.331E+02	Y898
1173.17	102659.	0.35	1.75	1.444E-02	1173.23	99.850	6.032E+02	Co1173
1332.49	92840.	0.37	1.87	1.311E-02	1332.49	99.983	6.000E+02	Co1332
1835.99	76553.	0.39	2.17	1.003E-02	1836.05	99.320	1.421E+02	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 08:39:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
122.00	30.52	7943.	920.	0.000E+00	26.10	0.000	-	s
291.12	72.88	27929.	2967.	1.211E+05	16.35	0.862	-	D
545.73	136.52	27250.	13818.	2.900E+05	4.14	0.933	-	
954.12	238.68	18582.	1282.	3.051E+04	34.09	0.803	-	
1020.21	255.21	16602.	3980.	9.818E+04	10.72	1.070	-	
1407.34	352.04	11266.	1158.	3.485E+04	30.13	1.057	-	
2435.36	609.12	7093.	844.	3.690E+04	34.66	1.305	-	
3255.82	814.24	5542.	1197.	6.391E+04	22.99	1.642	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibrationDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.79	46.48	33177.	19707.	1.825	3.20	0.835
AM-241	237.87	59.51	40574.	57664.	5.339	1.40	0.843
CD-109	351.82	88.01	56808.	172147.	15.940	0.67	0.862
Co-57	488.00	122.08	38491.	106570.	9.868	0.87	0.895
Ce-139	663.25	165.92	31640.	114743.	10.624	0.80	0.965
Hg-203	1116.34	279.26	20841.	59949.	5.551	1.19	1.084
SN-113	1566.09	391.75	14168.	94031.	8.707	0.80	1.168
Sr-85	2054.71	513.94	14982.	84658.	7.839	0.88	1.267
CS-137	2645.30	661.61	10262.	90820.	8.409	0.79	1.388
Y-898	3591.14	898.06	10115.	118249.	10.949	0.68	1.584
Co-1173	4691.93	1173.17	5520.	102659.	9.505	0.70	1.746
Co-1332	5329.59	1332.49	4868.	92840.	8.596	0.74	1.870
Y-1836	7345.44	1835.99	2200.	76553.	7.088	0.78	2.170

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 08:39:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source		COMMENTS
Pb-210		1.3721E+04				8.12E+03		
			46.54	1.372E+04	(	2.955E+02	1.60E+00	4.25E+00 G
AM-241		1.1039E+03				1.58E+05		
			59.54	1.104E+03	(	8.985E+00	7.00E-01	3.59E+01 G
CD-109		8.7937E+03				4.61E+02		
			88.03	8.794E+03	(	2.837E+01	3.37E-01	3.63E+00 G
Co-57		1.3331E+02				2.72E+02		
			122.06	1.333E+02	(	5.718E-01	4.34E-01	8.55E+01 G
Ce-139		7.9891E+01				1.38E+02		
			165.86	7.989E+01	(	2.886E-01	3.99E-01	7.99E+01 G
Hg-203		4.4371E+00				4.66E+01		
			279.20	4.437E+00	(	2.490E-02	5.94E-01	8.15E+01 G
SN-113		9.7368E+01				1.15E+02		
			391.70	9.737E+01	(	2.872E-01	3.99E-01	6.50E+01 G
Sr-85		2.1906E+01				6.48E+01		
			514.00	2.191E+01	(	7.380E-02	4.42E-01	9.85E+01 G
CS-137		4.5063E+02				1.10E+04		
			661.66	4.506E+02	(	1.171E+00	3.94E-01	8.50E+01 G
Y-898		1.3312E+02				1.07E+02		
			898.04	1.331E+02	(	2.638E-01	3.42E-01	9.39E+01 G
Co-1173		6.0320E+02				1.93E+03		
			1173.23	6.032E+02	(	1.017E+00	3.49E-01	9.98E+01 G
Co-1332		5.9999E+02				1.93E+03		
			1332.49	6.000E+02	(	1.051E+00	3.69E-01	1.00E+02 G
Y-1836		1.4210E+02				1.07E+02		
			1836.05	1.421E+02	(	2.029E-01	3.91E-01	9.93E+01 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 08:39:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130428002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	1.4014E+04	1.3721E+04	3.1986E+00%	9.0953E+00%	2.955E+02
AM-241	1.1051E+03	1.1039E+03	1.4010E+00%	8.0078E+00%	8.985E+00
CD-109	1.2759E+04	8.7937E+03	6.7433E-01%	8.2876E+00%	2.837E+01
Co-57	2.5078E+02	1.3331E+02	8.6887E-01%	6.6390E+00%	5.718E-01
Ce-139	2.7823E+02	7.9891E+01	7.9811E-01%	6.2497E+00%	2.886E-01
Hg-203	1.7698E+02	4.4371E+00	1.1872E+00%	6.0385E+00%	2.490E-02
SN-113	4.3302E+02	9.7368E+01	7.9806E-01%	5.1878E+00%	2.872E-01
Sr-85	3.0955E+02	2.1906E+01	8.8424E-01%	5.1485E+00%	7.380E-02
CS-137	4.5774E+02	4.5063E+02	7.8714E-01%	5.4754E+00%	1.171E+00
Y-898	6.6645E+02	1.3312E+02	6.8446E-01%	5.2847E+00%	2.638E-01
Co-1173	6.5948E+02	6.0320E+02	6.9865E-01%	5.1681E+00%	1.017E+00
Co-1332	6.5597E+02	5.9999E+02	7.3743E-01%	5.3024E+00%	1.051E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/29/2013 08:39:50
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20130428002_EffCal.An1

 Y-1836       7.1143E+02    1.4210E+02   7.8174E-01%   7.8662E+00% 2.029E-01
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   82.3 to  2035.4 keV)     3.248E+04  GPS/Source
 Total Decayed Activity (   82.3 to  2035.4 keV) 2.5884643E+04  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/29/2013 14:17:41
Curtis & Tompkins HPS Lab       Spectrum name: 3_20130429002_EffVerif.An1

Sample description
     RICV||S20633||Eff Verification


Spectrum Filename: C:\User\SPC\Det3\3_20130429002_EffVerif.An1

Acquisition information
       Start time:                 4/29/2013 11:15:16
       Live time:              10800
       Real time:              10938
       Dead time:                  1.26 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_Soil 250ml TunaCan_04-28-2013.Clb
     HPGE03 S22147 3_20130428002_EffCal RA226


       Energy Calibration
            Created:               4/29/2013 09:00:32
            Zero offset:          -0.094 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.849E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/29/2013 08:26:15
            Type:                  Polynomial
            Uncertainty:           1.273 %
            Coefficients:         -0.381561  -4.120787   0.430562
                                  -0.052380   0.002340  -0.000047

Library Files
       Main analysis library:      EfficiencyVerificationDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.93keV )
       Stop channel:            8144 (  2035.40keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 14:17:41
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0521

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.38	20548.	1.54	0.83	2.942E-03	46.54	100.000	6.376E+02	Pb210
59.44	61074.	0.63	0.84	1.336E-02	59.54	100.000	4.210E+02	AM241
87.95	138594.	0.36	0.86	3.440E-02	88.03	100.000	5.864E+02	CD109
122.03	69086.	0.52	0.90	4.601E-02	122.06	100.000	3.004E+02	Co57
136.47	8964.	2.35	0.91	4.764E-02				
165.87	47870.	0.65	0.94	4.779E-02	165.86	100.000	4.246E+02	Ce139
238.62	1337.	11.67	0.92	4.202E-02				
255.18	1570.	9.39	1.03	4.054E-02				
279.22	4391.	4.19	1.09	3.849E-02	279.20	100.000	9.452E+02	Hg203
352.04	963.	14.12	1.15	3.324E-02				
391.74	31922.	0.76	1.18	3.095E-02	391.70	100.000	5.891E+02	SN113
513.98	11806.	1.47	1.26	2.571E-02	514.00	100.000	1.074E+03	Sr85
609.17	760.	14.27	1.40	2.288E-02				
661.64	90431.	0.38	1.40	2.162E-02	661.66	100.000	3.948E+02	CS137
898.11	36502.	0.70	1.57	1.749E-02	898.04	100.000	1.377E+03	Y898
1173.24	97635.	0.36	1.79	1.444E-02	1173.23	100.000	6.982E+02	Co1173
1332.57	88709.	0.36	1.89	1.311E-02	1332.49	100.000	6.987E+02	Co1332
1836.08	23686.	0.72	2.18	1.003E-02	1836.05	100.000	1.558E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
545.74	136.47	14128.	8964.	1.881E+05	4.70	0.907	-
954.03	238.62	9583.	1337.	3.182E+04	23.34	0.917	-
1020.24	255.18	8401.	1570.	3.872E+04	18.78	1.029	-

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 14:17:41
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429002_EffVerif.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
1407.41	352.04	6746.	963.	2.899E+04	28.24	1.154	-
2435.54	609.17	4073.	760.	3.321E+04	28.54	1.397	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerificationDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.72	46.38	29551.	20548.	1.903	3.08	0.831
AM-241	237.89	59.44	31758.	61074.	5.655	1.25	0.837
CD-109	351.83	87.95	37645.	138594.	12.833	0.72	0.860
Co-57	488.04	122.03	21083.	69086.	6.397	1.04	0.901
Ce-139	663.27	165.87	16392.	47870.	4.432	1.30	0.941
Hg-203	1116.33	279.22	10133.	4391.	0.407	8.37	1.086
SN-113	1566.13	391.74	8507.	31922.	2.956	1.52	1.180
Sr-85	2054.87	513.98	6357.	11806.	1.093	2.95	1.256
CS-137	2645.36	661.64	6981.	90431.	8.373	0.76	1.404
Y-898	3591.20	898.11	6873.	36502.	3.380	1.39	1.572
Co-1173	4692.02	1173.24	4633.	97635.	9.040	0.71	1.786
Co-1332	5329.66	1332.57	2645.	88709.	8.214	0.72	1.886
Y-1836	7345.61	1836.08	949.	23686.	2.193	1.44	2.176

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Peak Code	MDA Value GPS/Source	COMMENTS
Pb-210		6.3756E+02				8.12E+03	
			46.54	6.376E+02	(	1.243E+01 1.54E+00	1.00E+02 G
AM-241		4.2100E+02				1.58E+05	
			59.54	4.210E+02	(	2.862E+00 6.27E-01	1.00E+02 G
CD-109		5.8641E+02				4.61E+02	
			88.03	5.864E+02	(	1.913E+00 3.59E-01	1.00E+02 G

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 14:17:41
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429002_EffVerif.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Co-57	3.0036E+02					2.72E+02	
		122.06	3.004E+02	(	1.471E+00	5.18E-01	1.00E+02 G
Ce-139	4.2461E+02					1.38E+02	
		165.86	4.246E+02	(	2.646E+00	6.51E-01	1.00E+02 G
Hg-203	9.4521E+02					4.66E+01	
		279.20	9.452E+02	(	5.048E+01	4.19E+00	1.00E+02 G
SN-113	5.8911E+02					1.15E+02	
		391.70	5.891E+02	(	3.966E+00	7.62E-01	1.00E+02 G
Sr-85	1.0737E+03					6.48E+01	
		514.00	1.074E+03	(	1.690E+01	1.47E+00	1.00E+02 G
CS-137	3.9483E+02					1.10E+04	
		661.66	3.948E+02	(	8.500E-01	3.80E-01	1.00E+02 G
Y-898	1.3767E+03					1.07E+02	
		898.04	1.377E+03	(	7.285E+00	6.97E-01	1.00E+02 G
Co-1173	6.9822E+02					1.93E+03	
		1173.23	6.982E+02	(	1.134E+00	3.57E-01	1.00E+02 G
Co-1332	6.9868E+02					1.93E+03	
		1332.49	6.987E+02	(	9.438E-01	3.59E-01	1.00E+02 G
Y-1836	1.5580E+03					1.07E+02	
		1836.05	1.558E+03	(	4.722E+00	7.20E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 14:17:41
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429002_EffVerif.An1

} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.2132E+02	6.3756E+02	3.0831E+00%	9.0553E+00%	1.243E+01
AM-241	4.2044E+02	4.2100E+02	1.2548E+00%	7.9835E+00%	2.862E+00
CD-109	3.7248E+02	5.8641E+02	7.1830E-01%	8.2913E+00%	1.913E+00
Co-57	1.3902E+02	3.0036E+02	1.0362E+00%	6.6630E+00%	1.471E+00
Ce-139	9.2745E+01	4.2461E+02	1.3015E+00%	6.3337E+00%	2.646E+00
Hg-203	1.0563E+01	9.4521E+02	8.3703E+00%	1.0253E+01%	5.048E+01
SN-113	9.5507E+01	5.8911E+02	1.5237E+00%	5.3478E+00%	3.966E+00
Sr-85	4.2520E+01	1.0737E+03	2.9461E+00%	5.8655E+00%	1.690E+01
CS-137	3.8737E+02	3.9483E+02	7.6086E-01%	5.4717E+00%	8.500E-01
Y-898	1.9318E+02	1.3767E+03	1.3935E+00%	5.4223E+00%	7.285E+00
Co-1173	6.2627E+02	6.9822E+02	7.1333E-01%	5.1701E+00%	1.134E+00
Co-1332	6.2668E+02	6.9868E+02	7.1794E-01%	5.2997E+00%	9.438E-01
Y-1836	2.1862E+02	1.5580E+03	1.4404E+00%	7.9587E+00%	4.722E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (24.9 to 2035.4 keV) 3.847E+03 GPS/Source
Total Decayed Activity (24.9 to 2035.4 keV) 9.7044336E+03 GPS/Source

Analyzed by: _____
Technician

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 14:17:41
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429002_EffVerif.An1

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

```
     ORTEC g v - i (1087) Env32  G53W4.26  3/4/2013 19:34:35
Curtis & Tompkins HPS Lab       Spectrum name: 4_20130304001_Energy.An1

Sample description
     RICAL,S19583,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\4_20130304001_Energy.An1

Acquisition information
       Start time:                 3/4/2013 19:18:56
       Live time:                600
       Real time:                683
       Dead time:                 12.14 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_QC.Clb
     HPGE04  S15983 4_20130304001_Energy


       Energy Calibration
            Created:               3/4/2013 19:32:55
            Zero offset:          -0.053 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.155E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/4/2013 19:32:03
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.97keV )
       Stop channel:            8144 (  2035.44keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 3/4/2013 19:34:35
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304001_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0286

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
39.68	8584.	2.01	1.14	1.739E-02				
45.25	4519.	2.33	0.79	1.722E-02				
46.62	1245.	8.98	0.79	1.718E-02				
121.77	83464.	0.38	0.86	1.492E-02	121.78	28.410	1.000E+00	QA122
244.76	16671.	0.86	1.00	1.122E-02	244.70	7.550	9.997E-01	Qa245
295.97	849.	7.30	1.07	1.013E-02				
344.23	47687.	0.49	1.11	9.109E-03	344.28	26.590	1.000E+00	Qa344
367.67	1536.	4.90	1.13	8.882E-03				
411.07	3512.	2.27	1.21	8.463E-03				
443.94	4576.	1.98	1.16	8.146E-03				
488.74	673.	9.38	1.17	7.714E-03				
563.97	579.	11.00	1.05	6.989E-03				
586.38	506.	11.32	1.23	6.773E-03				
674.57	323.	13.27	1.39	5.921E-03				
678.72	510.	8.89	1.40	5.881E-03				
688.69	1021.	7.42	1.48	5.786E-03				
719.42	436.	13.03	1.10	5.490E-03				
778.94	12555.	1.08	1.45	4.916E-03	778.90	12.970	1.000E+00	Qa779
810.61	384.	15.34	0.97	4.794E-03				
867.41	3773.	2.31	1.55	4.575E-03				
926.18	225.	17.85	0.87	4.348E-03				
964.05	11997.	1.07	1.65	4.202E-03	964.08	14.500	1.000E+00	Qa964
1005.02	708.	7.12	1.44	4.108E-03				
1085.87	7937.	1.18	1.72	3.922E-03				
1089.87	1369.	3.94	1.72	3.913E-03				
1112.03	10281.	1.14	1.73	3.862E-03				
1213.02	1049.	5.08	1.86	3.630E-03				

ORTEC g v - i (1087) Env32 G53W4.26 3/4/2013 19:34:35
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304001_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1299.21	1122.	3.60	1.85	3.432E-03				
1408.00	13063.	0.91	1.93	3.182E-03	1408.01	20.850	1.000E+00	Qa1408
1457.58	362.	5.81	1.74	3.068E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
158.79	39.68	7828.	8584.	4.936E+05	4.02	1.135	-	s
181.06	45.24	3301.	4519.	2.623E+05	4.67	0.793	-	D
186.53	46.61	5627.	1245.	7.247E+04	17.96	0.794	-	D
1183.36	295.97	1249.	849.	8.383E+04	14.61	1.066	-	
1470.02	367.67	1294.	1536.	1.730E+05	9.81	1.126	-	s
1643.55	411.07	1008.	3512.	4.150E+05	4.53	1.211	-	
1775.00	443.94	1144.	4576.	5.617E+05	3.97	1.165	-	
1954.12	488.74	1069.	673.	8.725E+04	18.76	1.171	-	
2255.00	563.97	1201.	579.	8.288E+04	22.01	1.047	-	
2344.59	586.38	994.	506.	7.477E+04	22.65	1.233	-	
2714.38	678.84	858.	512.	8.706E+04	21.70	1.211	-	
2753.79	688.69	1240.	1021.	1.764E+05	14.84	1.479	-	
2876.68	719.42	901.	436.	7.944E+04	26.06	1.101	-	
3241.47	810.61	907.	384.	8.007E+04	30.69	0.971	-	s
3468.65	867.41	1056.	3773.	8.249E+05	4.61	1.553	-	
3703.80	926.18	497.	225.	5.180E+04	35.70	0.872	-	s
4019.23	1005.02	470.	708.	1.724E+05	14.23	1.442	-	
4342.68	1085.84	434.	7937.	2.024E+06	2.36	1.717	-	D
4358.70	1089.84	767.	1369.	3.498E+05	7.87	1.720	-	D
4447.38	1112.03	756.	10281.	2.662E+06	2.28	1.732	-	
4851.49	1213.02	399.	1049.	2.890E+05	10.17	1.858	-	
5196.43	1299.21	119.	1122.	3.270E+05	7.20	1.854	-	
5830.30	1457.58	16.	362.	1.180E+05	11.62	1.735	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

ORTEC g v - i (1087) Env32 G53W4.26 3/4/2013 19:34:35
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304001_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	486.93	121.77	6000.	83464.	139.106	0.76	0.863
Qa-245	978.59	244.75	2632.	16492.	27.487	1.87	1.007
Qa-344	1376.28	344.23	1888.	47687.	79.479	0.97	1.106
Qa-779	3114.78	778.94	1376.	12555.	20.925	2.16	1.452
Qa-964	3855.29	964.05	972.	11997.	19.995	2.14	1.654
Qa-1408	5631.85	1408.00	197.	13063.	21.771	1.82	1.931

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Peak Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	2.162E-03 3.81E-01 2.84E+01	G
Qa-245		9.8901E-01				4.94E+03	
			244.70	9.890E-01	(	7.168E-03 9.37E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	2.123E-03 4.85E-01 2.66E+01	G
Qa-779		1.0000E+00				4.94E+03	
			778.90	1.000E+00	(	6.884E-03 1.08E+00 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	6.055E-03 1.07E+00 1.45E+01	G
Qa-1408		1.0000E+00				4.94E+03	
			1408.01	1.000E+00	(	2.506E-03 9.09E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

```
     ORTEC g v - i (1087) Env32  G53W4.26  3/4/2013 19:34:35
Curtis & Tompkins HPS Lab       Spectrum name: 4_20130304001_Energy.An1

  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               µCi            µCi           µCi          µCi
_____________________________________________________________________________
QA-122       8.8701E-01    1.0000E+00   7.6103E-03    1.1442E-01  2.162E-03
Qa-245       8.7727E-01    9.8901E-01   1.8526E-02    1.1442E-01  7.168E-03
Qa-344       8.8701E-01    1.0000E+00   9.7044E-03    1.1458E-01  2.123E-03
Qa-779       8.8701E-01    1.0000E+00   2.1570E-02    1.1618E-01  6.884E-03
Qa-964       8.8701E-01    1.0000E+00   2.1393E-02    1.1615E-01  6.055E-03
Qa-1408      8.8701E-01    1.0000E+00   1.8174E-02    1.1560E-01  2.506E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity ( 1111.9 to  2035.4 keV)     5.312E+00  µCi
Total Decayed Activity ( 1111.9 to  2035.4 keV) 5.9890275E+00  µCi

Analyzed by: ____________________________________________
                   Technician

Reviewed by: ____________________________________________
                   Supervisor
```

ORTEC g v - i (1087) Env32 G53W4.26 3/4/2013 19:34:35
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304001_Energy.An1

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 4_Soil 250ml TunaCan_03-04-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:44:12
Efficiency Calibration Date: 3/5/2013 Time: 18:53:13

Calibration Description:
HPGE04 S21603 4_20130304002_EffCal RA226

Energy Calibration Fit
Energy = -0.0594 +0.250210*Channel -3.14569e-008*Channel**2
FWHM (ch) = 3.0035 +0.000983*Channel -1.88958e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
486.92	121.78	121.77	0.01%	0.86	0.87	-1.30%
978.55	244.70	244.75	-0.02%	0.98	0.99	-0.42%
1376.25	344.28	344.23	0.01%	1.11	1.08	2.36%
3114.58	778.90	778.93	-0.00%	1.46	1.47	-0.99%
3855.10	964.08	964.06	0.00%	1.63	1.63	0.06%
5631.57	1408.01	1408.02	-0.00%	1.99	1.98	0.13%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.3486 %
Coefficients:
-0.377104 -4.127613 0.443802 -0.053447 0.002385 -0.000047

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	3.2391E-003	3.2326E-003	0.20%
59.54	1.4205E-002	1.4302E-002	-0.68%
88.03	3.7629E-002	3.6515E-002	2.96%
122.06	4.8153E-002	4.8445E-002	-0.61%
165.86	4.8618E-002	4.9924E-002	-2.69%
279.20	3.9819E-002	3.9668E-002	0.38%
391.70	3.1925E-002	3.1651E-002	0.86%
514.00	2.6599E-002	2.6162E-002	1.64%
661.66	2.2836E-002	2.1917E-002	4.02%
898.04	1.7055E-002	1.7683E-002	-3.69%
1173.23	1.4151E-002	1.4565E-002	-2.92%
1332.49	1.2935E-002	1.3218E-002	-2.19%
1836.05	1.0438E-002	1.0115E-002	3.09%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	15094.00	641.50	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.90	1.58E+005	1187.50	426.30	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.61	4.63E+002	15909.00	574.30	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.60	2.72E+002	363.55	311.20	4.10%	1/1/2013 09:00:00
Ce-139	165.85	79.90	1.38E+002	544.93	435.40	3.90%	1/1/2013 09:00:00
Hg-203	279.17	81.50	4.66E+001	1084.50	883.90	3.80%	1/1/2013 09:00:00
Sn-113	391.71	64.00	1.15E+002	947.66	606.50	3.90%	1/1/2013 09:00:00
Sr-85	513.99	95.70	6.48E+001	1166.10	1116.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	85.10	1.10E+004	473.09	402.60	4.00%	1/1/2013 09:00:00
Y-898	898.02	93.70	1.07E+002	1583.80	1484.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.97	1.92E+003	748.72	748.50	4.00%	1/1/2013 09:00:00
Co-1332	1332.51	99.99	1.92E+003	748.77	748.70	4.00%	1/1/2013 09:00:00
Y-1836	1836.01	99.20	1.07E+002	1583.70	1571.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  3/5/2013 18:54:00
Curtis & Tompkins HPS Lab       Spectrum name: 4_20130304002_EffCal.An1

Sample description
     RICAL,S21603,TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\4_20130304002_EffCal.An1

Acquisition information
       Start time:                 3/4/2013 19:42:26
       Live time:              10800
       Real time:              11644
       Dead time:                  7.24 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal


       Energy Calibration
            Created:               3/5/2013 18:53:33
            Zero offset:           0.071 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.988E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      EfficiencyCalibrationDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.08keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 3/5/2013 18:54:00
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304002_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0356

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
46.47	22321.	1.61	0.80	3.181E-03	46.54	4.252	1.512E+04	Pb210
59.47	65384.	0.71	0.82	1.424E-02	59.54	35.920	1.179E+03	AM241
70.67	4033.	7.50	0.82	2.425E-02				
72.90	7574.	4.06	0.83	2.607E-02				
82.37	2616.	12.71	0.88	3.301E-02				
88.06	212524.	0.30	0.82	3.653E-02	88.03	3.626	1.632E+04	CD109
122.11	137989.	0.40	0.85	4.845E-02	122.06	85.510	3.617E+02	Co57
136.52	17588.	1.92	0.87	5.003E-02				
165.93	166857.	0.33	0.92	4.992E-02	165.86	79.900	5.304E+02	Ce139
255.20	5696.	4.29	0.93	4.187E-02				
279.24	150028.	0.33	1.04	3.966E-02	279.20	81.480	1.088E+03	Hg203
391.66	143512.	0.32	1.12	3.165E-02	391.70	64.970	9.412E+02	SN113
513.99	164333.	0.29	1.23	2.616E-02	514.00	98.500	1.151E+03	Sr85
609.35	930.	18.22	1.43	2.322E-02				
661.65	98904.	0.40	1.36	2.192E-02	661.66	84.990	4.936E+02	CS137
814.09	1687.	6.88	1.42	1.895E-02				
898.03	182042.	0.27	1.56	1.768E-02	898.04	93.900	1.523E+03	Y898
1173.21	111849.	0.34	1.75	1.456E-02	1173.23	99.850	7.283E+02	Co1173
1324.82	3076.	4.98	2.71	1.328E-02				
1332.49	102264.	0.36	1.88	1.322E-02	1332.49	99.983	7.328E+02	Co1332
1836.04	117943.	0.31	2.25	1.011E-02	1836.05	99.320	1.631E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 3/5/2013 18:54:00
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304002_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
282.39	70.70	44989.	2757.	1.137E+05	22.62	0.762	-	D
291.09	72.92	41812.	6477.	2.484E+05	9.27	0.825	-	D
329.09	82.37	51398.	2616.	7.927E+04	25.42	0.879	-	s
545.60	136.52	40013.	17588.	3.516E+05	3.83	0.874	-	
1020.20	255.20	22518.	5696.	1.360E+05	8.58	0.930	-	
2436.64	609.35	9584.	930.	4.007E+04	36.43	1.432	-	
3255.56	814.07	6915.	1926.	1.016E+05	16.10	1.746	-	s
5299.12	1324.82	4966.	3076.	2.316E+05	9.95	2.712	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyCalibrationDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.53	46.47	46387.	22321.	2.067	3.22	0.803
AM-241	237.51	59.47	58384.	65384.	6.054	1.43	0.819
CD-109	351.81	88.06	70667.	212524.	19.678	0.60	0.822
Co-57	488.00	122.11	56952.	137989.	12.777	0.79	0.851
Ce-139	663.22	165.93	46172.	166857.	15.450	0.66	0.919
Hg-203	1116.34	279.24	29037.	150028.	13.892	0.65	1.041
SN-113	1565.95	391.66	19516.	143512.	13.288	0.64	1.121
Sr-85	2055.21	513.99	18900.	164333.	15.216	0.58	1.231
CS-137	2645.82	661.65	14944.	98904.	9.158	0.79	1.360
Y-898	3591.43	898.03	11860.	182042.	16.856	0.53	1.557
Co-1173	4692.46	1173.21	7030.	111849.	10.356	0.68	1.747
Co-1332	5329.83	1332.49	6101.	102264.	9.469	0.71	1.880
Y-1836	7345.24	1836.04	2060.	117943.	10.921	0.61	2.253

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 3/5/2013 18:54:00
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304002_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210		1.5117E+04				8.12E+03	
			46.54	1.512E+04	(	3.399E+02 1.61E+00 4.25E+00	G
AM-241		1.1788E+03				1.58E+05	
			59.54	1.179E+03	(	1.015E+01 7.13E-01 3.59E+01	G
CD-109		1.6324E+04				4.61E+02	
			88.03	1.632E+04	(	4.758E+01 2.99E-01 3.63E+00	G
Co-57		3.6168E+02				2.72E+02	
			122.06	3.617E+02	(	1.457E+00 3.95E-01 8.55E+01	G
Ce-139		5.3044E+02				1.38E+02	
			165.86	5.304E+02	(	1.592E+00 3.29E-01 7.99E+01	G
Hg-203		1.0882E+03				4.66E+01	
			279.20	1.088E+03	(	2.880E+00 3.27E-01 8.15E+01	G
SN-113		9.4124E+02				1.15E+02	
			391.70	9.412E+02	(	2.135E+00 3.18E-01 6.50E+01	G
Sr-85		1.1510E+03				6.48E+01	
			514.00	1.151E+03	(	2.243E+00 2.92E-01 9.85E+01	G
CS-137		4.9357E+02				1.10E+04	
			661.66	4.936E+02	(	1.421E+00 3.97E-01 8.50E+01	G
Y-898		1.5234E+03				1.07E+02	
			898.04	1.523E+03	(	2.123E+00 2.65E-01 9.39E+01	G
Co-1173		7.2831E+02				1.93E+03	
			1173.23	7.283E+02	(	1.272E+00 3.40E-01 9.98E+01	G
Co-1332		7.3276E+02				1.93E+03	
			1332.49	7.328E+02	(	1.304E+00 3.57E-01 1.00E+02	G
Y-1836		1.6314E+03				1.07E+02	
			1836.05	1.631E+03	(	1.463E+00 3.06E-01 9.93E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 3/5/2013 18:54:00
Curtis & Tompkins HPS Lab Spectrum name: 4_20130304002_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting Bq	2 Sigma Total Bq	MDA
Pb-210	1.5037E+04	1.5117E+04	4.8651E+02	1.3760E+03	3.399E+02
AM-241	1.1784E+03	1.1788E+03	1.6803E+01	9.4444E+01	1.015E+01
CD-109	1.4862E+04	1.6324E+04	9.7562E+01	1.3519E+03	4.758E+01
Co-57	3.0843E+02	3.6168E+02	2.8590E+00	2.3976E+01	1.457E+00
Ce-139	3.8731E+02	5.3044E+02	3.4868E+00	3.3064E+01	1.592E+00
Hg-203	4.2979E+02	1.0882E+03	7.1073E+00	6.4818E+01	2.880E+00
SN-113	6.4620E+02	9.4124E+02	5.9811E+00	4.8618E+01	2.135E+00
Sr-85	5.9046E+02	1.1510E+03	6.7249E+00	5.8763E+01	2.243E+00
CS-137	4.9162E+02	4.9357E+02	3.9193E+00	2.7030E+01	1.421E+00
Y-898	1.0151E+03	1.5234E+03	8.0796E+00	8.0237E+01	2.123E+00
Co-1173	7.1212E+02	7.2831E+02	4.9572E+00	3.7622E+01	1.272E+00
Co-1332	7.1647E+02	7.3276E+02	5.2337E+00	3.8830E+01	1.304E+00

```
     ORTEC g v - i (1087) Env32  G53W4.26  3/5/2013 18:54:00
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20130304002_EffCal.An1

 Y-1836       1.0871E+03    1.6314E+03   9.9859E+00    1.2808E+02  1.463E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   82.4 to  2035.6 keV)     3.746E+04  Bq
 Total Decayed Activity (   82.4 to  2035.6 keV) 4.1801832E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins Hunters Point Lab

Sample Description: RICV, S20633, Efficiency Verification
Detector: HPGE04 51-TP32733A
Source Date: 7/1/2012 09:00
Spectrum: 4_20130305002_EffVerif
Acquired: 3/5/2013 13:26:54
Report Date: 4/24/2013 17:57

Analyst: Philip Smith
Reviewer:
Review Date:

Efficiency: HPGE04 S21603 4_20130304002_EffCal RA226
Library: EfficiencyVerificationDDEP.lib

Nuclide	Activity GPS/Source	Uncertainty %
Pb-210	6.408E+02	9.00
AM-241	4.058E+02	7.99
CD-109	5.759E+02	8.29
Co-57	2.949E+02	6.65
Ce-139	4.157E+02	6.29
Hg-203	8.961E+02	7.38
SN-113	5.828E+02	5.27
Sr-85	1.069E+03	5.43
CS-137	3.899E+02	5.47
Y-898	1.363E+03	5.36
Co-1173	6.870E+02	5.17
Co-1332	6.935E+02	5.30
Y-1836	1.535E+03	7.91
Total	9.549E+03	

Curtis & Tompkins HPS Lab Spectrum name: 4_20130305002_EffVerif.An1

Sample description
RICV, S20633, Efficiency Verification

Spectrum Filename: C:\User\SPC\Det4\4_20130305002_EffVerif.An1

Acquisition information
Start time: 3/5/2013 13:26:54
Live time: 10800
Real time: 11231
Dead time: 3.84 %
Detector ID: 4

Detector system
HPGE04 51-TP32733A

Calibration
Filename: 4_Soil 250ml TunaCan_03-04-2013.Clb
HPGE04 S21603 4_20130304002_EffCal RA226

Energy Calibration
Created: 3/5/2013 13:14:46
Zero offset: 0.031 keV
Gain: 0.250 keV/channel
Quadratic: -2.055E-08 keV/channel^2

Efficiency Calibration
Created: 3/5/2013 18:53:13
Type: Polynomial
Uncertainty: 1.349 %
Coefficients: -0.377104 -4.127613 0.443802
-0.053447 0.002385 -0.000047

Library Files
Main analysis library: EfficiencyVerificationDDEP.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G53W4.26
Start channel: 100 (25.05keV)
Stop channel: 8144 (2036.01keV)
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00
Activity scaling factor: 1.0000E+00/(1.0000E+00* 1.0000E+00) =
1.0000E+00
Detection limit method: Critical level - ORTEC method
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00
Fraction Limit: 0.000%
Background width: average of five points.
Half lives decay limit: 12.000

Curtis & Tompkins HPS Lab Spectrum name: 4_20130305002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0719

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.40	21904.	1.46	0.79	3.121E-03	46.54	100.000	6.408E+02	Pb210
59.43	62608.	0.65	0.81	1.420E-02	59.54	100.000	4.058E+02	AM241
88.03	156670.	0.32	0.83	3.651E-02	88.03	100.000	5.759E+02	CD109
122.08	82153.	0.48	0.85	4.845E-02	122.06	100.000	2.949E+02	Co57
136.51	10450.	2.20	0.88	5.003E-02				
165.91	64551.	0.52	0.90	4.992E-02	165.86	100.000	4.157E+02	Ce139
238.78	1334.	13.17	0.86	4.346E-02				
255.29	1906.	8.78	0.94	4.186E-02				
279.24	9710.	2.21	1.00	3.966E-02	279.20	100.000	8.961E+02	Hg203
351.96	1009.	14.28	1.41	3.407E-02				
391.68	44955.	0.62	1.14	3.165E-02	391.70	100.000	5.828E+02	SN113
514.04	21501.	0.98	1.22	2.616E-02	514.00	100.000	1.069E+03	Sr85
609.37	894.	13.79	1.40	2.322E-02				
661.71	90859.	0.38	1.39	2.192E-02	661.66	100.000	3.899E+02	CS137
898.15	52197.	0.56	1.57	1.768E-02	898.04	100.000	1.363E+03	Y898
1173.39	98865.	0.35	1.79	1.456E-02	1173.23	100.000	6.870E+02	Co1173
1325.09	865.	10.63	1.85	1.328E-02				
1332.69	90573.	0.35	1.89	1.322E-02	1332.49	100.000	6.935E+02	Co1332
1461.02	869.	9.25	2.04	1.229E-02				
1836.33	33613.	0.58	2.23	1.011E-02	1836.05	100.000	1.535E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
545.58	136.51	16974.	10450.	2.089E+05	4.40	0.881	-

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
954.43	238.78	11812.	1334.	3.068E+04	26.35	0.860	-	
1020.47	255.29	10443.	1906.	4.553E+04	17.56	0.935	-	
1406.95	351.96	7605.	1009.	2.962E+04	28.57	1.408	-	s
2436.26	609.37	4930.	894.	3.848E+04	27.59	1.404	-	
5299.04	1325.09	1996.	865.	6.513E+04	21.27	1.848	-	M
5842.93	1461.02	1331.	869.	7.070E+04	18.50	2.045	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyVerificationDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.36	46.40	32276.	21904.	2.028	2.92	0.787
AM-241	237.44	59.43	37927.	62608.	5.797	1.30	0.807
CD-109	351.77	88.03	37549.	156670.	14.507	0.64	0.831
Co-57	487.90	122.08	25391.	82153.	7.607	0.95	0.851
Ce-139	663.13	165.91	17831.	64551.	5.977	1.05	0.904
Hg-203	1116.22	279.24	12054.	9710.	0.899	4.41	0.996
SN-113	1565.78	391.68	9745.	44955.	4.162	1.24	1.137
Sr-85	2055.04	514.04	7492.	21501.	1.991	1.95	1.225
CS-137	2645.57	661.71	7368.	90859.	8.413	0.76	1.393
Y-898	3591.18	898.15	7877.	52197.	4.833	1.12	1.566
Co-1173	4692.16	1173.39	4292.	98865.	9.154	0.70	1.787
Co-1332	5329.47	1332.69	2294.	90573.	8.386	0.70	1.885
Y-1836	7344.81	1836.33	729.	33613.	3.112	1.16	2.234

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source	COMMENTS
Pb-210		6.4077E+02				8.12E+03	
			46.54	6.408E+02	(	1.225E+01 1.46E+00 1.00E+02	G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
AM-241	4.0576E+02					1.58E+05	
		59.54	4.058E+02	(	2.941E+00	6.49E-01	1.00E+02 G
CD-109	5.7592E+02					4.61E+02	
		88.03	5.759E+02	(	1.660E+00	3.22E-01	1.00E+02 G
Co-57	2.9493E+02					2.72E+02	
		122.06	2.949E+02	(	1.333E+00	4.77E-01	1.00E+02 G
Ce-139	4.1570E+02					1.38E+02	
		165.86	4.157E+02	(	2.004E+00	5.24E-01	1.00E+02 G
Hg-203	8.9608E+02					4.66E+01	
		279.20	8.961E+02	(	2.361E+01	2.21E+00	1.00E+02 G
SN-113	5.8278E+02					1.15E+02	
		391.70	5.828E+02	(	2.982E+00	6.18E-01	1.00E+02 G
Sr-85	1.0685E+03					6.48E+01	
		514.00	1.069E+03	(	1.002E+01	9.75E-01	1.00E+02 G
CS-137	3.8988E+02					1.10E+04	
		661.66	3.899E+02	(	8.582E-01	3.78E-01	1.00E+02 G
Y-898	1.3631E+03					1.07E+02	
		898.04	1.363E+03	(	5.400E+00	5.62E-01	1.00E+02 G
Co-1173	6.8701E+02					1.93E+03	
		1173.23	6.870E+02	(	1.061E+00	3.49E-01	1.00E+02 G
Co-1332	6.9350E+02					1.93E+03	
		1332.49	6.935E+02	(	8.545E-01	3.51E-01	1.00E+02 G
Y-1836	1.5346E+03					1.07E+02	
		1836.05	1.535E+03	(	2.873E+00	5.80E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.2739E+02	6.4077E+02	2.9246E+00%	9.0026E+00%	1.225E+01
AM-241	4.0532E+02	4.0576E+02	1.2976E+00%	7.9904E+00%	2.941E+00
CD-109	3.9728E+02	5.7592E+02	6.4375E-01%	8.2852E+00%	1.660E+00
Co-57	1.5702E+02	2.9493E+02	9.5302E-01%	6.6506E+00%	1.333E+00
Ce-139	1.1972E+02	4.1570E+02	1.0483E+00%	6.2865E+00%	2.004E+00
Hg-203	2.2665E+01	8.9608E+02	4.4115E+00%	7.3834E+00%	2.361E+01
SN-113	1.3151E+02	5.8278E+02	1.2354E+00%	5.2729E+00%	2.982E+00
Sr-85	7.6096E+01	1.0685E+03	1.9507E+00%	5.4342E+00%	1.002E+01
CS-137	3.8385E+02	3.8988E+02	7.5653E-01%	5.4711E+00%	8.582E-01
Y-898	2.7331E+02	1.3631E+03	1.1241E+00%	5.3594E+00%	5.400E+00
Co-1173	6.2851E+02	6.8701E+02	6.9796E-01%	5.1680E+00%	1.061E+00
Co-1332	6.3445E+02	6.9350E+02	7.0300E-01%	5.2977E+00%	8.545E-01
Y-1836	3.0770E+02	1.5346E+03	1.1608E+00%	7.9129E+00%	2.873E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
-----------------------------   S U M M A R Y   -----------------------------
Total Activity (   25.0 to  2036.0 keV)     4.165E+03  GPS/Source
Total Decayed Activity (   25.0 to  2036.0 keV) 9.5484824E+03  GPS/Source
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/24/2013 17:57:07
Curtis & Tompkins HPS Lab       Spectrum name: 4_20130305002_EffVerif.An1

Sample description
     RICV, S20633, Efficiency Verification


Spectrum Filename: C:\User\SPC\Det4\4_20130305002_EffVerif.An1

Acquisition information
       Start time:                 3/5/2013 13:26:54
       Live time:              10800
       Real time:              11231
       Dead time:                  3.84 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_Soil 250ml TunaCan_03-04-2013.Clb
     HPGE04  S21603 4_20130304002_EffCal RA226


       Energy Calibration
            Created:               3/5/2013 13:14:46
            Zero offset:           0.031 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.055E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/5/2013 18:53:13
            Type:                  Polynomial
            Uncertainty:           1.349 %
            Coefficients:         -0.377104  -4.127613   0.443802
                                  -0.053447   0.002385  -0.000047

Library Files
       Main analysis library:      EfficiencyVerificationDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.05keV )
       Stop channel:            8144 (  2036.01keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 4/24/2013 17:57:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20130305002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0719

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.40	21904.	1.46	0.79	3.121E-03	46.54	100.000	6.408E+02	Pb210
59.43	62608.	0.65	0.81	1.420E-02	59.54	100.000	4.058E+02	AM241
88.03	156670.	0.32	0.83	3.651E-02	88.03	100.000	5.759E+02	CD109
122.08	82153.	0.48	0.85	4.845E-02	122.06	100.000	2.949E+02	Co57
136.51	10450.	2.20	0.88	5.003E-02				
165.91	64551.	0.52	0.90	4.992E-02	165.86	100.000	4.157E+02	Ce139
238.78	1334.	13.17	0.86	4.346E-02				
255.29	1906.	8.78	0.94	4.186E-02				
279.24	9710.	2.21	1.00	3.966E-02	279.20	100.000	8.961E+02	Hg203
351.96	1009.	14.28	1.41	3.407E-02				
391.68	44955.	0.62	1.14	3.165E-02	391.70	100.000	5.828E+02	SN113
514.04	21501.	0.98	1.22	2.616E-02	514.00	100.000	1.069E+03	Sr85
609.37	894.	13.79	1.40	2.322E-02				
661.71	90859.	0.38	1.39	2.192E-02	661.66	100.000	3.899E+02	CS137
898.15	52197.	0.56	1.57	1.768E-02	898.04	100.000	1.363E+03	Y898
1173.39	98865.	0.35	1.79	1.456E-02	1173.23	100.000	6.870E+02	Co1173
1325.09	865.	10.63	1.85	1.328E-02				
1332.69	90573.	0.35	1.89	1.322E-02	1332.49	100.000	6.935E+02	Co1332
1461.02	869.	9.25	2.04	1.229E-02				
1836.33	33613.	0.58	2.23	1.011E-02	1836.05	100.000	1.535E+03	Y1836

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
545.58	136.51	16974.	10450.	2.089E+05	4.40	0.881	-

ORTEC g v - i (1087) Env32 G53W4.26 4/24/2013 17:57:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20130305002_EffVerif.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected	
954.43	238.78	11812.	1334.	3.068E+04	26.35	0.860	-	
1020.47	255.29	10443.	1906.	4.553E+04	17.56	0.935	-	
1406.95	351.96	7605.	1009.	2.962E+04	28.57	1.408	-	s
2436.26	609.37	4930.	894.	3.848E+04	27.59	1.404	-	
5299.04	1325.09	1996.	865.	6.513E+04	21.27	1.848	-	M
5842.93	1461.02	1331.	869.	7.070E+04	18.50	2.045	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyVerificationDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.36	46.40	32276.	21904.	2.028	2.92	0.787
AM-241	237.44	59.43	37927.	62608.	5.797	1.30	0.807
CD-109	351.77	88.03	37549.	156670.	14.507	0.64	0.831
Co-57	487.90	122.08	25391.	82153.	7.607	0.95	0.851
Ce-139	663.13	165.91	17831.	64551.	5.977	1.05	0.904
Hg-203	1116.22	279.24	12054.	9710.	0.899	4.41	0.996
SN-113	1565.78	391.68	9745.	44955.	4.162	1.24	1.137
Sr-85	2055.04	514.04	7492.	21501.	1.991	1.95	1.225
CS-137	2645.57	661.71	7368.	90859.	8.413	0.76	1.393
Y-898	3591.18	898.15	7877.	52197.	4.833	1.12	1.566
Co-1173	4692.16	1173.39	4292.	98865.	9.154	0.70	1.787
Co-1332	5329.47	1332.69	2294.	90573.	8.386	0.70	1.885
Y-1836	7344.81	1836.33	729.	33613.	3.112	1.16	2.234

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Peak Code	Peak MDA Value GPS/Source	COMMENTS
Pb-210		6.4077E+02				8.12E+03	
			46.54	6.408E+02	(	1.225E+01 1.46E+00 1.00E+02	G

ORTEC g v - i (1087) Env32 G53W4.26 4/24/2013 17:57:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20130305002_EffVerif.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
AM-241	4.0576E+02					1.58E+05	
		59.54	4.058E+02	(	2.941E+00	6.49E-01	1.00E+02 G
CD-109	5.7592E+02					4.61E+02	
		88.03	5.759E+02	(	1.660E+00	3.22E-01	1.00E+02 G
Co-57	2.9493E+02					2.72E+02	
		122.06	2.949E+02	(	1.333E+00	4.77E-01	1.00E+02 G
Ce-139	4.1570E+02					1.38E+02	
		165.86	4.157E+02	(	2.004E+00	5.24E-01	1.00E+02 G
Hg-203	8.9608E+02					4.66E+01	
		279.20	8.961E+02	(	2.361E+01	2.21E+00	1.00E+02 G
SN-113	5.8278E+02					1.15E+02	
		391.70	5.828E+02	(	2.982E+00	6.18E-01	1.00E+02 G
Sr-85	1.0685E+03					6.48E+01	
		514.00	1.069E+03	(	1.002E+01	9.75E-01	1.00E+02 G
CS-137	3.8988E+02					1.10E+04	
		661.66	3.899E+02	(	8.582E-01	3.78E-01	1.00E+02 G
Y-898	1.3631E+03					1.07E+02	
		898.04	1.363E+03	(	5.400E+00	5.62E-01	1.00E+02 G
Co-1173	6.8701E+02					1.93E+03	
		1173.23	6.870E+02	(	1.061E+00	3.49E-01	1.00E+02 G
Co-1332	6.9350E+02					1.93E+03	
		1332.49	6.935E+02	(	8.545E-01	3.51E-01	1.00E+02 G
Y-1836	1.5346E+03					1.07E+02	
		1836.05	1.535E+03	(	2.873E+00	5.80E-01	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.

ORTEC g v - i (1087) Env32 G53W4.26 4/24/2013 17:57:07
Curtis & Tompkins HPS Lab Spectrum name: 4_20130305002_EffVerif.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.2739E+02	6.4077E+02	2.9246E+00%	9.0026E+00%	1.225E+01
AM-241	4.0532E+02	4.0576E+02	1.2976E+00%	7.9904E+00%	2.941E+00
CD-109	3.9728E+02	5.7592E+02	6.4375E-01%	8.2852E+00%	1.660E+00
Co-57	1.5702E+02	2.9493E+02	9.5302E-01%	6.6506E+00%	1.333E+00
Ce-139	1.1972E+02	4.1570E+02	1.0483E+00%	6.2865E+00%	2.004E+00
Hg-203	2.2665E+01	8.9608E+02	4.4115E+00%	7.3834E+00%	2.361E+01
SN-113	1.3151E+02	5.8278E+02	1.2354E+00%	5.2729E+00%	2.982E+00
Sr-85	7.6096E+01	1.0685E+03	1.9507E+00%	5.4342E+00%	1.002E+01
CS-137	3.8385E+02	3.8988E+02	7.5653E-01%	5.4711E+00%	8.582E-01
Y-898	2.7331E+02	1.3631E+03	1.1241E+00%	5.3594E+00%	5.400E+00
Co-1173	6.2851E+02	6.8701E+02	6.9796E-01%	5.1680E+00%	1.061E+00
Co-1332	6.3445E+02	6.9350E+02	7.0300E-01%	5.2977E+00%	8.545E-01
Y-1836	3.0770E+02	1.5346E+03	1.1608E+00%	7.9129E+00%	2.873E+00

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/24/2013 17:57:07
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20130305002_EffVerif.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2036.0 keV)     4.165E+03  GPS/Source
 Total Decayed Activity (   25.0 to  2036.0 keV) 9.5484824E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/28/2013 19:08:34
Curtis & Tompkins HPS Lab       Spectrum name: 5_20130628002_Energy.An1

Sample description
     RICAL,S19584,POINT SOURCE


Spectrum Filename: C:\User\Cal\Spectra\5_20130628002_Energy.An1

Acquisition information
       Start time:                 6/28/2013 18:19:27
       Live time:                600
       Real time:                629
       Dead time:                  4.54 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_QC.Clb
     HPGE05 S19584 5_20130628002_Energy RA226


       Energy Calibration
            Created:               6/28/2013 19:06:24
            Zero offset:          -0.084 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.605E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/28/2013 18:54:44
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.94keV )
       Stop channel:            8144 (  2035.25keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 6/28/2013 19:08:34
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628002_Energy.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0285

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. µCi	Nuc
39.70	7561.	2.28	1.16	1.730E-02				
45.27	4126.	2.64	0.89	1.714E-02				
46.71	1167.	9.49	0.89	1.710E-02				
121.81	82517.	0.38	0.94	1.499E-02	121.78	28.410	1.000E+00	QA122
244.71	16878.	0.91	1.09	1.154E-02	244.70	7.550	1.000E+00	Qa245
295.98	943.	7.80	1.15	1.036E-02				
344.19	47672.	0.49	1.15	9.256E-03	344.28	26.590	1.000E+00	Qa344
367.57	1601.	4.71	1.10	9.021E-03				
411.05	3528.	2.28	1.20	8.586E-03				
443.91	4619.	2.15	1.28	8.257E-03				
488.60	632.	9.22	1.20	7.809E-03				
564.03	663.	7.56	1.34	7.055E-03				
586.36	581.	10.91	1.28	6.831E-03				
678.83	529.	10.89	1.51	5.905E-03				
688.62	944.	6.97	1.43	5.807E-03				
719.44	331.	17.97	1.37	5.499E-03				
778.95	12392.	0.96	1.53	4.903E-03	778.90	12.970	1.006E+00	Qa779
810.25	455.	11.98	1.24	4.803E-03				
867.39	3765.	2.60	1.72	4.621E-03				
926.35	254.	16.60	1.15	4.433E-03				
964.05	12116.	1.02	1.64	4.313E-03	964.08	14.500	1.000E+00	Qa964
1005.08	699.	6.16	1.88	4.212E-03				
1085.85	7869.	1.21	1.79	4.013E-03				
1089.84	1287.	4.82	1.80	4.004E-03				
1112.04	10408.	1.12	1.84	3.949E-03				
1212.93	1001.	3.89	1.90	3.700E-03				
1299.19	1107.	3.78	1.89	3.488E-03				

ORTEC g v - i (1087) Env32 G53W4.26 6/28/2013 19:08:34
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628002_Energy.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1407.99	13007.	0.89	2.08	3.220E-03	1408.01	20.850	1.000E+00	Qa1408
1457.46	336.	6.42	1.50	3.098E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
159.01	39.70	7943.	7561.	4.371E+05	4.57	1.163	-	s
181.26	45.22	3853.	4126.	2.407E+05	5.27	0.887	-	D
187.01	46.66	5552.	1167.	6.824E+04	18.98	0.888	-	D
1183.47	295.98	1595.	943.	9.102E+04	15.59	1.152	-	
1469.70	367.57	1276.	1601.	1.775E+05	9.42	1.104	-	s
1643.53	411.05	1020.	3528.	4.109E+05	4.57	1.200	-	
1774.93	443.91	1415.	4619.	5.595E+05	4.30	1.278	-	
1953.62	488.60	920.	632.	8.093E+04	18.43	1.197	-	s
2255.27	563.98	923.	663.	9.398E+04	15.11	1.339	-	D
2344.58	586.36	1109.	581.	8.509E+04	21.81	1.277	-	
2714.44	678.83	901.	529.	8.960E+04	21.79	1.515	-	
2753.58	688.62	996.	944.	1.626E+05	13.94	1.428	-	
2876.84	719.44	1033.	331.	6.016E+04	35.94	1.369	-	s
3240.09	810.25	764.	455.	9.481E+04	23.96	1.244	-	s
3468.68	867.39	1316.	3765.	8.148E+05	5.19	1.715	-	
3704.56	926.35	508.	254.	5.729E+04	33.20	1.153	-	s
4019.57	1005.08	361.	699.	1.660E+05	12.32	1.883	-	
4342.76	1085.80	570.	7869.	1.961E+06	2.41	1.792	-	D
4358.76	1089.80	1280.	1287.	3.216E+05	9.63	1.796	-	D
4447.58	1112.04	666.	10408.	2.636E+06	2.23	1.843	-	
4851.54	1212.98	371.	1049.	2.835E+05	10.01	1.758	-	
5196.61	1299.19	137.	1107.	3.174E+05	7.56	1.892	-	
5830.15	1457.46	23.	336.	1.084E+05	12.83	1.496	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.Lib

ORTEC g v - i (1087) Env32 G53W4.26 6/28/2013 19:08:34
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628002_Energy.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.19	121.81	5794.	82517.	137.529	0.77	0.942
Qa-245	978.50	244.71	2461.	16878.	28.131	1.83	1.087
Qa-344	1376.22	344.19	2005.	47672.	79.453	0.98	1.155
Qa-779	3114.85	778.94	1264.	12604.	21.007	2.15	1.524
Qa-964	3855.41	964.05	756.	12116.	20.194	2.05	1.642
Qa-1408	5632.08	1407.99	84.	13007.	21.679	1.78	2.081

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity µCi	Peak Energy keV	Peak Activity µCi	Peak Code	MDA Value µCi	COMMENTS
QA-122		1.0000E+00				4.94E+03	
			121.78	1.000E+00	(	2.149E-03 3.84E-01 2.84E+01	G
Qa-245		1.0000E+00				4.94E+03	
			244.70	1.000E+00	(	6.848E-03 9.13E-01 7.55E+00	G
Qa-344		1.0000E+00				4.94E+03	
			344.28	1.000E+00	(	2.189E-03 4.91E-01 2.66E+01	G
Qa-779		1.0230E+00				4.94E+03	
			778.90	1.023E+00	(	6.722E-03 1.07E+00 1.30E+01	G
Qa-964		1.0000E+00				4.94E+03	
			964.08	1.000E+00	(	5.286E-03 1.02E+00 1.45E+01	G
Qa-1408		1.0000E+00				4.94E+03	
			1408.01	1.000E+00	(	1.638E-03 8.90E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 6/28/2013 19:08:34
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628002_Energy.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity µCi	Time Corrected Activity µCi	Uncertainty Counting µCi	2 Sigma Total µCi	MDA
QA-122	8.7269E-01	1.0000E+00	7.6829E-03	1.1442E-01	2.149E-03
Qa-245	8.7269E-01	1.0000E+00	1.8268E-02	1.1562E-01	6.848E-03
Qa-344	8.7269E-01	1.0000E+00	9.8111E-03	1.1458E-01	2.189E-03
Qa-779	8.9280E-01	1.0230E+00	2.1954E-02	1.1884E-01	6.722E-03
Qa-964	8.7269E-01	1.0000E+00	2.0462E-02	1.1598E-01	5.286E-03
Qa-1408	8.7269E-01	1.0000E+00	1.7805E-02	1.1554E-01	1.638E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1111.9 to 2035.2 keV) 5.256E+00 µCi
Total Decayed Activity (1111.9 to 2035.2 keV) 6.0230556E+00 µCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 6/28/2013 19:08:34
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628002_Energy.An1

Laboratory: Curtis & Tompkins HPS Lab

Calibration Data from file: 5_Soil 250ml TunaCan_06-28-2013.Clb
Energy Calibration Date: 1/24/2014 Time: 06:29:37
Efficiency Calibration Date: 6/29/2013 Time: 15:59:06

Calibration Description:
HPGE05 S22147 5_20130628003_EffCal RA226

Energy Calibration Fit
Energy = -0.0643 +0.250185*Channel -3.68782e-008*Channel**2
FWHM (ch) = 3.6856 +0.000831*Channel +5.71594e-009*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
487.18	121.78	121.81	-0.02%	1.00	1.02	-1.96%
978.52	244.70	244.71	-0.01%	1.14	1.13	1.52%
1376.32	344.28	344.20	0.02%	1.22	1.21	1.18%
3115.27	778.90	778.97	-0.01%	1.56	1.58	-1.59%
3855.79	964.08	964.05	0.00%	1.75	1.74	0.66%
5632.81	1408.01	1408.01	0.00%	2.14	2.14	0.04%

Efficiency Calibration Fit
Polynomial Uncertainty = 1.2951 %
Coefficients:
-0.372021 -4.149771 0.439762 -0.053337 0.002389 -0.000048

Efficiency Table

Energy	Efficiency	Fit	Delta
46.54	2.8733E-003	2.8678E-003	0.19%
59.54	1.3157E-002	1.3245E-002	-0.66%
88.03	3.5636E-002	3.4563E-002	3.01%
122.06	4.5688E-002	4.6223E-002	-1.17%
165.86	4.7117E-002	4.7904E-002	-1.67%
279.20	3.8169E-002	3.8355E-002	-0.49%
391.70	3.0827E-002	3.0724E-002	0.33%
514.00	2.6259E-002	2.5466E-002	3.02%
661.66	2.2082E-002	2.1384E-002	3.16%
898.04	1.6691E-002	1.7300E-002	-3.64%
1173.23	1.3826E-002	1.4283E-002	-3.31%
1332.49	1.2748E-002	1.2978E-002	-1.81%
1836.05	1.0278E-002	9.9643E-003	3.05%

Calibration Certificate Table

Isotope	Energy	Pct	Halflife	Activity	GPS	Error	Date & Time
Pb-210	46.54	4.25	8.12E+003	14132.00	600.90	4.10%	1/1/2013 09:00:00
Am-241	59.54	35.92	1.58E+005	1111.90	399.40	3.50%	1/1/2013 09:00:00
Cd-109	88.03	3.63	4.61E+002	14837.00	538.00	4.70%	1/1/2013 09:00:00
Co-57	122.06	85.51	2.72E+002	340.90	291.50	4.10%	1/1/2013 09:00:00
Ce-139	165.86	79.90	1.38E+002	510.51	407.90	3.90%	1/1/2013 09:00:00
Hg-203	279.20	81.48	4.66E+001	1016.20	828.00	3.80%	1/1/2013 09:00:00
Sn-113	391.70	64.97	1.15E+002	874.56	568.20	3.90%	1/1/2013 09:00:00
Sr-85	514.00	98.50	6.48E+001	1061.90	1046.00	3.50%	1/1/2013 09:00:00
Cs-137	661.66	84.99	1.10E+004	443.82	377.20	4.00%	1/1/2013 09:00:00
Y-898	898.04	93.90	1.07E+002	1480.30	1390.00	3.90%	1/1/2013 09:00:00
Co-1173	1173.23	99.85	1.93E+003	702.25	701.20	4.00%	1/1/2013 09:00:00
Co-1332	1332.49	99.98	1.93E+003	701.42	701.30	4.00%	1/1/2013 09:00:00
Y-1836	1836.05	99.32	1.07E+002	1481.10	1471.00	4.00%	1/1/2013 09:00:00

```
     ORTEC g v - i (1087) Env32  G53W4.26  7/1/2013 12:42:53
Curtis & Tompkins HPS Lab       Spectrum name: 5_20130628003_EffCal.An1

Sample description
     RICAL|S22147|TUNACAN


Spectrum Filename: C:\User\Cal\Spectra\5_20130628003_EffCal.An1

Acquisition information
       Start time:                 6/28/2013 20:22:06
       Live time:              10800
       Real time:              10970
       Dead time:                  1.55 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:               6/28/2013 19:06:24
            Zero offset:          -0.084 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.605E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/29/2013 15:59:06
            Type:                  Polynomial
            Uncertainty:           1.295 %
            Coefficients:         -0.372021  -4.149771   0.439762
                                  -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:      EfficiencyCalibrationDDEP.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.94keV )
       Stop channel:            8144 (  2035.25keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 7/1/2013 12:42:53
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628003_EffCal.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	1/1/2013 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0459

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. Bq	Nuc
46.40	18365.	1.75	0.88	2.760E-03	46.54	4.252	1.416E+04	Pb210
59.44	56710.	0.73	0.90	1.315E-02	59.54	35.920	1.105E+03	AM241
88.02	158349.	0.34	0.93	3.456E-02	88.03	3.626	1.530E+04	CD109
122.09	91227.	0.48	0.96	4.623E-02	122.06	85.510	3.369E+02	Co57
136.53	11658.	2.27	0.96	4.784E-02				
165.91	84265.	0.46	1.02	4.790E-02	165.86	79.900	5.008E+02	Ce139
238.60	1205.	14.38	1.03	4.195E-02				
255.05	3054.	6.10	1.09	4.045E-02				
279.18	24031.	1.08	1.11	3.836E-02	279.20	81.480	1.013E+03	Hg203
351.87	972.	13.82	1.15	3.305E-02				
391.65	64547.	0.52	1.21	3.073E-02	391.70	64.970	8.771E+02	SN113
510.61	1274.	9.86	1.29	2.558E-02				
514.00	43551.	0.54	1.30	2.547E-02	514.00	98.500	1.083E+03	Sr85
609.35	840.	16.59	0.81	2.264E-02				
661.69	88948.	0.40	1.45	2.138E-02	661.66	84.990	4.583E+02	CS137
898.09	78424.	0.43	1.67	1.730E-02	898.04	93.900	1.426E+03	Y898
1173.28	97210.	0.33	1.87	1.428E-02	1173.23	99.850	6.730E+02	Co1173
1325.01	1404.	7.26	2.36	1.303E-02				
1332.53	90416.	0.36	2.03	1.298E-02	1332.49	99.983	6.880E+02	Co1332
1460.74	846.	10.86	1.63	1.208E-02				
1835.87	51156.	0.46	2.46	9.965E-03	1836.05	99.320	1.527E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 7/1/2013 12:42:53
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628003_EffCal.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
546.03	136.53	22347.	11658.	2.437E+05	4.53	0.957	-	
954.06	238.60	12520.	1205.	2.872E+04	28.76	1.029	-	
1019.81	255.05	12656.	3054.	7.549E+04	12.20	1.092	-	s
1406.44	351.75	8893.	1106.	3.347E+04	28.14	1.065	-	
2041.66	510.61	7256.	1274.	1.935E+04	19.72	1.293	-	lD
2436.51	609.35	6190.	840.	3.711E+04	33.17	0.806	-	s
5299.96	1325.01	2306.	1404.	1.078E+05	14.52	2.357	-	sM
5843.25	1460.74	1808.	846.	7.005E+04	21.72	1.631	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: EfficiencyCalibrationDDEP.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.76	46.40	34008.	18365.	1.700	3.50	0.881
AM-241	237.90	59.44	41539.	56710.	5.251	1.47	0.904
CD-109	352.15	88.02	46012.	158349.	14.662	0.68	0.927
Co-57	488.31	122.09	33592.	91227.	8.447	0.96	0.964
Ce-139	663.49	165.91	24658.	84465.	7.821	0.94	1.016
Hg-203	1116.30	279.18	14640.	24031.	2.225	2.17	1.109
SN-113	1565.96	391.65	13281.	64547.	5.977	1.04	1.206
Sr-85	2055.18	513.99	10342.	42539.	3.939	1.31	1.305
CS-137	2645.87	661.69	9330.	88948.	8.236	0.80	1.455
Y-898	3591.50	898.09	8184.	78424.	7.261	0.86	1.667
Co-1173	4692.57	1173.26	5338.	98306.	9.102	0.72	1.927
Co-1332	5330.04	1332.53	2744.	90416.	8.372	0.71	2.030
Y-1836	7345.39	1835.87	745.	51156.	4.737	0.92	2.462

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 7/1/2013 12:42:53
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628003_EffCal.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity Bq	Peak Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210		1.4159E+04				8.12E+03	
			46.54	1.416E+04	(	3.313E+02 1.75E+00 4.25E+00	G
AM-241		1.1046E+03				1.58E+05	
			59.54	1.105E+03	(	9.250E+00 7.33E-01 3.59E+01	G
CD-109		1.5297E+04				4.61E+02	
			88.03	1.530E+04	(	4.828E+01 3.38E-01 3.63E+00	G
Co-57		3.3689E+02				2.72E+02	
			122.06	3.369E+02	(	1.577E+00 4.80E-01 8.55E+01	G
Ce-139		5.0196E+02				1.38E+02	
			165.86	5.020E+02	(	2.174E+00 4.71E-01 7.99E+01	G
Hg-203		1.0128E+03				4.66E+01	
			279.20	1.013E+03	(	1.188E+01 1.08E+00 8.15E+01	G
SN-113		8.7714E+02				1.15E+02	
			391.70	8.771E+02	(	3.649E+00 5.22E-01 6.50E+01	G
Sr-85		1.0579E+03				6.48E+01	
			514.00	1.058E+03	(	5.892E+00 6.55E-01 9.85E+01	G
CS-137		4.5830E+02				1.10E+04	
			661.66	4.583E+02	(	1.160E+00 3.99E-01 8.50E+01	G
Y-898		1.4263E+03				1.07E+02	
			898.04	1.426E+03	(	3.833E+00 4.30E-01 9.39E+01	G
Co-1173		6.8061E+02				1.93E+03	
			1173.23	6.806E+02	(	1.179E+00 3.61E-01 9.98E+01	G
Co-1332		6.8802E+02				1.93E+03	
			1332.49	6.880E+02	(	9.287E-01 3.56E-01 1.00E+02	G
Y-1836		1.5271E+03				1.07E+02	
			1836.05	1.527E+03	(	1.898E+00 4.61E-01 9.93E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 7/1/2013 12:42:53
Curtis & Tompkins HPS Lab Spectrum name: 5_20130628003_EffCal.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	1.3945E+04	1.4159E+04	3.5016E+00%	9.2062E+00%	3.313E+02
AM-241	1.1037E+03	1.1046E+03	1.4669E+00%	8.0196E+00%	9.250E+00
CD-109	1.1699E+04	1.5297E+04	6.7685E-01%	8.2878E+00%	4.828E+01
Co-57	2.1371E+02	3.3689E+02	9.6064E-01%	6.6516E+00%	1.577E+00
Ce-139	2.0433E+02	5.0196E+02	9.4251E-01%	6.2698E+00%	2.174E+00
Hg-203	7.1199E+01	1.0128E+03	2.1695E+00%	6.3056E+00%	1.188E+01
SN-113	2.9940E+02	8.7714E+02	1.0447E+00%	5.2315E+00%	3.649E+00
Sr-85	1.5702E+02	1.0579E+03	1.3105E+00%	5.2386E+00%	5.892E+00
CS-137	4.5317E+02	4.5830E+02	7.9899E-01%	5.4771E+00%	1.160E+00
Y-898	4.4702E+02	1.4263E+03	8.5961E-01%	5.3102E+00%	3.833E+00
Co-1173	6.3826E+02	6.8061E+02	7.2235E-01%	5.1713E+00%	1.179E+00
Co-1332	6.4520E+02	6.8802E+02	7.1192E-01%	5.2989E+00%	9.287E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  7/1/2013 12:42:53
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20130628003_EffCal.An1

 Y-1836       4.7862E+02    1.5271E+03   9.2146E-01%   7.8813E+00% 1.898E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   24.9 to  2035.2 keV)     3.036E+04  Bq
 Total Decayed Activity (   24.9 to  2035.2 keV) 3.9127598E+04  Bq

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/30/2013 14:03:05
Curtis & Tompkins HPS Lab       Spectrum name: 5_20130630002_EffVerif.An1

Sample description
     RICV|S20633|Eff Verification


Spectrum Filename: C:\User\SPC\Det5\5_20130630002_EffVerif.An1

Acquisition information
       Start time:                 6/30/2013 11:01:00
       Live time:              10800
       Real time:              10919
       Dead time:                  1.09 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_Soil 250ml TunaCan_06-28-2013.Clb
     HPGE05 S22147 5_20130628003_EffCal RA226


       Energy Calibration
            Created:               6/30/2013 10:57:04
            Zero offset:          -0.074 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.562E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/29/2013 15:59:06
            Type:                  Polynomial
            Uncertainty:           1.295 %
            Coefficients:         -0.372021  -4.149771   0.439762
                                  -0.053337   0.002389  -0.000048

Library Files
       Main analysis library:      EfficiencyVerificationDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.95keV )
       Stop channel:            8144 (  2035.30keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
       Half lives decay limit:    12.000
```

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 14:03:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630002_EffVerif.An1

Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 09:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0572

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. GPS/Sour	Nuc
46.35	19944.	1.51	0.88	2.720E-03	46.54	100.000	6.643E+02	Pb210
59.42	59492.	0.67	0.88	1.313E-02	59.54	100.000	4.166E+02	AM241
88.01	125936.	0.38	0.90	3.455E-02	88.03	100.000	5.830E+02	CD109
122.08	60109.	0.56	0.95	4.623E-02	122.06	100.000	3.047E+02	Co57
136.48	7884.	2.71	0.94	4.783E-02				
165.90	35140.	0.78	1.00	4.790E-02	165.86	100.000	4.249E+02	Ce139
238.66	1421.	11.01	1.05	4.195E-02				
255.09	971.	13.07	1.09	4.044E-02				
279.16	1657.	9.38	1.29	3.836E-02	279.20	100.000	9.002E+02	Hg203
352.01	977.	12.61	1.29	3.303E-02				
391.64	22126.	0.99	1.21	3.073E-02	391.70	100.000	5.974E+02	SN113
510.81	691.	14.82	1.33	2.558E-02				
514.00	6429.	1.93	1.33	2.547E-02	514.00	100.000	1.145E+03	Sr85
583.21	622.	17.75	1.20	2.333E-02				
609.23	660.	17.73	1.13	2.264E-02				
661.71	88529.	0.38	1.45	2.138E-02	661.66	100.000	3.922E+02	CS137
898.09	24425.	0.91	1.68	1.730E-02	898.04	100.000	1.394E+03	Y898
1173.30	93304.	0.36	1.93	1.428E-02	1173.23	100.000	6.896E+02	Co1173
1332.58	86082.	0.35	2.07	1.298E-02	1332.49	100.000	7.002E+02	Co1332
1460.95	795.	5.84	2.13	1.208E-02				
1835.95	15670.	0.85	2.53	9.965E-03	1836.05	100.000	1.553E+03	Y1836

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 14:03:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630002_EffVerif.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
545.81	136.48	13950.	7884.	1.648E+05	5.41	0.940	-	
954.24	238.66	9231.	1421.	3.388E+04	22.03	1.052	-	
1020.03	255.11	8514.	1066.	2.637E+04	28.57	0.813	-	s
1407.41	352.01	5682.	977.	2.958E+04	25.22	1.294	-	
2042.30	510.79	4890.	690.	2.697E+04	29.67	1.329	-	D
2331.94	583.21	3988.	622.	2.665E+04	35.50	1.199	-	
2435.99	609.23	4342.	660.	2.915E+04	35.45	1.128	-	
5844.47	1461.07	791.	876.	7.254E+04	15.21	1.924	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: EfficiencyVerificationDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
Pb-210	185.52	46.35	28264.	19944.	1.847	3.02	0.881
AM-241	237.76	59.42	35000.	59492.	5.509	1.35	0.883
CD-109	352.05	88.01	34388.	125936.	11.661	0.75	0.904
Co-57	488.23	122.08	18630.	60109.	5.566	1.11	0.948
Ce-139	663.41	165.90	13864.	35140.	3.254	1.56	1.003
Hg-203	1116.15	279.16	8330.	1657.	0.153	18.76	1.292
SN-113	1565.86	391.64	7972.	22126.	2.049	1.99	1.208
Sr-85	2055.16	514.00	4491.	6429.	0.595	3.86	1.332D
CS-137	2645.89	661.71	5757.	88529.	8.197	0.75	1.453
Y-898	3591.44	898.09	6126.	24425.	2.262	1.82	1.678
Co-1173	4692.63	1173.30	3538.	93304.	8.639	0.71	1.930
Co-1332	5330.09	1332.58	1270.	86082.	7.971	0.70	2.071
Y-1836	7345.52	1835.95	392.	15670.	1.451	1.70	2.530

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 14:03:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630002_EffVerif.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity GPS/Source	Peak Energy keV	Peak Activity GPS/Source	Code	MDA Value GPS/Source	COMMENTS
Pb-210		6.6428E+02				8.12E+03	
			46.54	6.643E+02	(	1.305E+01 1.51E+00 1.00E+02	G
AM-241		4.1657E+02				1.58E+05	
			59.54	4.166E+02	(	3.052E+00 6.74E-01 1.00E+02	G
CD-109		5.8298E+02				4.61E+02	
			88.03	5.830E+02	(	2.000E+00 3.77E-01 1.00E+02	G
Co-57		3.0471E+02				2.72E+02	
			122.06	3.047E+02	(	1.612E+00 5.57E-01 1.00E+02	G
Ce-139		4.2489E+02				1.38E+02	
			165.86	4.249E+02	(	3.317E+00 7.81E-01 1.00E+02	G
Hg-203		9.0015E+02				4.66E+01	
			279.20	9.002E+02	(	1.155E+02 9.38E+00 1.00E+02	G
SN-113		5.9745E+02				1.15E+02	
			391.70	5.974E+02	(	5.617E+00 9.95E-01 1.00E+02	G
Sr-85		1.1450E+03				6.48E+01	
			514.00	1.145E+03	(	2.781E+01 1.93E+00 1.00E+02	G
CS-137		3.9225E+02				1.10E+04	
			661.66	3.922E+02	(	7.833E-01 3.75E-01 1.00E+02	G
Y-898		1.3940E+03				1.07E+02	
			898.04	1.394E+03	(	1.041E+01 9.11E-01 1.00E+02	G
Co-1173		6.8959E+02				1.93E+03	
			1173.23	6.896E+02	(	1.024E+00 3.56E-01 1.00E+02	G
Co-1332		7.0018E+02				1.93E+03	
			1332.49	7.002E+02	(	6.755E-01 3.52E-01 1.00E+02	G
Y-1836		1.5528E+03				1.07E+02	
			1836.05	1.553E+03	(	4.569E+00 8.51E-01 1.00E+02	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 14:03:05
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630002_EffVerif.An1

! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity GPS/Source	Time Corrected Activity GPS/Source	Uncertainty Counting	2 Sigma Total	MDA
Pb-210	6.4395E+02	6.6428E+02	3.0185E+00%	9.0335E+00%	1.305E+01
AM-241	4.1591E+02	4.1657E+02	1.3489E+00%	7.9989E+00%	3.052E+00
CD-109	3.3738E+02	5.8298E+02	7.5441E-01%	8.2945E+00%	2.000E+00
Co-57	1.2041E+02	3.0471E+02	1.1149E+00%	6.6757E+00%	1.612E+00
Ce-139	6.7920E+01	4.2489E+02	1.5623E+00%	6.3924E+00%	3.317E+00
Hg-203	4.0002E+00	9.0015E+02	1.8756E+01%	1.9669E+01%	1.155E+02
SN-113	6.6680E+01	5.9745E+02	1.9893E+00%	5.4985E+00%	5.617E+00
Sr-85	2.3375E+01	1.1450E+03	3.8620E+00%	6.3750E+00%	2.781E+01
CS-137	3.8333E+02	3.9225E+02	7.5065E-01%	5.4703E+00%	7.833E-01
Y-898	1.3073E+02	1.3940E+03	1.8225E+00%	5.5480E+00%	1.041E+01
Co-1173	6.0487E+02	6.8959E+02	7.1185E-01%	5.1699E+00%	1.024E+00
Co-1332	6.1416E+02	7.0018E+02	7.0394E-01%	5.2978E+00%	6.755E-01

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/30/2013 14:03:05
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20130630002_EffVerif.An1

 Y-1836       1.4562E+02    1.5528E+03   1.7021E+00%   8.0102E+00% 4.569E+00
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (  583.0 to  2035.3 keV)     3.558E+03  GPS/Source
 Total Decayed Activity (  583.0 to  2035.3 keV) 9.7648457E+03  GPS/Source

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Continuing Calibration Verification Raw Data

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE01
Seqnum : 1504034935001
Cal : 24-JAN-2014 06:26:40,19-JUN-2013 14:52:15

Run Name : QUALITY CONTROL CHEC
File : 1_20140124_001
Caldate : 24-JAN-2014, 19-JUN-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:15
Dead Time : 4.6 %

Standards: S19582

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9962	uCi	.0074859	487.04	486.00 - 488.00	121.81	121.58 - 121.98	0.90	0.81 - 0.99	-0.38	5	
QA-779	1.000	0.9983	uCi	.020726					1.51	1.35 - 1.65	-0.17	5	
QA-1408	1.000	0.9915	uCi	.017756	5632.12	5629.00 - 5635.00	1407.99	1407.58 - 1408.58	1.96	1.80 - 2.20	-0.85	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:26:58
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124001_QCAsLeft.An1

Sample description
     RCCV,S19582,Quality control Check


Spectrum Filename: C:\User\SPC\Det1\1_20140124001_QCAsLeft.An1

Acquisition information
       Start time:                1/24/2014 06:15:49
       Live time:               600
       Real time:               629
       Dead time:                 4.60 %
       Detector ID:                   1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                  1_QC.Clb
     HPGE01 S19582 1_20130619001_Energy RA226


       Energy Calibration
            Created:              1/24/2014 06:26:40
            Zero offset:          0.000 keV
            Gain:                 0.250 keV/channel
            Quadratic:           -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:              6/19/2013 14:52:15
            Knee Energy:          0.00 keV
            Above the Knee:       Interpolative    Uncertainty =   0.00 %
            Below the Knee:       Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:     QCDDEP.lib
       Library Match Width:       0.500
       Peak stripping:            Library based

Analysis parameters
       Analysis engine:           Env32   G53W4.26
       Start channel:           100 (    25.01keV )
       Stop channel:           8144 (  2035.50keV )
       Peak rejection level:     20.000%
       Peak search sensitivity:   3
       Sample Size:               1.0000E+00
       Activity scaling factor:   1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                  1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:              1.0000000E+00
       Systematic error:          1.0000000E+00
       Fraction Limit:            0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:26:58
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0222

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.98	13707.	1.32	1.17	1.866E-02				
45.50	5926.	1.94	0.82	1.848E-02				
46.82	1756.	6.78	0.82	1.843E-02				
121.81	84778.	0.38	0.90	1.592E-02	121.78	28.410	9.962E-01	QA122
244.65	16920.	0.97	1.05	1.181E-02	244.70	7.550	1.009E+00	Qa245
295.94	826.	8.09	0.93	1.069E-02				
344.28	47635.	0.49	1.12	9.637E-03	344.28	26.590	9.881E-01	Qa344
367.66	1654.	4.60	1.02	9.397E-03				
411.17	3505.	2.49	1.26	8.949E-03				
444.07	4622.	2.08	1.23	8.610E-03				
488.65	668.	9.64	1.05	8.151E-03				
564.04	594.	10.17	1.18	7.375E-03				
586.39	548.	12.80	1.27	7.145E-03				
678.75	412.	14.94	1.22	6.194E-03				
688.76	964.	6.30	1.42	6.091E-03				
719.36	333.	17.74	1.20	5.776E-03				
778.94	12576.	1.04	1.51	5.163E-03	778.90	12.970	9.983E-01	Qa779
810.36	295.	19.05	1.18	5.044E-03				
867.35	3691.	2.67	1.47	4.829E-03				
964.05	12017.	1.03	1.68	4.463E-03	964.08	14.500	9.870E-01	Qa964
1005.27	655.	8.20	1.53	4.359E-03				
1085.90	7688.	1.23	1.75	4.156E-03				
1089.80	1381.	4.16	1.76	4.146E-03				
1112.06	10234.	1.17	1.66	4.089E-03				
1212.97	1095.	5.27	1.78	3.835E-03				
1299.12	1132.	3.60	1.88	3.617E-03				
1407.99	12998.	0.90	1.96	3.342E-03	1408.01	20.850	9.915E-01	Qa1408

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:26:58
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1457.64	309.	6.24	1.33	3.217E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
159.87	39.98	7235.	13707.	7.344E+05	2.63	1.174	-	s
181.91	45.51	3633.	5926.	3.207E+05	3.88	0.823	-	D
187.18	46.83	6218.	1756.	9.527E+04	13.57	0.825	-	D
1183.34	295.94	1400.	826.	7.727E+04	16.18	0.930	-	
1470.15	367.66	1291.	1654.	1.760E+05	9.20	1.022	-	s
1644.18	411.17	1240.	3505.	3.917E+05	4.97	1.258	-	
1775.74	444.07	1328.	4622.	5.369E+05	4.17	1.226	-	
1954.04	488.65	1087.	668.	8.198E+04	19.27	1.048	-	s
2255.58	564.04	1093.	594.	8.060E+04	20.34	1.184	-	
2344.96	586.39	1322.	548.	7.663E+04	25.60	1.272	-	
2714.40	678.75	1056.	412.	6.651E+04	29.89	1.223	-	
2754.42	688.76	880.	964.	1.583E+05	12.60	1.419	-	
2876.83	719.36	1021.	333.	5.772E+04	35.48	1.199	-	
3240.88	810.36	898.	295.	5.856E+04	38.11	1.183	-	s
3468.84	867.35	1363.	3691.	7.643E+05	5.33	1.473	-	
4020.63	1005.27	531.	655.	1.502E+05	16.41	1.526	-	
4343.25	1085.85	610.	7688.	1.850E+06	2.46	1.752	-	D
4358.84	1089.74	963.	1381.	3.332E+05	8.33	1.755	-	D
4447.91	1112.06	832.	10234.	2.503E+06	2.34	1.662	-	
4851.70	1212.97	428.	1095.	2.855E+05	10.53	1.775	-	s
5196.45	1299.12	122.	1132.	3.129E+05	7.19	1.878	-	
5830.84	1457.64	12.	309.	9.597E+04	12.49	1.327	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.04	121.81	5755.	84778.	141.296	0.75	0.898
Qa-245	978.22	244.65	3104.	16920.	28.200	1.94	1.055
Qa-344	1376.67	344.28	2054.	47635.	79.391	0.98	1.123
Qa-779	3115.16	778.94	1146.	12576.	20.961	2.08	1.512
Qa-964	3855.73	964.05	772.	12017.	20.028	2.06	1.677

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:26:58
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124001_QCAsLeft.An1

 Nuclide  Channel   Energy  Background  Net area  Cnts/sec   Uncert   FWHM
 Qa-1408  5632.12  1407.99       103.     12998.    21.663     1.79   1.958

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             uCi           keV     uCi           uCi            COMMENTS
 ____________________________________________________________________________

QA-122       9.9617E-01                                        4.94E+03
                            121.78 9.962E-01  (  2.077E-03 3.76E-01 2.84E+01 G

Qa-245       1.0090E+00                                        4.94E+03
                            244.70 1.009E+00  (  7.742E-03 9.69E-01 7.55E+00 G

Qa-344       9.8810E-01                                        4.94E+03
                            344.28 9.881E-01  (  2.191E-03 4.91E-01 2.66E+01 G

Qa-779       9.9832E-01                                        4.94E+03
                            778.90 9.983E-01  (  6.260E-03 1.04E+00 1.30E+01 G

Qa-964       9.8704E-01                                        4.94E+03
                            964.08 9.870E-01  (  5.318E-03 1.03E+00 1.45E+01 G

Qa-1408      9.9151E-01                                        4.94E+03
                           1408.01 9.915E-01  (  1.806E-03 8.95E-01 2.09E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:26:58
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124001_QCAsLeft.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.4416E-01	9.9617E-01	7.4859E-03	1.1397E-01	2.077E-03
Qa-245	8.5504E-01	1.0090E+00	1.9545E-02	1.1684E-01	7.742E-03
Qa-344	8.3732E-01	9.8810E-01	9.6958E-03	1.1322E-01	2.191E-03
Qa-779	8.4598E-01	9.9832E-01	2.0726E-02	1.1584E-01	6.260E-03
Qa-964	8.3642E-01	9.8704E-01	2.0345E-02	1.1451E-01	5.318E-03
Qa-1408	8.4021E-01	9.9151E-01	1.7756E-02	1.1458E-01	1.806E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1111.8 to 2035.5 keV) 5.059E+00 uCi
Total Decayed Activity (1111.8 to 2035.5 keV) 5.9701490E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514010795001
Cal : 07-JAN-2014 12:17:05,06-JAN-2014 18:36:56

Run Name : QUALITY CONTROL CHEC
File : 2_20140107_001
Caldate : 07-JAN-2014, 06-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 07-JAN-2014 11:55
Dead Time : 4.26 %

Standards: S19582

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.003	uCi	.0052944	487.00	486.00 - 488.00	121.88	121.58 - 121.98	0.88	0.79 - 0.97	0.33	5	
QA-779	1.000	1.002	uCi	.01499					1.47	1.37 - 1.67	0.17	5	
QA-1408	1.000	0.9855	uCi	.012375	5631.76	5629.00 - 5635.00	1407.96	1407.58 - 1408.58	1.91	1.74 - 2.12	-1.45	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 12:17:22
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140107001_QCAsLeft.An1

Sample description
     RCCV,S19582,Quality control Check


Spectrum Filename: C:\User\SPC\Det2\2_20140107001_QCAsLeft.An1

Acquisition information
       Start time:                 1/7/2014 11:55:46
       Live time:               1200
       Real time:               1253
       Dead time:                  4.26 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_QC.Clb
     HPGE02 S19582 2_20140106001_Energy RA226


       Energy Calibration
            Created:               1/7/2014 12:17:05
            Zero offset:          -0.001 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.279E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 18:36:56
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.03keV )
       Stop channel:            8144 (  2034.94keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 12:17:22
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0603

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
30.55	333.	19.65	0.86	1.818E-02				
39.98	20736.	1.08	1.13	1.791E-02				
45.48	10338.	1.48	0.82	1.776E-02				
46.74	3096.	5.47	0.82	1.772E-02				
121.88	167944.	0.26	0.88	1.562E-02	121.78	28.410	1.003E+00	QA122
244.65	34802.	0.64	1.03	1.218E-02	244.70	7.550	1.004E+00	Qa245
295.85	1777.	4.57	1.06	1.092E-02				
329.35	463.	18.45	0.64	1.010E-02				
344.15	97739.	0.34	1.11	9.742E-03	344.28	26.590	1.001E+00	Qa344
367.53	3220.	3.46	1.22	9.499E-03				
411.04	6906.	1.76	1.15	9.051E-03				
415.72	357.	17.73	0.96	9.003E-03				
443.90	9262.	1.47	1.20	8.712E-03				
488.66	980.	8.59	1.23	8.251E-03				
503.39	432.	14.29	1.30	8.099E-03				
564.08	1264.	8.14	1.17	7.474E-03				
586.30	1164.	7.24	1.45	7.245E-03				
674.82	468.	12.50	1.39	6.332E-03				
678.69	977.	6.68	1.39	6.292E-03				
688.67	1952.	5.20	1.39	6.189E-03				
719.32	812.	9.82	1.22	5.874E-03				
778.98	25772.	0.75	1.47	5.259E-03	778.90	12.970	1.002E+00	Qa779
810.63	631.	11.39	1.66	5.131E-03				
867.41	7700.	1.73	1.56	4.902E-03				
919.36	853.	9.34	1.50	4.692E-03				
926.29	555.	12.19	1.34	4.664E-03				
964.06	24658.	0.71	1.60	4.511E-03	964.08	14.500	9.996E-01	Qa964

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 12:17:22
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1005.14	1254.	6.14	1.48	4.411E-03				
1085.90	15761.	0.87	1.69	4.216E-03				
1089.89	2624.	3.10	1.69	4.206E-03				
1112.03	21373.	0.77	1.70	4.152E-03				
1212.94	2098.	3.85	1.75	3.907E-03				
1274.28	334.	12.45	1.13	3.758E-03				
1299.17	2274.	2.75	1.76	3.698E-03				
1407.96	26609.	0.63	1.91	3.434E-03	1408.01	20.850	9.855E-01	Qa1408
1457.55	615.	4.67	1.90	3.313E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
122.07	30.55	2327.	333.	1.833E+04	39.31	0.859	-	s
159.73	39.98	11211.	20736.	1.157E+06	2.15	1.130	-	s
181.73	45.52	6582.	10338.	5.821E+05	2.97	0.818	-	D
186.74	46.77	12807.	3096.	1.747E+05	10.94	0.820	-	D
1182.40	295.88	3097.	1769.	1.619E+05	11.38	1.004	-	
1316.17	329.35	2622.	463.	4.578E+04	36.89	0.635	-	s
1468.83	367.53	2794.	3220.	3.390E+05	6.93	1.221	-	s
1642.75	411.04	2435.	6906.	7.630E+05	3.51	1.149	-	
1661.46	415.72	1522.	357.	3.968E+04	35.45	0.959	-	
1774.12	443.90	2648.	9262.	1.063E+06	2.94	1.203	-	
1953.12	488.66	2103.	980.	1.187E+05	17.18	1.229	-	
2012.01	503.39	1407.	432.	5.334E+04	28.57	1.305	-	
2254.67	564.08	2913.	1264.	1.692E+05	16.28	1.166	-	
2343.56	586.30	2048.	1164.	1.606E+05	14.48	1.454	-	s
2697.62	674.83	1445.	492.	7.773E+04	26.49	1.530	-	
2713.11	678.70	1856.	1041.	1.654E+05	15.84	1.457	-	
2753.00	688.67	2317.	1952.	3.154E+05	10.39	1.387	-	s
2875.59	719.32	1789.	812.	1.382E+05	19.65	1.216	-	s
3240.87	810.63	1510.	631.	1.230E+05	22.77	1.658	-	
3468.00	867.41	2520.	7700.	1.571E+06	3.46	1.562	-	
3675.87	919.36	1482.	853.	1.817E+05	18.67	1.501	-	
3703.64	926.29	1219.	555.	1.190E+05	24.38	1.336	-	s
4019.15	1005.14	1110.	1254.	2.842E+05	12.27	1.477	-	
4342.37	1085.82	1477.	15761.	3.739E+06	1.74	1.691	-	D
4358.33	1089.81	1986.	2624.	6.238E+05	6.19	1.694	-	D
4446.96	1112.03	1268.	21373.	5.148E+06	1.54	1.701	-	
4850.91	1212.94	944.	2098.	5.368E+05	7.71	1.750	-	
5096.50	1274.28	323.	334.	8.877E+04	24.89	1.130	-	s
5196.15	1299.17	332.	2274.	6.151E+05	5.49	1.757	-	
5830.37	1457.55	43.	615.	1.856E+05	9.34	1.901	-	

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 12:17:22
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107001_QCAsLeft.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.00	121.88	9791.	167944.	139.954	0.53	0.877
Qa-245	977.65	244.65	5310.	34802.	29.001	1.29	1.027
Qa-344	1375.37	344.15	3708.	97739.	81.449	0.68	1.109
Qa-779	3114.25	778.98	2653.	25772.	21.477	1.50	1.467
Qa-964	3854.77	964.06	1500.	24658.	20.548	1.42	1.602
Qa-1408	5631.76	1407.96	260.	26609.	22.174	1.26	1.907

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi	COMMENTS
QA-122		1.0033E+00				4.94E+03	
			121.78	1.003E+00	(	1.377E-03 2.64E-01 2.84E+01	G
Qa-245		1.0037E+00				4.94E+03	
			244.70	1.004E+00	(	4.897E-03 6.44E-01 7.55E+00	G
Qa-344		1.0008E+00				4.94E+03	
			344.28	1.001E+00	(	1.453E-03 3.40E-01 2.66E+01	G
Qa-779		1.0017E+00				4.94E+03	
			778.90	1.002E+00	(	4.665E-03 7.48E-01 1.30E+01	G
Qa-964		9.9957E-01				4.94E+03	
			964.08	9.996E-01	(	3.658E-03 7.10E-01 1.45E+01	G
Qa-1408		9.8554E-01				4.94E+03	
			1408.01	9.855E-01	(	1.392E-03 6.28E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

ORTEC g v - i (1087) Env32 G53W4.26 1/7/2014 12:17:22
Curtis & Tompkins HPS Lab Spectrum name: 2_20140107001_QCAsLeft.An1

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  2 Sigma
Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi            uCi          uCi
_____________________________________________________________________________
QA-122       8.5224E-01    1.0033E+00   5.2944E-03    1.1467E-01  1.377E-03
Qa-245       8.5252E-01    1.0037E+00   1.2924E-02    1.1531E-01  4.897E-03
Qa-344       8.5008E-01    1.0008E+00   6.8028E-03    1.1446E-01  1.453E-03
Qa-779       8.5089E-01    1.0017E+00   1.4990E-02    1.1534E-01  4.665E-03
Qa-964       8.4904E-01    9.9957E-01   1.4196E-02    1.1499E-01  3.658E-03
Qa-1408      8.3712E-01    9.8554E-01   1.2375E-02    1.1319E-01  1.392E-03
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/7/2014 12:17:22
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140107001_QCAsLeft.An1

 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity ( 1111.8 to  2034.9 keV)     5.092E+00  uCi
 Total Decayed Activity ( 1111.8 to  2034.9 keV) 5.9946895E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE02
Seqnum : 1514034951001
Cal : 24-JAN-2014 06:52:16,06-JAN-2014 18:36:56

Run Name : QUALITY CONTROL CHEC
File : 2_20140124_001
Caldate : 24-JAN-2014, 06-JAN-2014
Live Time : 1200 sec

IDF : 1.0
Time : 24-JAN-2014 06:31
Dead Time : 4.2 %

Standards: S19582

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9913	uCi	.0052619	486.85	486.00 - 488.00	121.88	121.58 - 121.98	0.88	0.79 - 0.97	-0.87	5	
QA-779	1.000	0.9917	uCi	.014632					1.51	1.37 - 1.67	-0.83	5	
QA-1408	1.000	0.9969	uCi	.012628	5631.25	5629.00 - 5635.00	1407.95	1407.58 - 1408.58	1.88	1.74 - 2.12	-0.31	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:52:34
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124001_QCAsLeft.An1

Sample description
     RCCV,S19582,Quality control Check


Spectrum Filename: C:\User\SPC\Det2\2_20140124001_QCAsLeft.An1

Acquisition information
       Start time:                 1/24/2014 06:31:04
       Live time:               1200
       Real time:               1253
       Dead time:                  4.20 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_QC.Clb
     HPGE02 S19582 2_20140106001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:52:16
            Zero offset:           0.026 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 18:36:56
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.06keV )
       Stop channel:            8144 (  2035.12keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:52:34
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0590

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
40.07	17823.	1.11	0.81	1.791E-02				
42.95	671.	17.74	0.81	1.783E-02				
45.47	10494.	1.45	0.81	1.776E-02				
46.90	2915.	5.03	0.81	1.772E-02				
121.88	165534.	0.27	0.88	1.562E-02	121.78	28.410	9.913E-01	QA122
244.66	34685.	0.67	1.05	1.218E-02	244.70	7.550	1.003E+00	Qa245
295.87	1758.	5.86	1.06	1.092E-02				
329.35	447.	19.12	1.11	1.010E-02				
344.15	96784.	0.34	1.10	9.742E-03	344.28	26.590	9.934E-01	Qa344
367.51	3398.	3.25	1.17	9.499E-03				
411.03	7076.	1.79	1.18	9.051E-03				
415.97	345.	19.41	0.47	9.000E-03				
443.90	9331.	1.35	1.22	8.712E-03				
488.62	1198.	6.69	1.36	8.251E-03				
503.35	468.	16.97	1.33	8.099E-03				
563.98	1138.	6.25	1.31	7.475E-03				
586.11	1138.	7.34	1.38	7.247E-03				
656.41	349.	19.77	1.07	6.522E-03				
674.77	431.	13.92	1.40	6.332E-03				
678.68	1070.	6.07	1.41	6.292E-03				
688.66	2045.	4.28	1.36	6.190E-03				
719.43	711.	8.97	1.44	5.872E-03				
765.17	374.	15.04	1.47	5.401E-03				
778.98	25453.	0.74	1.51	5.259E-03	778.90	12.970	9.917E-01	Qa779
810.61	517.	14.62	1.14	5.131E-03				
867.45	7632.	1.70	1.62	4.902E-03				
919.45	712.	10.44	1.75	4.691E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:52:34
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
926.42	520.	10.04	1.59	4.664E-03				
964.07	24809.	0.73	1.59	4.511E-03	964.08	14.500	1.008E+00	Qa964
1005.12	1186.	5.65	1.56	4.411E-03				
1085.90	15600.	0.86	1.69	4.216E-03				
1089.92	2602.	2.95	1.69	4.206E-03				
1112.04	21394.	0.77	1.76	4.152E-03				
1123.11	308.	15.13	0.56	4.125E-03				
1212.98	2002.	3.89	1.84	3.907E-03				
1299.10	2230.	2.56	1.80	3.698E-03				
1407.95	26852.	0.63	1.88	3.434E-03	1408.01	20.850	9.969E-01	Qa1408
1457.52	672.	4.49	1.94	3.313E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
159.64	39.98	10637.	20996.	1.172E+06	2.10	1.111	-	s
171.49	42.87	6742.	671.	1.236E+04	35.48	0.809	-	lD
181.55	45.38	6490.	10311.	5.805E+05	2.96	0.811	-	D
187.29	46.82	9421.	2801.	1.581E+05	10.50	0.813	-	D
1182.16	295.87	3161.	1758.	1.609E+05	11.72	1.065	-	
1316.01	329.35	2642.	447.	4.428E+04	38.23	1.108	-	
1468.55	367.51	2661.	3398.	3.577E+05	6.50	1.167	-	s
1642.53	411.03	2621.	7076.	7.818E+05	3.57	1.184	-	
1662.28	415.97	1656.	345.	3.833E+04	38.82	0.474	-	s
1773.91	443.90	2083.	9331.	1.071E+06	2.69	1.215	-	
1952.72	488.62	1867.	1198.	1.452E+05	13.38	1.364	-	
2011.60	503.35	2012.	468.	5.777E+04	33.94	1.330	-	
2254.05	563.95	1965.	1138.	1.523E+05	12.51	1.311	-	D
2342.52	586.11	2016.	1138.	1.571E+05	14.69	1.380	-	s
2623.66	656.41	1577.	349.	5.354E+04	39.53	1.067	-	
2697.21	674.80	1508.	425.	6.713E+04	31.55	1.518	-	
2712.84	678.71	1640.	1081.	1.718E+05	14.13	1.595	-	
2752.65	688.66	1806.	2045.	3.304E+05	8.55	1.358	-	
2875.78	719.45	2055.	731.	1.245E+05	23.38	1.491	-	
3058.68	765.17	1232.	338.	6.258E+04	33.96	1.546	-	s
3240.46	810.61	1678.	517.	1.008E+05	29.25	1.145	-	s
3467.84	867.45	2384.	7632.	1.557E+06	3.41	1.622	-	
3675.90	919.45	1416.	712.	1.518E+05	20.88	1.754	-	
3703.35	926.31	1090.	606.	1.300E+05	20.83	1.689	-	
4018.68	1005.12	894.	1186.	2.689E+05	11.30	1.557	-	
4341.98	1085.83	1300.	15600.	3.701E+06	1.73	1.692	-	D
4358.05	1089.84	1644.	2602.	6.186E+05	5.90	1.695	-	D
4446.58	1112.04	1316.	21394.	5.153E+06	1.55	1.760	-	s
4490.91	1123.11	642.	308.	7.462E+04	30.27	0.561	-	s
4850.62	1212.98	886.	2002.	5.125E+05	7.79	1.839	-	

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:52:34
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124001_QCAsLeft.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
5195.39	1299.10	248.	2230.	6.030E+05	5.11	1.800	-
5829.76	1457.52	49.	672.	2.027E+05	8.98	1.941	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	486.85	121.88	9479.	165534.	137.945	0.53	0.877
Qa-245	977.49	244.66	6015.	34685.	28.904	1.34	1.048
Qa-344	1375.16	344.15	3799.	96784.	80.653	0.68	1.099
Qa-779	3113.93	778.98	2451.	25453.	21.211	1.48	1.507
Qa-964	3854.41	964.07	1789.	24809.	20.674	1.47	1.592
Qa-1408	5631.25	1407.95	391.	26852.	22.376	1.27	1.884

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	MDA Value uCi	COMMENTS
QA-122		9.9128E-01				4.94E+03	
			121.78	9.913E-01	(	1.358E-03 2.65E-01 2.84E+01	G
Qa-245		1.0027E+00				4.94E+03	
			244.70	1.003E+00	(	5.224E-03 6.70E-01 7.55E+00	G
Qa-344		9.9336E-01				4.94E+03	
			344.28	9.934E-01	(	1.474E-03 3.42E-01 2.66E+01	G
Qa-779		9.9169E-01				4.94E+03	
			778.90	9.917E-01	(	4.494E-03 7.38E-01 1.30E+01	G
Qa-964		1.0081E+00				4.94E+03	
			964.08	1.008E+00	(	4.005E-03 7.33E-01 1.45E+01	G

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:52:34
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124001_QCAsLeft.An1

 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Qa-1408      9.9687E-01                                        4.94E+03
                         1408.01 9.969E-01  (  1.711E-03 6.33E-01 2.09E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  2 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
          Time of Count  Time Corrected  Uncertainty  2 Sigma
 Nuclide     Activity       Activity       Counting     Total         MDA
               uCi            uCi            uCi          uCi
 ____________________________________________________________________________
 QA-122       8.4001E-01    9.9128E-01   5.2619E-03    1.1329E-01  1.358E-03
 Qa-245       8.4967E-01    1.0027E+00   1.3427E-02    1.1525E-01  5.224E-03
 Qa-344       8.4178E-01    9.9336E-01   6.7989E-03    1.1361E-01  1.474E-03
 Qa-779       8.4036E-01    9.9169E-01   1.4632E-02    1.1416E-01  4.494E-03
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:52:34
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124001_QCAsLeft.An1

 Qa-964       8.5423E-01    1.0081E+00   1.4771E-02    1.1603E-01  4.005E-03
 Qa-1408      8.4475E-01    9.9687E-01   1.2628E-02    1.1451E-01  1.711E-03
   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity ( 1111.9 to  2035.1 keV)     5.071E+00  uCi
 Total Decayed Activity ( 1111.9 to  2035.1 keV) 5.9839358E+00  uCi

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 3_20130429001_QCAsLeft
Acquired: 4/29/2013 08:49:37
Detector: HPGE03 51-TP42227A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1408 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	487.00	485.00	485.67	486.90	488.33	489.00	PASS
Energy	121.78	121.28	121.45	121.75	122.11	122.28	PASS
FWHM	0.87	0.77	0.80	0.89	0.94	0.97	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.11	5.00	7.00	PASS
QA-779							
FWHM	1.43	1.26	1.32	1.49	1.54	1.60	PASS
ActivityDiff	1.00	-7.00	-5.00	1.32	5.00	7.00	PASS
QA-1408							
Channel	5632.00	5630.00	5630.67	5631.50	5633.33	5634.00	PASS
Energy	1408.08	1407.58	1407.75	1407.99	1408.41	1408.58	PASS
FWHM	1.96	1.73	1.80	1.87	2.12	2.19	PASS
ActivityDiff	1.00	-7.00	-5.00	0.65	5.00	7.00	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  4/29/2013 09:00:50
Curtis & Tompkins HPS Lab       Spectrum name: 3_20130429001_QCAsLeft.An1

Sample description
     RCCV,S19582,Quality control Check


Spectrum Filename: C:\User\SPC\Det3\3_20130429001_QCAsLeft.An1

Acquisition information
       Start time:                 4/29/2013 08:49:37
       Live time:                600
       Real time:                628
       Dead time:                  4.53 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_QC.Clb
     HPGE03 S19583 3_20130428001_Energy RA226


       Energy Calibration
            Created:               4/29/2013 09:00:32
            Zero offset:          -0.094 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.849E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/28/2013 14:09:55
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.93keV )
       Stop channel:            8144 (  2035.40keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 09:00:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0218

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.76	8220.	1.90	1.17	1.673E-02				
45.29	4149.	2.55	0.81	1.660E-02				
46.73	1164.	8.33	0.81	1.656E-02				
121.75	81799.	0.38	0.89	1.472E-02	121.78	28.410	1.001E+00	QA122
244.69	16969.	0.93	1.01	1.171E-02	244.70	7.550	9.826E-01	Qa245
295.94	884.	8.64	1.05	1.046E-02				
344.34	47622.	0.49	1.13	9.283E-03	344.28	26.590	9.873E-01	Qa344
367.73	1690.	4.87	1.21	9.054E-03				
411.06	3567.	2.26	1.31	8.628E-03				
443.90	4629.	1.94	1.26	8.305E-03				
488.63	650.	9.96	1.07	7.866E-03				
503.14	263.	18.65	1.07	7.723E-03				
563.85	512.	11.94	1.15	7.127E-03				
586.24	547.	10.87	1.27	6.907E-03				
656.01	264.	19.50	0.70	6.222E-03				
678.56	536.	10.49	1.44	6.000E-03				
688.64	1036.	6.52	1.38	5.901E-03				
778.89	12539.	1.10	1.49	5.015E-03	778.90	12.970	9.868E-01	Qa779
867.37	3903.	2.35	1.64	4.690E-03				
919.28	417.	13.07	1.74	4.500E-03				
926.26	231.	16.41	1.03	4.474E-03				
964.04	12278.	1.04	1.62	4.336E-03	964.08	14.500	9.996E-01	Qa964
1005.10	597.	9.49	1.64	4.237E-03				
1085.84	7746.	1.24	1.70	4.043E-03				
1089.91	1350.	3.83	1.70	4.033E-03				
1111.96	10549.	1.09	1.74	3.980E-03				
1212.91	1046.	5.43	1.70	3.737E-03				

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 09:00:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1299.14	1092.	3.92	1.74	3.529E-03				
1407.99	13222.	0.90	1.87	3.267E-03	1408.01	20.850	9.935E-01	Qa1408
1457.61	314.	6.12	1.42	3.148E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
159.25	39.76	6200.	8220.	4.913E+05	3.80	1.166	-	s
181.37	45.24	3544.	4149.	2.500E+05	5.11	0.810	-	D
187.11	46.68	4123.	1164.	7.031E+04	16.66	0.811	-	D
1183.17	295.94	1704.	884.	8.448E+04	17.27	1.049	-	
1470.15	367.73	1455.	1690.	1.867E+05	9.75	1.213	-	s
1643.40	411.06	982.	3567.	4.134E+05	4.52	1.307	-	
1774.67	443.90	1117.	4629.	5.573E+05	3.89	1.263	-	
1953.51	488.63	1104.	650.	8.258E+04	19.91	1.066	-	
2011.53	503.14	794.	263.	3.407E+04	37.29	1.067	-	s
2254.29	563.85	1150.	512.	7.181E+04	23.87	1.150	-	
2343.82	586.24	1032.	547.	7.924E+04	21.74	1.273	-	
2622.85	656.01	826.	264.	4.251E+04	39.01	0.697	-	s
2713.04	678.56	846.	536.	8.928E+04	20.98	1.441	-	
2753.34	688.64	1034.	1036.	1.755E+05	13.03	1.384	-	
3468.22	867.37	1131.	3903.	8.322E+05	4.70	1.641	-	
3675.90	919.28	710.	417.	9.271E+04	26.14	1.742	-	
3703.81	926.26	464.	231.	5.163E+04	32.83	1.031	-	s
4019.24	1005.10	581.	597.	1.409E+05	18.98	1.641	-	
4342.27	1085.78	719.	7746.	1.916E+06	2.47	1.696	-	D
4358.58	1089.86	658.	1350.	3.346E+05	7.65	1.698	-	D
4446.80	1111.96	629.	10549.	2.651E+06	2.19	1.735	-	
4850.75	1212.91	445.	1046.	2.800E+05	10.85	1.698	-	
5195.88	1299.14	164.	1092.	3.096E+05	7.84	1.735	-	
5830.20	1457.61	11.	314.	9.963E+04	12.24	1.415	-	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 09:00:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	486.93	121.75	5250.	81799.	136.332	0.76	0.893
Qa-245	978.31	244.69	2681.	16969.	28.282	1.85	1.014
Qa-344	1376.63	344.34	2069.	47622.	79.370	0.98	1.132
Qa-779	3114.32	778.89	1472.	12539.	20.899	2.19	1.494
Qa-964	3854.97	964.04	855.	12278.	20.464	2.08	1.617
Qa-1408	5631.57	1407.99	212.	13222.	22.037	1.81	1.868

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		1.0011E+00				4.94E+03	
			121.78	1.001E+00	(	2.066E-03 3.81E-01 2.84E+01	G
Qa-245		9.8258E-01				4.94E+03	
			244.70	9.826E-01	(	6.986E-03 9.27E-01 7.55E+00	G
Qa-344		9.8733E-01				4.94E+03	
			344.28	9.873E-01	(	2.197E-03 4.91E-01 2.66E+01	G
Qa-779		9.8676E-01				4.94E+03	
			778.90	9.868E-01	(	7.034E-03 1.10E+00 1.30E+01	G
Qa-964		9.9959E-01				4.94E+03	
			964.08	9.996E-01	(	5.546E-03 1.04E+00 1.45E+01	G
Qa-1408		9.9346E-01				4.94E+03	
			1408.01	9.935E-01	(	2.549E-03 9.04E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 09:00:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.8106E-01	1.0011E+00	7.6240E-03	1.1454E-01	2.066E-03
Qa-245	8.6479E-01	9.8258E-01	1.8217E-02	1.1364E-01	6.986E-03
Qa-344	8.6897E-01	9.8733E-01	9.6940E-03	1.1313E-01	2.197E-03
Qa-779	8.6847E-01	9.8676E-01	2.1619E-02	1.1471E-01	7.034E-03
Qa-964	8.7976E-01	9.9959E-01	2.0785E-02	1.1599E-01	5.546E-03
Qa-1408	8.7436E-01	9.9346E-01	1.7959E-02	1.1483E-01	2.549E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1111.8 to 2035.4 keV) 5.237E+00 uCi
Total Decayed Activity (1111.8 to 2035.4 keV) 5.9507914E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 4/29/2013 09:00:50
Curtis & Tompkins HPS Lab Spectrum name: 3_20130429001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE03
Seqnum : 1524034937001
Cal : 24-JAN-2014 06:28:35,28-APR-2013 14:09:55

Run Name : QUALITY CONTROL CHEC
File : 3_20140124_001
Caldate : 24-JAN-2014, 28-APR-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:17
Dead Time : 4.43 %

Standards: S19583

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.019	uCi	.0077928	487.18	486.00 - 488.00	121.75	121.58 - 121.98	0.90	0.77 - 0.95	1.92	5	
QA-779	1.000	1.043	uCi	.021927					1.44	1.32 - 1.62	4.26	5	
QA-1408	1.000	1.000	uCi	.01815	5632.27	5629.00 - 5635.00	1407.99	1407.58 - 1408.58	1.99	1.72 - 2.10	0.02	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:28:52
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124001_QCAsLeft.An1

Sample description
     RCCV,S19583,Quality control Check


Spectrum Filename: C:\User\SPC\Det3\3_20140124001_QCAsLeft.An1

Acquisition information
       Start time:                 1/24/2014 06:17:39
       Live time:                600
       Real time:                628
       Dead time:                  4.43 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_QC.Clb
     HPGE03 S19583 3_20130428001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:28:35
            Zero offset:          -0.141 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/28/2013 14:09:55
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.88keV )
       Stop channel:            8144 (  2035.17keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:28:52
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0222

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.77	7557.	2.10	1.17	1.673E-02				
45.31	4187.	2.48	0.85	1.659E-02				
46.64	1308.	7.69	0.85	1.656E-02				
121.75	80181.	0.38	0.90	1.472E-02	121.78	28.410	1.019E+00	QA122
244.69	16712.	0.96	1.04	1.171E-02	244.70	7.550	1.005E+00	Qa245
295.96	864.	8.23	1.17	1.046E-02				
344.33	47615.	0.48	1.12	9.284E-03	344.28	26.590	1.025E+00	Qa344
367.67	1589.	4.72	1.12	9.054E-03				
411.09	3445.	2.34	1.22	8.628E-03				
443.93	4506.	2.01	1.26	8.305E-03				
488.50	592.	9.54	1.15	7.867E-03				
563.90	577.	8.98	1.29	7.128E-03				
586.02	652.	9.28	1.47	6.909E-03				
678.53	456.	12.01	1.68	6.000E-03				
688.56	924.	8.35	1.27	5.902E-03				
778.92	12532.	0.96	1.47	5.015E-03	778.90	12.970	1.024E+00	Qa779
810.40	304.	18.13	1.33	4.899E-03				
867.39	3696.	2.68	1.57	4.690E-03				
919.26	458.	11.79	1.43	4.500E-03				
926.23	256.	17.14	0.90	4.474E-03				
964.05	11969.	1.06	1.66	4.336E-03	964.08	14.500	1.012E+00	Qa964
1005.21	654.	7.92	1.85	4.237E-03				
1085.83	7635.	1.24	1.73	4.043E-03				
1089.87	1355.	4.07	1.73	4.033E-03				
1111.96	10241.	1.17	1.79	3.980E-03				
1212.83	1016.	5.63	1.53	3.737E-03				
1407.99	12817.	0.91	1.99	3.267E-03	1408.01	20.850	1.000E+00	Qa1408

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:28:52
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124001_QCAsLeft.An1

pk energy area uncert fwhm corr nuclide brnch. act. nuc

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
159.52	39.77	6523.	7557.	4.517E+05	4.20	1.170	- s
181.65	45.35	3314.	4187.	2.523E+05	4.97	0.852	- D
186.98	46.68	4408.	1308.	7.895E+04	15.39	0.853	- D
1183.54	295.96	1554.	864.	8.262E+04	16.46	1.170	-
1470.25	367.67	1258.	1589.	1.755E+05	9.43	1.116	- s
1643.87	411.09	1016.	3445.	3.993E+05	4.68	1.220	-
1775.15	443.93	1125.	4506.	5.426E+05	4.02	1.264	-
1953.39	488.50	929.	592.	7.527E+04	19.08	1.155	-
2254.90	563.76	1054.	577.	8.098E+04	17.95	1.290	- D
2343.39	586.02	1002.	652.	9.437E+04	18.55	1.465	-
2713.39	678.53	848.	456.	7.599E+04	24.02	1.679	- s
2753.48	688.56	1290.	924.	1.566E+05	16.70	1.266	-
3240.87	810.40	851.	304.	6.197E+04	36.25	1.334	-
3468.83	867.39	1351.	3696.	7.880E+05	5.35	1.567	-
3676.36	919.26	684.	458.	1.018E+05	23.59	1.434	- s
3704.25	926.23	540.	256.	5.728E+04	34.28	0.898	- s
4020.24	1005.21	483.	654.	1.543E+05	15.85	1.847	- s
4342.83	1085.79	681.	7635.	1.889E+06	2.48	1.726	- D
4359.02	1089.83	845.	1355.	3.360E+05	8.14	1.729	- D
4447.43	1111.96	808.	10241.	2.573E+06	2.33	1.794	-
4851.09	1212.83	443.	1016.	2.719E+05	11.26	1.534	-

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.18	121.75	4925.	80181.	133.635	0.76	0.902
Qa-245	978.61	244.69	2846.	16712.	27.853	1.91	1.036
Qa-344	1376.94	344.33	1704.	47615.	79.358	0.97	1.117
Qa-779	3114.72	778.87	1277.	12757.	21.261	2.10	1.436
Qa-964	3855.57	964.05	871.	11969.	19.948	2.11	1.657
Qa-1408	5632.27	1407.99	133.	12817.	21.361	1.81	1.994

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:28:52
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124001_QCAsLeft.An1


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             uCi           keV     uCi           uCi            COMMENTS
 ____________________________________________________________________________

QA-122       1.0192E+00                                        4.94E+03
                           121.78 1.019E+00  (  2.078E-03 3.82E-01 2.84E+01 G

Qa-245       1.0050E+00                                        4.94E+03
                           244.70 1.005E+00  (  7.475E-03 9.56E-01 7.55E+00 G

Qa-344       1.0253E+00                                        4.94E+03
                           344.28 1.025E+00  (  2.071E-03 4.85E-01 2.66E+01 G

Qa-779       1.0426E+00                                        4.94E+03
                           778.90 1.043E+00  (  6.806E-03 1.05E+00 1.30E+01 G

Qa-964       1.0120E+00                                        4.94E+03
                           964.08 1.012E+00  (  5.815E-03 1.06E+00 1.45E+01 G

Qa-1408      1.0002E+00                                        4.94E+03
                          1408.01 1.000E+00  (  2.099E-03 9.07E-01 2.09E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:28:52
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124001_QCAsLeft.An1

C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.6363E-01	1.0192E+00	7.7928E-03	1.1661E-01	2.078E-03
Qa-245	8.5166E-01	1.0050E+00	1.9219E-02	1.1634E-01	7.475E-03
Qa-344	8.6883E-01	1.0253E+00	9.9368E-03	1.1747E-01	2.071E-03
Qa-779	8.8354E-01	1.0426E+00	2.1927E-02	1.2103E-01	6.806E-03
Qa-964	8.5759E-01	1.0120E+00	2.1375E-02	1.1750E-01	5.815E-03
Qa-1408	8.4756E-01	1.0002E+00	1.8150E-02	1.1562E-01	2.099E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1111.9 to 2035.2 keV) 5.173E+00 uCi
Total Decayed Activity (1111.9 to 2035.2 keV) 6.1042919E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE04
Seqnum : 1534034952001
Cal : 24-JAN-2014 06:44:12,04-MAR-2013 19:32:03

Run Name : QUALITY CONTROL CHEC
File : 4_20140124_001
Caldate : 24-JAN-2014, 04-MAR-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:32
Dead Time : 11.8 %

Standards: S19583

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	1.026	uCi	.0078612	486.92	486.00 - 488.00	121.76	121.58 - 121.98	0.86	0.77 - 0.94	2.60	5	
QA-779	1.000	1.027	uCi	.022473					1.46	1.35 - 1.65	2.70	5	
QA-1408	1.000	1.021	uCi	.018656	5631.53	5629.00 - 5635.00	1408.00	1407.58 - 1408.58	1.99	1.80 - 2.20	2.05	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:44:30
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124001_QCAsLeft.An1

Sample description
     RCCV,S19583,Quality control Check


Spectrum Filename: C:\User\SPC\Det4\4_20140124001_QCAsLeft.An1

Acquisition information
       Start time:                 1/24/2014 06:32:24
       Live time:                600
       Real time:                680
       Dead time:                 11.80 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_QC.Clb
     HPGE04 S15983 4_20130304001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/4/2013 19:32:03
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:44:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0255

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.70	8181.	2.07	1.14	1.739E-02				
45.22	4463.	2.33	0.80	1.723E-02				
46.57	1379.	7.98	0.80	1.718E-02				
121.76	81813.	0.38	0.86	1.492E-02	121.78	28.410	1.026E+00	QA122
244.75	15997.	0.98	0.98	1.122E-02	244.70	7.550	1.004E+00	Qa245
295.92	884.	8.61	1.06	1.013E-02				
344.24	46082.	0.48	1.08	9.109E-03	344.28	26.590	1.011E+00	Qa344
367.62	1584.	5.08	1.17	8.882E-03				
411.07	3367.	2.64	1.16	8.463E-03				
443.93	4436.	2.01	1.17	8.146E-03				
488.71	621.	9.90	1.28	7.715E-03				
563.92	526.	11.02	1.05	6.989E-03				
586.28	551.	10.63	1.40	6.774E-03				
678.59	476.	12.83	1.08	5.883E-03				
688.61	971.	7.53	1.57	5.787E-03				
719.35	306.	19.58	1.34	5.490E-03				
778.93	12318.	1.09	1.46	4.916E-03	778.90	12.970	1.027E+00	Qa779
810.27	328.	14.78	1.27	4.795E-03				
867.42	3656.	2.35	1.54	4.574E-03				
919.32	431.	13.32	1.25	4.374E-03				
964.06	11624.	1.08	1.63	4.202E-03	964.08	14.500	1.014E+00	Qa964
1005.09	617.	8.14	1.55	4.107E-03				
1085.88	7520.	1.24	1.73	3.922E-03				
1089.85	1256.	4.62	1.73	3.913E-03				
1112.04	10403.	1.10	1.79	3.862E-03				
1212.88	1046.	5.55	1.66	3.630E-03				
1299.23	1086.	3.90	1.73	3.432E-03				

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:44:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1408.00	12735.	0.91	1.99	3.182E-03	1408.01	20.850	1.020E+00	Qa1408
1457.63	299.	6.85	1.83	3.068E-03				

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
158.92	39.70	7597.	8181.	4.704E+05	4.14	1.144	-	s
180.99	45.22	3262.	4380.	2.543E+05	4.77	0.796	-	D
186.39	46.57	5382.	1358.	7.900E+04	16.22	0.797	-	D
1183.10	295.92	1693.	884.	8.726E+04	17.22	1.056	-	
1469.75	367.62	1435.	1584.	1.783E+05	10.15	1.166	-	s
1643.47	411.07	1290.	3367.	3.978E+05	5.27	1.163	-	
1774.87	443.93	1104.	4436.	5.445E+05	4.03	1.175	-	
1953.94	488.71	1016.	621.	8.045E+04	19.79	1.280	-	s
2254.65	563.92	1051.	526.	7.532E+04	22.03	1.049	-	
2344.10	586.28	996.	551.	8.141E+04	21.27	1.398	-	
2713.25	678.59	1019.	476.	8.098E+04	25.66	1.077	-	
2753.32	688.61	1151.	971.	1.678E+05	15.05	1.567	-	s
2876.26	719.35	1025.	306.	5.570E+04	39.17	1.337	-	s
3239.93	810.27	695.	328.	6.832E+04	29.56	1.269	-	
3468.52	867.42	1072.	3656.	7.993E+05	4.71	1.536	-	
3676.14	919.32	753.	431.	9.848E+04	26.64	1.245	-	s
4019.28	1005.09	477.	617.	1.502E+05	16.29	1.553	-	
4342.49	1085.83	588.	7520.	1.917E+06	2.48	1.729	-	D
4358.38	1089.81	1055.	1256.	3.211E+05	9.24	1.732	-	D
4447.14	1112.04	629.	10403.	2.694E+06	2.21	1.787	-	
4850.65	1212.88	464.	1046.	2.882E+05	11.09	1.660	-	
5196.20	1299.23	148.	1086.	3.164E+05	7.81	1.733	-	
5830.13	1457.63	24.	299.	9.747E+04	13.69	1.828	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:44:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124001_QCAsLeft.An1

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	486.92	121.76	5660.	81813.	136.355	0.77	0.860
Qa-245	978.55	244.75	2872.	15997.	26.662	1.96	0.983
Qa-344	1376.25	344.23	1976.	46195.	76.992	0.99	1.107
Qa-779	3114.58	778.93	1360.	12318.	20.531	2.19	1.457
Qa-964	3855.12	964.06	952.	11624.	19.373	2.16	1.629
Qa-1408	5631.53	1408.00	160.	12735.	21.225	1.83	1.991

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi	Peak Energy keV	Peak Activity uCi	Peak Code	Peak MDA Value uCi	COMMENTS
QA-122		1.0260E+00				4.94E+03	
			121.78	1.026E+00	(	2.198E-03 3.83E-01 2.84E+01	G
Qa-245		1.0041E+00				4.94E+03	
			244.70	1.004E+00	(	7.838E-03 9.81E-01 7.55E+00	G
Qa-344		1.0140E+00				4.94E+03	
			344.28	1.014E+00	(	2.273E-03 4.96E-01 2.66E+01	G
Qa-779		1.0270E+00				4.94E+03	
			778.90	1.027E+00	(	7.163E-03 1.09E+00 1.30E+01	G
Qa-964		1.0142E+00				4.94E+03	
			964.08	1.014E+00	(	6.273E-03 1.08E+00 1.45E+01	G
Qa-1408		1.0205E+00				4.94E+03	
			1408.01	1.020E+00	(	2.361E-03 9.14E-01 2.09E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:44:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124001_QCAsLeft.An1

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.6947E-01	1.0260E+00	7.8612E-03	1.1740E-01	2.198E-03
Qa-245	8.5091E-01	1.0041E+00	1.9696E-02	1.1632E-01	7.838E-03
Qa-344	8.5926E-01	1.0140E+00	1.0060E-02	1.1620E-01	2.273E-03
Qa-779	8.7030E-01	1.0270E+00	2.2473E-02	1.1938E-01	7.163E-03
Qa-964	8.5943E-01	1.0142E+00	2.1943E-02	1.1785E-01	6.273E-03
Qa-1408	8.6477E-01	1.0205E+00	1.8656E-02	1.1799E-01	2.361E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1112.0 to 2035.6 keV) 5.174E+00 uCi
Total Decayed Activity (1112.0 to 2035.6 keV) 6.1058855E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:44:30
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124001_QCAsLeft.An1

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Quality Control Check

Spectrum: 5_20130630001_QCAsLeft
Acquired: 6/30/2013 10:46:09
Detector: HPGE05 51-TP42242A
Quality Control Evaluation Criteria:
1) Place instrument out of service if 'AS LEFT' parameters exceed Control Limits.
2) Run Gain Stabilization Automation Job if Channel Centroid exceeds Tolerance Limits.
3) Extend count time or replace QC source if QA-1836 Peak Area fails low.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
QA-122							
Channel	487.00	485.00	485.67	487.10	488.33	489.00	PASS
Energy	121.78	121.28	121.45	121.81	122.11	122.28	PASS
FWHM	0.95	0.84	0.88	0.94	1.03	1.07	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.60	5.00	7.00	PASS
QA-779							
FWHM	1.53	1.34	1.40	1.54	1.65	1.71	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.90	5.00	7.00	PASS
QA-1408							
Channel	5632.00	5630.00	5630.67	5632.00	5633.33	5634.00	PASS
Energy	1408.01	1407.51	1407.68	1408.01	1408.34	1408.51	PASS
FWHM	2.07	1.82	1.91	2.09	2.24	2.32	PASS
ActivityDiff	1.00	-7.00	-5.00	-0.04	5.00	7.00	PASS

Analyst: Philip Smith Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/30/2013 10:57:20
Curtis & Tompkins HPS Lab       Spectrum name: 5_20130630001_QCAsLeft.An1

Sample description
     RCCV,S19584,Quality control Check


Spectrum Filename: C:\User\SPC\Det5\5_20130630001_QCAsLeft.An1

Acquisition information
       Start time:                 6/30/2013 10:46:09
       Live time:                600
       Real time:                629
       Dead time:                  4.54 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_QC.Clb
     HPGE05 S19584 5_20130628002_Energy RA226


       Energy Calibration
            Created:               6/30/2013 10:57:04
            Zero offset:          -0.074 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.562E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/28/2013 18:54:44
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.95keV )
       Stop channel:            8144 (  2035.30keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 10:57:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0266

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.71	7735.	2.24	1.15	1.730E-02				
45.28	4110.	2.64	0.88	1.714E-02				
46.64	1171.	9.23	0.88	1.710E-02				
121.81	82989.	0.38	0.94	1.499E-02	121.78	28.410	1.006E+00	QA122
244.71	17346.	0.93	1.10	1.154E-02	244.70	7.550	1.028E+00	Qa245
295.90	857.	8.33	1.12	1.036E-02				
344.20	47825.	0.49	1.18	9.256E-03	344.28	26.590	1.003E+00	Qa344
367.63	1626.	5.32	1.16	9.020E-03				
411.04	3391.	2.59	1.34	8.586E-03				
443.91	4589.	2.13	1.23	8.257E-03				
488.77	527.	12.35	1.14	7.808E-03				
564.29	708.	10.01	1.22	7.052E-03				
586.20	624.	11.24	1.46	6.832E-03				
678.75	462.	12.71	1.48	5.906E-03				
688.71	881.	7.98	1.41	5.806E-03				
719.23	341.	18.44	1.44	5.501E-03				
778.97	12429.	1.05	1.54	4.903E-03	778.90	12.970	1.009E+00	Qa779
810.83	391.	15.88	1.29	4.801E-03				
867.38	3754.	2.24	1.72	4.621E-03				
919.34	402.	13.64	1.14	4.456E-03				
964.07	11998.	0.95	1.73	4.313E-03	964.08	14.500	9.904E-01	Qa964
1005.19	593.	8.71	1.53	4.212E-03				
1085.85	7824.	1.20	1.83	4.013E-03				
1089.82	1302.	4.68	1.84	4.004E-03				
1112.05	10445.	1.11	1.80	3.949E-03				
1213.04	1050.	4.89	1.92	3.700E-03				
1299.11	1186.	3.35	2.10	3.488E-03				

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 10:57:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630001_QCAsLeft.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1408.01	13009.	0.89	2.09	3.220E-03	1408.01	20.850	1.000E+00	Qa1408

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
158.99	39.71	7956.	7735.	4.472E+05	4.48	1.153	-	s
181.26	45.25	3830.	4110.	2.398E+05	5.28	0.879	-	D
186.68	46.61	5246.	1171.	6.845E+04	18.45	0.881	-	D
1183.08	295.90	1567.	857.	8.265E+04	16.66	1.119	-	
1469.87	367.63	1622.	1626.	1.802E+05	10.63	1.161	-	
1643.45	411.04	1267.	3391.	3.949E+05	5.18	1.335	-	
1774.86	443.91	1375.	4589.	5.557E+05	4.26	1.235	-	
1954.24	488.77	1162.	527.	6.755E+04	24.71	1.140	-	
2256.27	564.29	1306.	708.	1.003E+05	20.02	1.216	-	s
2343.86	586.20	1262.	624.	9.127E+04	22.49	1.456	-	
2714.01	678.75	964.	462.	7.824E+04	25.42	1.481	-	
2753.86	688.71	1128.	881.	1.517E+05	15.97	1.412	-	
2875.94	719.23	1066.	341.	6.207E+04	36.89	1.441	-	
3242.36	810.83	965.	391.	8.152E+04	31.76	1.289	-	
3468.59	867.38	942.	3754.	8.124E+05	4.47	1.722	-	
3676.44	919.34	705.	402.	9.029E+04	27.27	1.143	-	s
4019.95	1005.19	505.	593.	1.407E+05	17.42	1.529	-	
4342.66	1085.83	494.	7824.	1.950E+06	2.40	1.834	-	D
4358.56	1089.80	1207.	1302.	3.252E+05	9.37	1.838	-	D
4447.52	1112.05	659.	10445.	2.645E+06	2.23	1.799	-	
4851.68	1213.04	346.	1050.	2.839E+05	9.78	1.916	-	
5196.14	1299.11	96.	1186.	3.400E+05	6.70	2.095	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.17	121.81	5790.	82989.	138.315	0.77	0.936
Qa-245	978.42	244.71	2824.	17346.	28.911	1.86	1.101
Qa-344	1376.19	344.20	2065.	47825.	79.708	0.98	1.180
Qa-779	3114.88	778.97	1180.	12429.	20.715	2.10	1.538
Qa-964	3855.36	964.06	591.	11990.	19.983	1.99	1.756

```
     ORTEC g v - i (1087) Env32  G53W4.26  6/30/2013 10:57:20
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20130630001_QCAsLeft.An1

 Nuclide  Channel   Energy  Background  Net area  Cnts/sec   Uncert   FWHM
 Qa-1408  5632.06  1408.01        70.     13009.    21.682     1.78   2.093

   s - Peak fails shape tests.
   D - Peak area deconvoluted.
   A   Derived peak area.


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             uCi           keV     uCi           uCi            COMMENTS
 ____________________________________________________________________________

QA-122       1.0060E+00                                        4.94E+03
                            121.78 1.006E+00  (  2.149E-03 3.83E-01 2.84E+01 G

Qa-245       1.0280E+00                                        4.94E+03
                            244.70 1.028E+00  (  7.338E-03 9.31E-01 7.55E+00 G

Qa-344       1.0034E+00                                        4.94E+03
                            344.28 1.003E+00  (  2.222E-03 4.91E-01 2.66E+01 G

Qa-779       1.0090E+00                                        4.94E+03
                            778.90 1.009E+00  (  6.499E-03 1.05E+00 1.30E+01 G

Qa-964       9.8979E-01                                        4.94E+03
                            964.08 9.898E-01  (  4.677E-03 9.93E-01 1.45E+01 G

Qa-1408      1.0004E+00                                        4.94E+03
                           1408.01 1.000E+00  (  1.496E-03 8.89E-01 2.09E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
```

ORTEC g v - i (1087) Env32 G53W4.26 6/30/2013 10:57:20
Curtis & Tompkins HPS Lab Spectrum name: 5_20130630001_QCAsLeft.An1

T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.7769E-01	1.0060E+00	7.7022E-03	1.1510E-01	2.149E-03
Qa-245	8.9690E-01	1.0280E+00	1.9149E-02	1.1891E-01	7.338E-03
Qa-344	8.7549E-01	1.0034E+00	9.8460E-03	1.1498E-01	2.222E-03
Qa-779	8.8035E-01	1.0090E+00	2.1190E-02	1.1713E-01	6.499E-03
Qa-964	8.6357E-01	9.8979E-01	1.9659E-02	1.1470E-01	4.677E-03
Qa-1408	8.7282E-01	1.0004E+00	1.7780E-02	1.1558E-01	1.496E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1111.9 to 2035.3 keV) 5.267E+00 uCi
Total Decayed Activity (1111.9 to 2035.3 keV) 6.0365763E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

CURTIS & TOMPKINS CONTINUING CALIBRATION FOR 251449 RAD-IG Soil

DOE HASL 300 4.5.2.3

Inst : HPGE05
Seqnum : 1544034938001
Cal : 24-JAN-2014 06:29:37,28-JUN-2013 18:54:44

Run Name : QUALITY CONTROL CHEC
File : 5_20140124_001
Caldate : 24-JAN-2014, 28-JUN-2013
Live Time : 600 sec

IDF : 1.0
Time : 24-JAN-2014 06:18
Dead Time : 4.36 %

Standards: S19584

Analyte	Spiked	Quant	Units	2 sigma Uncert uCi Counting	Channel	Channel Limits	Energy	Energy Limits	FWHM	FWHM Limits	%D	Max %D	Flags
QA-122	1.000	0.9865	uCi	.0078334	487.17	486.00 - 488.00	121.81	121.58 - 121.98	1.00	0.86 - 1.05	-1.35	5	
QA-779	1.000	0.9908	uCi	.021416					1.56	1.38 - 1.68	-0.92	5	
QA-1408	1.000	0.9814	uCi	.018137	5632.82	5629.00 - 5635.00	1408.01	1407.58 - 1408.58	2.14	1.86 - 2.28	-1.86	5	

FWHM=Full Width Half Max

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:29:54
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124001_QCAsLeft.An1

Sample description
     RCCV,S19584,Quality control Check


Spectrum Filename: C:\User\SPC\Det5\5_20140124001_QCAsLeft.An1

Acquisition information
       Start time:                 1/24/2014 06:18:42
       Live time:                600
       Real time:                627
       Dead time:                  4.36 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_QC.Clb
     HPGE05 S19584 5_20130628002_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:29:37
            Zero offset:          -0.064 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/28/2013 18:54:44
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      QCDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.95keV )
       Stop channel:            8144 (  2035.00keV )
       Peak rejection level:      20.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:29:54
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124001_QCAsLeft.An1

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2010 12:00:00
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 6 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.0261

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. uCi	Nuc
39.68	7443.	2.37	1.16	1.730E-02				
45.30	4007.	2.63	0.96	1.714E-02				
46.82	1018.	10.55	0.96	1.710E-02				
121.81	79044.	0.40	1.00	1.499E-02	121.78	28.410	9.865E-01	QA122
244.72	16324.	0.87	1.13	1.154E-02	244.70	7.550	9.960E-01	Qa245
295.86	873.	8.39	1.18	1.036E-02				
344.20	45589.	0.51	1.23	9.256E-03	344.28	26.590	9.848E-01	Qa344
367.61	1598.	4.89	1.42	9.020E-03				
411.04	3369.	2.13	1.27	8.586E-03				
443.92	4228.	2.03	1.32	8.257E-03				
488.89	611.	9.84	0.92	7.806E-03				
563.84	421.	15.59	1.31	7.056E-03				
586.21	500.	12.31	1.36	6.832E-03				
678.76	500.	10.32	1.07	5.906E-03				
688.67	965.	7.90	1.30	5.807E-03				
778.97	11853.	1.08	1.56	4.903E-03	778.90	12.970	9.908E-01	Qa779
867.41	3498.	2.55	1.62	4.621E-03				
919.40	421.	11.09	1.33	4.455E-03				
964.05	11725.	1.07	1.76	4.313E-03	964.08	14.500	9.965E-01	Qa964
1005.16	687.	6.31	1.80	4.212E-03				
1085.87	7609.	1.23	1.85	4.013E-03				
1089.85	1315.	4.40	1.85	4.003E-03				
1112.05	9829.	1.16	1.85	3.949E-03				
1212.96	1003.	5.09	2.01	3.700E-03				
1299.21	1086.	3.54	1.77	3.488E-03				
1408.01	12396.	0.92	2.14	3.220E-03	1408.01	20.850	9.814E-01	Qa1408

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:29:54
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124001_QCAsLeft.An1

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide	
158.85	39.68	8178.	7443.	4.303E+05	4.74	1.160	-	s
181.32	45.25	3547.	4007.	2.337E+05	5.26	0.960	-	D
187.39	46.77	5257.	1018.	5.955E+04	21.09	0.961	-	D
1183.04	295.86	1604.	873.	8.425E+04	16.77	1.175	-	
1469.91	367.61	1325.	1598.	1.772E+05	9.78	1.418	-	s
1643.55	411.03	1210.	3451.	4.019E+05	5.08	1.371	-	
1775.09	443.92	1014.	4228.	5.120E+05	4.06	1.324	-	
1954.95	488.89	968.	611.	7.826E+04	19.68	0.924	-	s
2254.71	563.84	1296.	421.	5.966E+04	31.18	1.313	-	s
2344.15	586.21	1058.	500.	7.312E+04	24.61	1.362	-	
2714.38	678.76	747.	500.	8.472E+04	20.64	1.071	-	s
2754.01	688.67	1212.	965.	1.662E+05	15.80	1.296	-	
3469.09	867.41	1146.	3498.	7.568E+05	5.10	1.621	-	
3677.13	919.40	550.	421.	9.449E+04	22.19	1.331	-	
4020.30	1005.16	340.	687.	1.631E+05	12.61	1.802	-	s
4343.30	1085.85	550.	7609.	1.896E+06	2.45	1.850	-	D
4359.24	1089.84	1017.	1315.	3.285E+05	8.80	1.853	-	D
4448.09	1112.05	681.	9829.	2.489E+06	2.32	1.851	-	
4851.98	1212.96	349.	1003.	2.710E+05	10.19	2.007	-	
5197.24	1299.21	99.	1086.	3.114E+05	7.09	1.770	-	

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: QCDDEP.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
QA-122	487.17	121.81	5893.	79044.	131.741	0.79	1.004
Qa-245	978.50	244.71	2785.	16155.	26.926	1.95	1.144
Qa-344	1376.32	344.20	2036.	45589.	75.982	1.01	1.225
Qa-779	3115.25	778.97	1169.	11853.	19.755	2.16	1.558
Qa-964	3855.81	964.05	858.	11725.	19.541	2.14	1.756
Qa-1408	5632.82	1408.01	127.	12396.	20.660	1.85	2.138

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:29:54
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124001_QCAsLeft.An1


 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             uCi           keV     uCi           uCi            COMMENTS
 ____________________________________________________________________________

QA-122       9.8650E-01                                        4.94E+03
                           121.78 9.865E-01  (  2.232E-03 3.97E-01 2.84E+01 G

Qa-245       9.8573E-01                                        4.94E+03
                           244.70 9.857E-01  (  7.502E-03 9.75E-01 7.55E+00 G

Qa-344       9.8485E-01                                        4.94E+03
                           344.28 9.848E-01  (  2.271E-03 5.06E-01 2.66E+01 G

Qa-779       9.9078E-01                                        4.94E+03
                           778.90 9.908E-01  (  6.658E-03 1.08E+00 1.30E+01 G

Qa-964       9.9655E-01                                        4.94E+03
                           964.08 9.965E-01  (  5.802E-03 1.07E+00 1.45E+01 G

Qa-1408      9.8144E-01                                        4.94E+03
                          1408.01 9.814E-01  (  2.078E-03 9.24E-01 2.09E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:29:54
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124001_QCAsLeft.An1

C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
K - Key Line
A - Not in Average
C - Coincidence Peak

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi	Time Corrected Activity uCi	Uncertainty Counting uCi	2 Sigma Total uCi	MDA
QA-122	8.3597E-01	9.8650E-01	7.8334E-03	1.1289E-01	2.232E-03
Qa-245	8.3531E-01	9.8573E-01	1.9213E-02	1.1416E-01	7.502E-03
Qa-344	8.3456E-01	9.8485E-01	9.9580E-03	1.1287E-01	2.271E-03
Qa-779	8.3959E-01	9.9078E-01	2.1416E-02	1.1512E-01	6.658E-03
Qa-964	8.4448E-01	9.9655E-01	2.1340E-02	1.1575E-01	5.802E-03
Qa-1408	8.3168E-01	9.8144E-01	1.8137E-02	1.1350E-01	2.078E-03

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (1112.0 to 2035.0 keV) 5.022E+00 uCi
Total Decayed Activity (1112.0 to 2035.0 keV) 5.9258485E+00 uCi

Analyzed by: _____
Technician

Reviewed by: _____
Supervisor

Laboratory: Curtis & Tompkins HPS Lab

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 1_20140124002_BG
Acquired: 1/24/2014 06:30:37
Detector: HPGE01 50-TP42236A
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.07	1.87	1.94	2.16	2.21	2.28	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:40:43
Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det1\1_20140124002_BG.An1

Acquisition information
       Start time:                 1/24/2014 06:30:37
       Live time:                600
       Real time:                600
       Dead time:                  0.04 %
       Detector ID:                    1

Detector system
     HPGE01 50-TP42236A


Calibration
       Filename:                   1_QC.Clb
     HPGE01 S19582 1_20130619001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:26:40
            Zero offset:           0.000 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.162E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/19/2013 14:52:15
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.01keV )
       Stop channel:            8144 (  2035.50keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:40:43
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysisDDEP.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:40:43
Curtis & Tompkins HPS Lab Spectrum name: 1_20140124002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	5.5055E+00			
Am-241	<	8.4901E-01			
Bi-212	<	2.7134E+01			
Bi-214	<	1.2356E+00			
Co-60	<	1.0994E+00			
Cs-137	<	7.1729E-01			
Eu-152	<	2.6247E+00			
Eu-154	<	6.6384E+00			
K-40	<	1.1471E+01			
Pa-234	<	1.3674E+00			
Pb-212	<	1.2846E+00			
Pb-214	<	1.1412E+00			
Ra-226	<	7.9356E+00			
Th-234	<	8.1896E+00			
Tl-208	<	6.3648E-01			
U-235	<	2.3373E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:40:43
 Curtis & Tompkins HPS Lab       Spectrum name: 1_20140124002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.5 keV)     0.000E+00  DPS

 Analyzed by: ___________________________________________
                    Technician

 Reviewed by: ___________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 2_20140124002_BG
Acquired: 1/24/2014 06:57:19
Detector: HPGE02 50-TP42234A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.02	1.83	1.89	2.11	2.16	2.22	PASS

Analyst: Robin Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 07:07:27
Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det2\2_20140124002_BG.An1

Acquisition information
       Start time:                 1/24/2014 06:57:19
       Live time:                600
       Real time:                601
       Dead time:                  0.09 %
       Detector ID:                    2

Detector system
     HPGE02 50-TP42234A


Calibration
       Filename:                   2_QC.Clb
     HPGE02 S19582 2_20140106001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:52:16
            Zero offset:           0.026 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -5.239E-08 keV/channel^2

       Efficiency Calibration
            Created:               1/6/2014 18:36:56
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    25.06keV )
       Stop channel:            8144 (  2035.12keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 07:07:27
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysisDDEP.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 07:07:27
Curtis & Tompkins HPS Lab Spectrum name: 2_20140124002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	7.0146E+00			
Am-241	<	8.8037E-01			
Bi-212	<	1.7466E+01			
Bi-214	<	3.2232E+00			
Co-60	<	1.0738E+00			
Cs-137	<	1.2236E+00			
Eu-152	<	1.4996E+00			
Eu-154	<	6.5408E+00			
K-40	<	2.4900E+01			
Pa-234	<	1.3895E+00			
Pb-212	<	7.2133E-01			
Pb-214	<	1.1292E+00			
Ra-226	<	2.0917E+01			
Th-234	<	5.9993E+00			
Tl-208	<	8.8791E-01			
U-235	<	4.0971E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 07:07:27
 Curtis & Tompkins HPS Lab       Spectrum name: 2_20140124002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.1 to  2035.1 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 3_20140124002_BG
Acquired: 1/24/2014 06:32:07
Detector: HPGE03 51-TP42227A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	2.01	1.81	1.88	1.93	2.14	2.20	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:42:15
Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det3\3_20140124002_BG.An1

Acquisition information
       Start time:                 1/24/2014 06:32:07
       Live time:                600
       Real time:                601
       Dead time:                  0.09 %
       Detector ID:                    3

Detector system
     HPGE03 51-TP42227A


Calibration
       Filename:                   3_QC.Clb
     HPGE03 S19583 3_20130428001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:28:35
            Zero offset:          -0.141 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.784E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/28/2013 14:09:55
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.88keV )
       Stop channel:            8144 (  2035.17keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:42:15
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysisDDEP.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:42:15
Curtis & Tompkins HPS Lab Spectrum name: 3_20140124002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.2723E+00			
Am-241	<	9.4109E-01			
Bi-212	<	1.0577E+01			
Bi-214	<	1.2779E+00			
Co-60	<	1.1262E+00			
Cs-137	<	1.2834E+00			
Eu-152	<	1.5731E+00			
Eu-154	<	6.8345E+00			
K-40	<	1.1723E+01			
Pa-234	<	3.6077E+00			
Pb-212	<	1.8402E+00			
Pb-214	<	1.6752E+00			
Ra-226	<	8.3127E+00			
Th-234	<	6.4105E+00			
Tl-208	<	6.5858E-01			
U-235	<	6.1312E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:42:15
 Curtis & Tompkins HPS Lab       Spectrum name: 3_20140124002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   24.9 to  2035.2 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 4_20140124002_BG
Acquired: 1/24/2014 06:47:28
Detector: HPGE04 51-TP32733A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.97	1.78	1.84	1.97	2.10	2.17	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:57:36
Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det4\4_20140124002_BG.An1

Acquisition information
       Start time:                 1/24/2014 06:47:28
       Live time:                600
       Real time:                601
       Dead time:                  0.24 %
       Detector ID:                    4

Detector system
     HPGE04 51-TP32733A


Calibration
       Filename:                   4_QC.Clb
     HPGE04 S15983 4_20130304001_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:44:12
            Zero offset:          -0.059 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.146E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/4/2013 19:32:03
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.96keV )
       Stop channel:            8144 (  2035.56keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:57:36
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysisDDEP.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:57:36
Curtis & Tompkins HPS Lab Spectrum name: 4_20140124002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.3643E+00			
Am-241	<	1.1150E+00			
Bi-212	<	1.0788E+01			
Bi-214	<	3.1917E+00			
Co-60	<	1.1576E+00			
Cs-137	<	7.5566E-01			
Eu-152	<	2.7775E+00			
Eu-154	<	7.0096E+00			
K-40	<	1.2028E+01			
Pa-234	<	3.2606E+00			
Pb-212	<	1.3533E+00			
Pb-214	<	3.1948E+00			
Ra-226	<	8.4168E+00			
Th-234	<	1.2416E+01			
Tl-208	<	1.5016E+00			
U-235	<	3.5211E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:57:36
 Curtis & Tompkins HPS Lab       Spectrum name: 4_20140124002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ----------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.6 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins
Hunters Point Lab
Background Check

Spectrum: 5_20140124002_BG
Acquired: 1/24/2014 06:33:35
Detector: HPGE05 51-TP42242A

Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

	Target	L_Ctrl	L_Tol	Measured	H_Tol	H_Ctrl	Results
Bkgd Countrate	1.85	1.64	1.71	1.92	1.99	2.06	PASS

Analyst: Chris Fluty Reviewer:

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:43:43
Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124002_BG.An1

Sample description
     RIB,Background Contamination Check


Spectrum Filename: C:\User\SPC\Det5\5_20140124002_BG.An1

Acquisition information
       Start time:                 1/24/2014 06:33:35
       Live time:                600
       Real time:                600
       Dead time:                  0.05 %
       Detector ID:                    5

Detector system
     HPGE05 51-TP42242A


Calibration
       Filename:                   5_QC.Clb
     HPGE05 S19584 5_20130628002_Energy RA226


       Energy Calibration
            Created:               1/24/2014 06:29:37
            Zero offset:          -0.064 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.688E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/28/2013 18:54:44
            Knee Energy:           0.00 keV
            Above the Knee:        Interpolative    Uncertainty =   0.00 %
            Below the Knee:        Interpolative    Uncertainty =   0.00 %

Library Files
       Main analysis library:      GenericAnalysisDDEP.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.26
       Start channel:            100 (    24.95keV )
       Stop channel:            8144 (  2035.00keV )
       Peak rejection level:      50.000%
       Peak search sensitivity:    1
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Critical level - ORTEC method
       Random error:               1.0000000E+00
       Systematic error:           1.0000000E+00
       Fraction Limit:             0.000%
       Background width:           average of five points.
```

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:43:43
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124002_BG.An1

        Half lives decay limit:    12.000
        Activity range factor:      2.000
        Min. step backg. energy     0.000
        Multiplet shift channel     2.000

 Corrections                          Status          Comments
        Decay correct to date:         NO
        Decay during acquisition:      NO
        Decay during collection:       NO
        True coincidence correction:   NO
        Peaked background correction:  NO
        Absorption (Internal):         NO
        Geometry correction:           NO
        Random summing:                NO


 total peaks alloc.    0 cutoff: 5.00E+01 %

 *****   S U M M A R Y   O F   P E A K S   I N   R A N G E   *****
  Peak       Area   Uncert  FWHM    Corrctn   Nuclide  Brnch.     Act.   Nuc
  Energy                             Factor    Energy   Ratio    DPS
 ____________________________________________________________________________
 No unknown peaks passed sensitivity test.

-------------------------------------------------------------
 This section based on library: GenericAnalysisDDEP.lib


 ************** I D E N T I F I E D   P E A K   S U M M A R Y **************
 Nuclide  Peak    Centroid  Background  Net Area   Intensity   Uncert  FWHM
          Channel Energy    Counts      Counts     Cts/Sec  2 Sigma %  keV
 ____________________________________________________________________________

 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             DPS           keV     DPS           DPS            COMMENTS
 ____________________________________________________________________________
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
```

ORTEC g v - i (1087) Env32 G53W4.26 1/24/2014 06:43:43
Curtis & Tompkins HPS Lab Spectrum name: 5_20140124002_BG.An1

- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- -

********** D I S C A R D E D I S O T O P E P E A K S **********

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count Activity DPS	Uncertainty Counting DPS	2 Sigma Total DPS	MDA
Ac-228	<	3.3073E+00			
Am-241	<	9.1331E-01			
Bi-212	<	1.0775E+01			
Bi-214	<	1.2933E+00			
Co-60	<	1.1403E+00			
Cs-137	<	7.5189E-01			
Eu-152	<	1.5782E+00			
Eu-154	<	1.2008E+01			
K-40	<	1.6846E+01			
Pa-234	<	1.4491E+00			
Pb-212	<	1.7009E+00			
Pb-214	<	1.1886E+00			
Ra-226	<	8.2867E+00			
Th-234	<	6.2252E+00			
Tl-208	<	6.6574E-01			
U-235	<	6.5335E+00			

```
     ORTEC g v - i (1087) Env32  G53W4.26  1/24/2014 06:43:43
 Curtis & Tompkins HPS Lab       Spectrum name: 5_20140124002_BG.An1

   < - MDA value printed.
   A - Activity printed, but activity < MDA.
   B - Activity < MDA and failed test.
   C - Area < Critical level.
   F - Failed fraction or key line test.
   H - Halflife limit exceeded
 ------------------------------   S U M M A R Y   ----------------------------
 Total Activity (   25.0 to  2035.0 keV)     0.000E+00  DPS

 Analyzed by: ____________________________________________
                    Technician

 Reviewed by: ____________________________________________
                    Supervisor

Laboratory:  Curtis & Tompkins HPS Lab
```

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-01	Received:	12/09/13
Lab ID:	251449-001	Prepared:	12/30/13 16:45
Matrix:	Soil	Analyzed:	01/24/14 17:04
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	346.12 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:44		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0545 U	0.169	0.136	
Bismuth-212	0.236 U	0.351	0.264	
Bismuth-214	0.263	0.0709	0.0366	
Cesium-137	0.0109 U	0.0248	0.0192	0.07
Cobalt-60	-0.00660 U	0.0345	0.0277	
Europium-152	0.0297 U	0.0471	0.0504	
Europium-154	0.0901 U	0.186	0.143	
Lead-212	0.267	0.0628	0.0348	
Lead-214	0.282	0.0664	0.0377	
Potassium-40	18.3	1.30	0.206	
Protactinium-234	0.0309 U	0.0698	0.0794	
Radium-226 (By Bismuth-214)	0.263	0.0709	0.0366	0.2
Thallium-208	0.0932	0.0325	0.0172	
Thorium-232 (By Actinium-228)	0.392	0.0979	0.0558	
Thorium-234	0.373 U	0.291	1.19	
Uranium-235	0.0552 U	0.0319	0.144	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-02	Received:	12/09/13
Lab ID:	251449-002	Prepared:	12/30/13 16:47
Matrix:	Soil	Analyzed:	01/24/14 17:04
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	334.81 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:46		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0 U	0.136	0.154	
Bismuth-212	0.0892 U	0.248	0.248	
Bismuth-214	0.220	0.0762	0.0415	
Cesium-137	0.00540 U	0.0222	0.0176	0.07
Cobalt-60	0.00485 U	0.0223	0.0246	
Europium-152	0.0416 U	0.0803	0.0569	
Europium-154	0.0266 U	0.0456	0.165	
Lead-212	0.279	0.0623	0.0346	
Lead-214	0.332	0.0830	0.0447	
Potassium-40	21.4	1.44	0.237	
Protactinium-234	0.0530 U	0.0831	0.0857	
Radium-226 (By Bismuth-214)	0.220	0.0762	0.0415	0.2
Thallium-208	0.110	0.0379	0.0175	
Thorium-232 (By Actinium-228)	0.365	0.0965	0.0521	
Thorium-234	0.226 U	0.316	0.929	
Uranium-235	0.0213 U	0.0206	0.151	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-03	Received:	12/09/13
Lab ID:	251449-003	Prepared:	12/30/13 16:49
Matrix:	Soil	Analyzed:	01/24/14 17:05
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	363 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:49		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00430 U	0.180	0.148	
Bismuth-212	0.447	0.409	0.231	
Bismuth-214	0.181	0.0703	0.0478	
Cesium-137	-0.00290 U	0.0252	0.0205	0.07
Cobalt-60	0.0130 U	0.0310	0.0240	
Europium-152	0.0265 U	0.0586	0.0483	
Europium-154	-0.00590 U	0.0253	0.183	
Lead-212	0.265	0.0695	0.0410	
Lead-214	0.318	0.0819	0.0394	
Potassium-40	22.4	1.41	0.202	
Protactinium-234	0.0161 U	0.116	0.0909	
Radium-226 (By Bismuth-214)	0.181	0.0703	0.0478	0.2
Thallium-208	0.105	0.0356	0.0175	
Thorium-232 (By Actinium-228)	0.304	0.0915	0.0878	
Thorium-234	0.750 U	1.43	1.14	
Uranium-235	0.172	0.151	0.140	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-04	Received:	12/09/13
Lab ID:	251449-004	Prepared:	12/30/13 16:53
Matrix:	Soil	Analyzed:	01/24/14 17:02
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	333.35 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:51		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0481 U	0.162	0.131	
Bismuth-212	0.206 U	0.306	0.246	
Bismuth-214	0.366	0.0998	0.0470	
Cesium-137	-0.00557 U	0.0276	0.0222	0.07
Cobalt-60	-0.000946 U	0.0265	0.0217	
Europium-152	0.0374 U	0.0442	0.0456	
Europium-154	0.0180 U	0.0388	0.134	
Lead-212	0.296	0.0667	0.0373	
Lead-214	0.389	0.0865	0.0409	
Potassium-40	15.2	1.24	0.317	
Protactinium-234	-0.0589 U	0.112	0.0891	
Radium-226 (By Bismuth-214)	0.366	0.0998	0.0470	0.2
Thallium-208	0.140	0.0400	0.0195	
Thorium-232 (By Actinium-228)	0.377	0.102	0.0583	
Thorium-234	0.369 U	0.405	1.02	
Uranium-235	0.0358 U	0.0376	0.101	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-05	Received:	12/09/13
Lab ID:	251449-005	Prepared:	12/30/13 16:56
Matrix:	Soil	Analyzed:	01/24/14 17:01
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	323.67 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:53		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0233 U	0.151	0.123	
Bismuth-212	0.528	0.439	0.246	
Bismuth-214	0.371	0.0948	0.0451	
Cesium-137	0.00438 U	0.0257	0.0207	0.07
Cobalt-60	-0.0154 U	0.0378	0.0295	
Europium-152	0.0121 U	0.0233	0.0582	
Europium-154	0.0314 U	0.0605	0.147	
Lead-212	0.376	0.0700	0.0362	
Lead-214	0.418	0.0920	0.0465	
Potassium-40	16.5	1.27	0.246	
Protactinium-234	0.0565 U	0.118	0.0932	
Radium-226 (By Bismuth-214)	0.371	0.0948	0.0451	0.2
Thallium-208	0.0906	0.0305	0.0170	
Thorium-232 (By Actinium-228)	0.382	0.122	0.0605	
Thorium-234	0.743 U	1.22	0.959	
Uranium-235	0.0733 U	0.151	0.120	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-06	Received:	12/09/13
Lab ID:	251449-006	Prepared:	12/30/13 16:59
Matrix:	Soil	Analyzed:	01/24/14 17:53
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	340.92 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:55		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0836 U	0.160	0.127	
Bismuth-212	0.170 U	0.372	0.234	
Bismuth-214	0.285	0.0750	0.0384	
Cesium-137	0.000335 U	0.0276	0.0227	0.07
Cobalt-60	0.0120 U	0.0214	0.0177	
Europium-152	0.0118 U	0.0278	0.0558	
Europium-154	-0.0193 U	0.215	0.175	
Lead-212	0.271	0.0640	0.0356	
Lead-214	0.339	0.0798	0.0414	
Potassium-40	15.8	1.23	0.227	
Protactinium-234	0.0107 U	0.0506	0.0920	
Radium-226 (By Bismuth-214)	0.285	0.0750	0.0384	0.2
Thallium-208	0.0966	0.0335	0.0199	
Thorium-232 (By Actinium-228)	0.531	0.161	0.0640	
Thorium-234	0.162 U	0.516	1.17	
Uranium-235	0.0273 U	0.0272	0.109	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-07	Received:	12/09/13
Lab ID:	251449-007	Prepared:	12/30/13 17:01
Matrix:	Soil	Analyzed:	01/24/14 17:52
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	339.57 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:57		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0860 U	0.144	0.114	
Bismuth-212	0.361	0.397	0.284	
Bismuth-214	0.385	0.0848	0.0359	
Cesium-137	0.0346	0.0256	0.0171	0.07
Cobalt-60	0.00614 U	0.0312	0.0250	
Europium-152	-0.000532 U	0.00119	0.0678	
Europium-154	0.0465 U	0.0899	0.173	
Lead-212	0.361	0.0661	0.0346	
Lead-214	0.382	0.0884	0.0431	
Potassium-40	17.3	1.30	0.306	
Protactinium-234	0.0157 U	0.0232	0.0783	
Radium-226 (By Bismuth-214)	0.385	0.0848	0.0359	0.2
Thallium-208	0.137	0.0416	0.0214	
Thorium-232 (By Actinium-228)	0.469	0.118	0.0649	
Thorium-234	0.583 U	0.554	0.909	
Uranium-235	0.0648 U	0.0444	0.134	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-08	Received:	12/09/13
Lab ID:	251449-008	Prepared:	12/30/13 17:05
Matrix:	Soil	Analyzed:	01/24/14 17:52
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	330.01 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 13:59		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0374 U	0.137	0.111	
Bismuth-212	0.327	0.332	0.235	
Bismuth-214	0.361	0.0904	0.0442	
Cesium-137	-0.000588 U	0.0292	0.0240	0.07
Cobalt-60	0.00618 U	0.0238	0.0197	
Europium-152	0.0151 U	0.0371	0.0565	
Europium-154	0.0583 U	0.190	0.149	
Lead-212	0.365	0.0680	0.0337	
Lead-214	0.385	0.0855	0.0397	
Potassium-40	16.5	1.29	0.283	
Protactinium-234	0.0126 U	0.0274	0.0852	
Radium-226 (By Bismuth-214)	0.361	0.0904	0.0442	0.2
Thallium-208	0.153	0.0365	0.0144	
Thorium-232 (By Actinium-228)	0.330	0.108	0.0820	
Thorium-234	0.474 U	0.656	1.06	
Uranium-235	0.0992 U	0.182	0.145	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-09	Received:	12/09/13
Lab ID:	251449-009	Prepared:	12/30/13 17:09
Matrix:	Soil	Analyzed:	01/24/14 17:53
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	345.27 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:01		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0343 U	0.153	0.124	
Bismuth-212	0.390	0.402	0.239	
Bismuth-214	0.274	0.0729	0.0417	
Cesium-137	0.0172 U	0.0239	0.0177	0.07
Cobalt-60	0.00430 U	0.0158	0.0225	
Europium-152	0.0174 U	0.0897	0.0458	
Europium-154	-0.0531 U	0.200	0.159	
Lead-212	0.259	0.0634	0.0363	
Lead-214	0.312	0.0762	0.0393	
Potassium-40	19.9	1.36	0.226	
Protactinium-234	0.0496 U	0.0706	0.0766	
Radium-226 (By Bismuth-214)	0.274	0.0729	0.0417	0.2
Thallium-208	0.0853	0.0349	0.0194	
Thorium-232 (By Actinium-228)	0.398	0.123	0.0551	
Thorium-234	0.130 U	0.334	1.04	
Uranium-235	0.112 U	0.147	0.114	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-10	Received:	12/09/13
Lab ID:	251449-010	Prepared:	12/30/13 17:12
Matrix:	Soil	Analyzed:	01/24/14 18:44
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	327.83 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:03		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00612 U	0.164	0.135	
Bismuth-212	0.142 U	0.371	0.291	
Bismuth-214	0.323	0.0818	0.0382	
Cesium-137	0.00254 U	0.0232	0.0188	0.07
Cobalt-60	0.0102 U	0.0228	0.0235	
Europium-152	0.0175 U	0.0226	0.0664	
Europium-154	0.0103 U	0.0269	0.149	
Lead-212	0.343	0.0699	0.0379	
Lead-214	0.390	0.101	0.0481	
Potassium-40	16.9	1.34	0.354	
Protactinium-234	0.0251 U	0.0454	0.0962	
Radium-226 (By Bismuth-214)	0.323	0.0818	0.0382	0.2
Thallium-208	0.141	0.0426	0.0208	
Thorium-232 (By Actinium-228)	0.483	0.146	0.0593	
Thorium-234	0.590 U	1.22	0.969	
Uranium-235	0.0418 U	0.0395	0.125	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-11	Received:	12/09/13
Lab ID:	251449-011	Prepared:	12/30/13 17:14
Matrix:	Soil	Analyzed:	01/24/14 18:47
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	356.36 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:06		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.133 U	0.174	0.136	
Bismuth-212	0.446	0.350	0.215	
Bismuth-214	0.383	0.0973	0.0462	
Cesium-137	-0.00739 U	0.0221	0.0173	0.07
Cobalt-60	0.0107 U	0.0200	0.0228	
Europium-152	0.0333 U	0.0496	0.0496	
Europium-154	0.0127 U	0.0604	0.148	
Lead-212	0.313	0.0644	0.0349	
Lead-214	0.437	0.0816	0.0368	
Potassium-40	18.8	1.30	0.181	
Protactinium-234	-0.0573 U	0.111	0.0890	
Radium-226 (By Bismuth-214)	0.383	0.0973	0.0462	0.2
Thallium-208	0.126	0.0443	0.0205	
Thorium-232 (By Actinium-228)	0.331	0.106	0.0506	
Thorium-234	0.376 U	1.36	1.10	
Uranium-235	0.0394 U	0.0322	0.135	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-12	Received:	12/09/13
Lab ID:	251449-012	Prepared:	12/30/13 17:17
Matrix:	Soil	Analyzed:	01/24/14 18:47
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	343.45 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:08		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0414 U	0.155	0.125	
Bismuth-212	0.564	0.365	0.185	
Bismuth-214	0.290	0.0758	0.0386	
Cesium-137	-0.00497 U	0.0256	0.0206	0.07
Cobalt-60	0.000377 U	0.0267	0.0220	
Europium-152	0.0257 U	0.0386	0.0482	
Europium-154	0.0234 U	0.0598	0.197	
Lead-212	0.263	0.0683	0.0398	
Lead-214	0.364	0.0676	0.0370	
Potassium-40	16.6	1.24	0.207	
Protactinium-234	0.0529 U	0.0774	0.0767	
Radium-226 (By Bismuth-214)	0.290	0.0758	0.0386	0.2
Thallium-208	0.119	0.0328	0.0140	
Thorium-232 (By Actinium-228)	0.300	0.0965	0.0762	
Thorium-234	0.892 U	1.35	1.07	
Uranium-235	-0.0879 U	0.171	0.136	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-13	Received:	12/09/13
Lab ID:	251449-013	Prepared:	12/30/13 17:20
Matrix:	Soil	Analyzed:	01/24/14 18:46
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	334.92 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:11		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0440 U	0.188	0.152	
Bismuth-212	0.414	0.436	0.266	
Bismuth-214	0.279	0.0808	0.0439	
Cesium-137	0.00562 U	0.0220	0.0174	0.07
Cobalt-60	0.00137 U	0.0327	0.0268	
Europium-152	0.00566 U	0.00848	0.0722	
Europium-154	0.0131 U	0.0269	0.164	
Lead-212	0.294	0.0664	0.0372	
Lead-214	0.309	0.0885	0.0452	
Potassium-40	20.3	1.44	0.315	
Protactinium-234	0.0626 U	0.124	0.0865	
Radium-226 (By Bismuth-214)	0.279	0.0808	0.0439	0.2
Thallium-208	0.107	0.0328	0.0157	
Thorium-232 (By Actinium-228)	0.352	0.0908	0.0545	
Thorium-234	0.493 U	0.321	1.25	
Uranium-235	0.0317 U	0.0492	0.0921	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-14	Received:	12/09/13
Lab ID:	251449-014	Prepared:	12/30/13 17:22
Matrix:	Soil	Analyzed:	01/24/14 18:44
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	306.02 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:13		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0290 U	0.163	0.132	
Bismuth-212	0.369	0.477	0.299	
Bismuth-214	0.332	0.0900	0.0429	
Cesium-137	0.0146 U	0.0235	0.0175	0.07
Cobalt-60	0.00100 U	0.0315	0.0258	
Europium-152	0.0205 U	0.0496	0.0601	
Europium-154	0.0182 U	0.0392	0.183	
Lead-212	0.275	0.0593	0.0301	
Lead-214	0.311	0.0826	0.0442	
Potassium-40	18.0	1.39	0.288	
Protactinium-234	0.0478 U	0.102	0.0956	
Radium-226 (By Bismuth-214)	0.332	0.0900	0.0429	0.2
Thallium-208	0.0767	0.0359	0.0196	
Thorium-232 (By Actinium-228)	0.226	0.115	0.0843	
Thorium-234	1.08	1.21	0.933	
Uranium-235	0.0199 U	0.0292	0.119	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-15	Received:	12/09/13
Lab ID:	251449-015	Prepared:	12/30/13 17:25
Matrix:	Soil	Analyzed:	01/24/14 19:36
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	329.98 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:15		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0165 U	0.185	0.152	
Bismuth-212	0.383	0.333	0.227	
Bismuth-214	0.289	0.0737	0.0379	
Cesium-137	-0.00640 U	0.0247	0.0197	0.07
Cobalt-60	0.0101 U	0.0302	0.0236	
Europium-152	0.00544 U	0.0659	0.0538	
Europium-154	-0.00869 U	0.0338	0.175	
Lead-212	0.286	0.0694	0.0388	
Lead-214	0.422	0.0996	0.0450	
Potassium-40	17.5	1.33	0.262	
Protactinium-234	-0.0488 U	0.119	0.0957	
Radium-226 (By Bismuth-214)	0.289	0.0737	0.0379	0.2
Thallium-208	0.124	0.0355	0.0158	
Thorium-232 (By Actinium-228)	0.438	0.108	0.0652	
Thorium-234	0.534 U	0.652	1.16	
Uranium-235	0.168	0.154	0.129	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-16	Received:	12/09/13
Lab ID:	251449-016	Prepared:	12/30/13 17:28
Matrix:	Soil	Analyzed:	01/24/14 19:35
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	306.6 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:18		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0555 U	0.178	0.144	
Bismuth-212	0.346	0.447	0.271	
Bismuth-214	0.360	0.0937	0.0456	
Cesium-137	-0.000375 U	0.0276	0.0227	0.07
Cobalt-60	0.000361 U	0.0339	0.0279	
Europium-152	0.0205 U	0.0534	0.0534	
Europium-154	0.0125 U	0.0365	0.172	
Lead-212	0.302	0.0675	0.0372	
Lead-214	0.375	0.0880	0.0478	
Potassium-40	16.0	1.32	0.290	
Protactinium-234	0.0519 U	0.0836	0.0784	
Radium-226 (By Bismuth-214)	0.360	0.0937	0.0456	0.2
Thallium-208	0.106	0.0352	0.0166	
Thorium-232 (By Actinium-228)	0.363	0.104	0.0492	
Thorium-234	0.223 U	1.31	1.07	
Uranium-235	0.0343 U	0.0287	0.158	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-17	Received:	12/09/13
Lab ID:	251449-017	Prepared:	12/30/13 17:31
Matrix:	Soil	Analyzed:	01/24/14 19:37
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	352.28 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:20		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0852 U	0.186	0.149	
Bismuth-212	0.395	0.353	0.249	
Bismuth-214	0.312	0.0858	0.0442	
Cesium-137	-0.00951 U	0.0267	0.0210	0.07
Cobalt-60	-0.00206 U	0.0288	0.0235	
Europium-152	0.0335 U	0.0511	0.0412	
Europium-154	0.00657 U	0.0156	0.173	
Lead-212	0.300	0.0664	0.0366	
Lead-214	0.340	0.0779	0.0399	
Potassium-40	19.1	1.33	0.208	
Protactinium-234	-0.0593 U	0.117	0.0938	
Radium-226 (By Bismuth-214)	0.312	0.0858	0.0442	0.2
Thallium-208	0.121	0.0347	0.0156	
Thorium-232 (By Actinium-228)	0.362	0.113	0.0752	
Thorium-234	0.514 U	0.462	1.28	
Uranium-235	0.103 U	0.161	0.127	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-18	Received:	12/09/13
Lab ID:	251449-018	Prepared:	12/30/13 17:34
Matrix:	Soil	Analyzed:	01/24/14 19:37
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	343.7 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:23		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.174	0.148	0.110	
Bismuth-212	0.234 U	0.435	0.300	
Bismuth-214	0.326	0.0878	0.0444	
Cesium-137	0.00578 U	0.0253	0.0203	0.07
Cobalt-60	0.0121 U	0.0230	0.0204	
Europium-152	0.0369 U	0.0337	0.0576	
Europium-154	-0.00665 U	0.0209	0.163	
Lead-212	0.271	0.0567	0.0303	
Lead-214	0.356	0.0775	0.0379	
Potassium-40	15.9	1.22	0.214	
Protactinium-234	-0.00910 U	0.104	0.0854	
Radium-226 (By Bismuth-214)	0.326	0.0878	0.0444	0.2
Thallium-208	0.0926	0.0322	0.0188	
Thorium-232 (By Actinium-228)	0.429	0.130	0.0502	
Thorium-234	-0.349 U	1.37	1.11	
Uranium-235	0.0369 U	0.0312	0.129	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-19	Received:	12/09/13
Lab ID:	251449-019	Prepared:	12/30/13 17:36
Matrix:	Soil	Analyzed:	01/24/14 20:27
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.76 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:25		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.000351 U	0.159	0.131	
Bismuth-212	0.361	0.410	0.237	
Bismuth-214	0.246	0.0739	0.0460	
Cesium-137	-0.000156 U	0.0235	0.0194	0.07
Cobalt-60	-0.000102 U	0.0325	0.0267	
Europium-152	0.0404 U	0.0665	0.0492	
Europium-154	0.0383 U	0.0955	0.143	
Lead-212	0.330	0.0606	0.0315	
Lead-214	0.334	0.0715	0.0369	
Potassium-40	17.6	1.36	0.304	
Protactinium-234	0.0245 U	0.0434	0.101	
Radium-226 (By Bismuth-214)	0.246	0.0739	0.0460	0.2
Thallium-208	0.119	0.0377	0.0181	
Thorium-232 (By Actinium-228)	0.457	0.120	0.0321	
Thorium-234	0.874	0.611	0.847	
Uranium-235	0.0391 U	0.0290	0.130	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-20	Received:	12/09/13
Lab ID:	251449-020	Prepared:	12/30/13 17:38
Matrix:	Soil	Analyzed:	01/24/14 20:28
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.16 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g
Sampled:	11/29/13 14:27		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0171 U	0.136	0.111	
Bismuth-212	0.339	0.429	0.267	
Bismuth-214	0.415	0.0861	0.0362	
Cesium-137	-0.00723 U	0.0289	0.0231	0.07
Cobalt-60	-0.0124 U	0.0326	0.0254	
Europium-152	0.0360 U	0.0644	0.0578	
Europium-154	0.0297 U	0.0331	0.179	
Lead-212	0.457	0.0741	0.0377	
Lead-214	0.500	0.0983	0.0455	
Potassium-40	14.7	1.25	0.369	
Protactinium-234	0.0780	0.0985	0.0686	
Radium-226 (By Bismuth-214)	0.415	0.0861	0.0362	0.2
Thallium-208	0.110	0.0381	0.0209	
Thorium-232 (By Actinium-228)	0.409	0.128	0.0796	
Thorium-234	0.200 U	0.433	1.12	
Uranium-235	0.0429 U	0.0352	0.151	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-21	Received:	12/09/13
Lab ID:	251449-021	Prepared:	12/30/13 17:41
Matrix:	Soil	Analyzed:	01/24/14 20:26
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	335.96 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:26		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0138 U	0.209	0.172	
Bismuth-212	0.801	0.313	0.107	
Bismuth-214	0.250	0.0685	0.0355	
Cesium-137	0.00624 U	0.0278	0.0223	0.07
Cobalt-60	-0.00457 U	0.0349	0.0282	
Europium-152	0.0174 U	0.0375	0.0636	
Europium-154	0.0336 U	0.0559	0.159	
Lead-212	0.293	0.0675	0.0367	
Lead-214	0.286	0.0775	0.0428	
Potassium-40	23.3	1.50	0.219	
Protactinium-234	0.0567 U	0.0665	0.0966	
Radium-226 (By Bismuth-214)	0.250	0.0685	0.0355	0.2
Thallium-208	0.0925	0.0333	0.0201	
Thorium-232 (By Actinium-228)	0.239	0.118	0.0901	
Thorium-234	0 U	0.637	1.34	
Uranium-235	0.0411 U	0.0504	0.140	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-22	Received:	12/09/13
Lab ID:	251449-022	Prepared:	12/30/13 17:47
Matrix:	Soil	Analyzed:	01/24/14 20:26
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	339.12 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:29		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0000919 U	0.180	0.148	
Bismuth-212	0 U	0.346	0.231	
Bismuth-214	0.247	0.0889	0.0481	
Cesium-137	0.000768 U	0.0234	0.0192	0.07
Cobalt-60	-0.00856 U	0.0304	0.0239	
Europium-152	0.0204 U	0.0741	0.0482	
Europium-154	0.0181 U	0.0406	0.146	
Lead-212	0.311	0.0683	0.0368	
Lead-214	0.313	0.0852	0.0418	
Potassium-40	22.1	1.45	0.239	
Protactinium-234	0.0314 U	0.0584	0.0867	
Radium-226 (By Bismuth-214)	0.247	0.0889	0.0481	0.2
Thallium-208	0.0987	0.0423	0.0232	
Thorium-232 (By Actinium-228)	0.287	0.109	0.0846	
Thorium-234	0.0428 U	0.213	1.16	
Uranium-235	0.0423 U	0.0296	0.129	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-23	Received:	12/09/13
Lab ID:	251449-023	Prepared:	12/30/13 17:50
Matrix:	Soil	Analyzed:	01/24/14 20:28
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	301.52 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:32		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0290 U	0.116	0.0930	
Bismuth-212	0.266 U	0.467	0.314	
Bismuth-214	0.387	0.0830	0.0342	
Cesium-137	-0.00439 U	0.0220	0.0175	0.07
Cobalt-60	0.00403 U	0.0191	0.0258	
Europium-152	0.0139 U	0.0389	0.0611	
Europium-154	0.00184 U	0.0351	0.168	
Lead-212	0.338	0.0739	0.0392	
Lead-214	0.413	0.0881	0.0415	
Potassium-40	14.5	1.25	0.280	
Protactinium-234	-0.0963 U	0.132	0.104	
Radium-226 (By Bismuth-214)	0.387	0.0830	0.0342	0.2
Thallium-208	0.0993	0.0372	0.0199	
Thorium-232 (By Actinium-228)	0.424	0.116	0.0743	
Thorium-234	0.789 U	1.33	1.05	
Uranium-235	0.0632 U	0.0339	0.161	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-24	Received:	12/09/13
Lab ID:	251449-024	Prepared:	12/30/13 17:55
Matrix:	Soil	Analyzed:	01/24/14 21:18
Units:	pCi/g	Duration (sec):	2,700
Basis:	dry	Sample Amount:	354.56 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g
Sampled:	12/08/13 10:35		

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	0.0723 U	0.169	0.135	
Bismuth-212	0.403	0.353	0.255	
Bismuth-214	0.445	0.0937	0.0457	
Cesium-137	-0.00417 U	0.0259	0.0210	0.07
Cobalt-60	0.00788 U	0.0230	0.0177	
Europium-152	0.0557	0.0762	0.0502	
Europium-154	0 U	0.176	0.209	
Lead-212	0.417	0.0768	0.0412	
Lead-214	0.574	0.0868	0.0440	
Potassium-40	17.2	1.24	0.203	
Protactinium-234	0.0325 U	0.0738	0.0911	
Radium-226 (By Bismuth-214)	0.445	0.0937	0.0457	0.2
Thallium-208	0.172	0.0428	0.0210	
Thorium-232 (By Actinium-228)	0.590	0.120	0.0726	
Thorium-234	0.533 U	0.710	1.23	
Uranium-235	0.0772 U	0.0324	0.134	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Type:	BLANK	Prepared:	12/30/13 14:40
Lab ID:	QC723787	Analyzed:	01/24/14 11:49
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	323.66 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207004	Uncert. Units:	pCi/g

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.00118 U	0.0988	0.0813	
Bismuth-212	0.000310 U	0.241	0.198	
Bismuth-214	-0.0112 U	0.0640	0.0381	
Cesium-137	0.00476 U	0.0133	0.00993	0.07
Cobalt-60	0.00155 U	0.0166	0.0133	
Europium-152	0.0202 U	0.0363	0.0261	
Europium-154	0.0192 U	0.108	0.0843	
Lead-212	-0.00751 U	0.195	0.0221	
Lead-214	-0.0252 U	0.473	0.0390	
Potassium-40	-0.0685 U	0.389	0.256	
Protactinium-234	0.00662 U	0.0512	0.0380	
Radium-226 (By Bismuth-214)	-0.0112 U	0.0640	0.0381	0.2
Thallium-208	-0.00422 U	0.0333	0.0163	
Thorium-232 (By Actinium-228)	0.0202 U	0.0655	0.0504	
Thorium-234	0 U	0.629	0.680	
Uranium-235	0.0620 U	0.101	0.0775	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Analyte:	Radium-226 (By Bismuth-214)	Prepared:	12/30/13 14:35
Type:	LCS	Analyzed:	01/24/14 14:28
Lab ID:	QC723788	Duration (sec):	2,700
Matrix:	Soil	Sample Amount:	330.03 g
Units:	pCi/g	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207004		

Spiked	Result	Uncert	%REC	Limits
13.00	11.91	0.4090	92	75-125

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0034-07	Sampled:	11/29/13 13:57
Type:	IDUP	Received:	12/09/13
MSS Lab ID:	251449-007	Prepared:	12/30/13 17:01
Lab ID:	QC723789	Analyzed:	01/24/14 19:35
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	339.57 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207004		

Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	0.08599 U	0.1445	0.004416 U	0.1359	0.1117		NC	40	NC	1
Bismuth-212	0.3612	0.3970	0.06201 U	0.3130	0.2748		NC	40	NC	1
Bismuth-214	0.3854	0.08694	0.3253	0.08241	0.04163		17	40	0.355	1
Cesium-137	0.03459	0.02569	0.01683 U	0.02593	0.01952	0.07	NC	40	NC	1
Cobalt-60	0.006142 U	0.03122	0.0009373 U	0.02375	0.01942		NC	40	NC	1
Europium-152	-0.0005315 U	0.001189	0.01826 U	0.05569	0.05214		NC	40	NC	1
Europium-154	0.04646 U	0.08996	-0.004395 U	0.01247	0.1595		NC	40	NC	1
Lead-212	0.3606	0.07116	0.3876	0.07464	0.03532		7	40	0.185	1
Lead-214	0.3824	0.09048	0.4559	0.09700	0.04196		18	40	0.392	1
Potassium-40	17.34	1.566	17.30	1.568	0.3165		0	40	0.011	1
Protactinium-234	0.01568 U	0.02349	0.004751 U	0.08445	0.06927		NC	40	NC	1
Radium-226 (By Bismuth-214)	0.3854	0.08694	0.3253	0.08241	0.04163	0.2	17	20	0.355	1
Thallium-208	0.1367	0.04260	0.1545	0.04035	0.01760		12	40	0.215	1
Thorium-232 (By Actinium-228)	0.4692	0.1227	0.3432	0.1132	0.08242		31	40	0.534	1
Thorium-234	0.5834 U	0.5567	0.8338 U	0.5018	0.8599		NC	40	NC	1
Uranium-235	0.06481 U	0.04458	0.01795 U	0.02481	0.1404		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Type:	BLANK	Prepared:	12/30/13 14:40
Lab ID:	QC723801	Analyzed:	01/24/14 15:21
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	323.66 g
Diln Fac:	1.000	Uncert. Sigma:	2
Batch#:	207008	Uncert. Units:	pCi/g

Analyte	Result	Uncert	MDA	Project MDA
Americium-241	-0.0217 U	0.0855	0.0679	
Bismuth-212	0.100 U	0.180	0.144	
Bismuth-214	-0.0144 U	0.0774	0.0393	
Cesium-137	0 U	0.00333	0.0138	0.07
Cobalt-60	0.000975 U	0.0167	0.0136	
Europium-152	0.00723 U	0.0313	0.0453	
Europium-154	0.00321 U	0.0408	0.114	
Lead-212	-0.00760 U	0.110	0.0242	
Lead-214	0.00745 U	0.0376	0.0334	
Potassium-40	-0.0864 U	0.444	0.260	
Protactinium-234	0.00297 U	0.0130	0.0533	
Radium-226 (By Bismuth-214)	-0.0144 U	0.0774	0.0393	0.2
Thallium-208	-0.00747 U	0.149	0.0157	
Thorium-232 (By Actinium-228)	0.0237 U	0.0305	0.0463	
Thorium-234	0.242 U	0.653	0.509	
Uranium-235	0.0626	0.0799	0.0609	

U= Not Detected
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Analyte:	Radium-226 (By Bismuth-214)	Prepared:	12/30/13 14:35
Type:	LCS	Analyzed:	01/24/14 10:56
Lab ID:	QC723802	Duration (sec):	2,700
Matrix:	Soil	Sample Amount:	330.03 g
Units:	pCi/g	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207008		

Spiked	Result	Uncert	%REC	Limits
13.00	11.28	0.3906	87	75-125

Curtis & Tompkins, Ltd.

Batch QC Report

Gamma Radioactivity in Soil (Ingrowth)

Lab #:	251449	Location:	HPNS Parcel D-1
Client:	Innovative Technical Solutions,Inc.	Prep:	GS 186/RA226 Prep
Project#:	07204.0004	Analysis:	DOE HASL 300 4.5.2.3
Field ID:	04-PD-D0039-21	Sampled:	12/07/13 09:30
Type:	IDUP	Received:	12/09/13
MSS Lab ID:	251445-021	Prepared:	12/30/13 16:30
Lab ID:	QC723803	Analyzed:	01/24/14 17:54
Matrix:	Soil	Duration (sec):	2,700
Units:	pCi/g	Sample Amount:	372.95 g
Basis:	dry	Uncert. Sigma:	2
Diln Fac:	1.000	Uncert. Units:	pCi/g
Batch#:	207008		

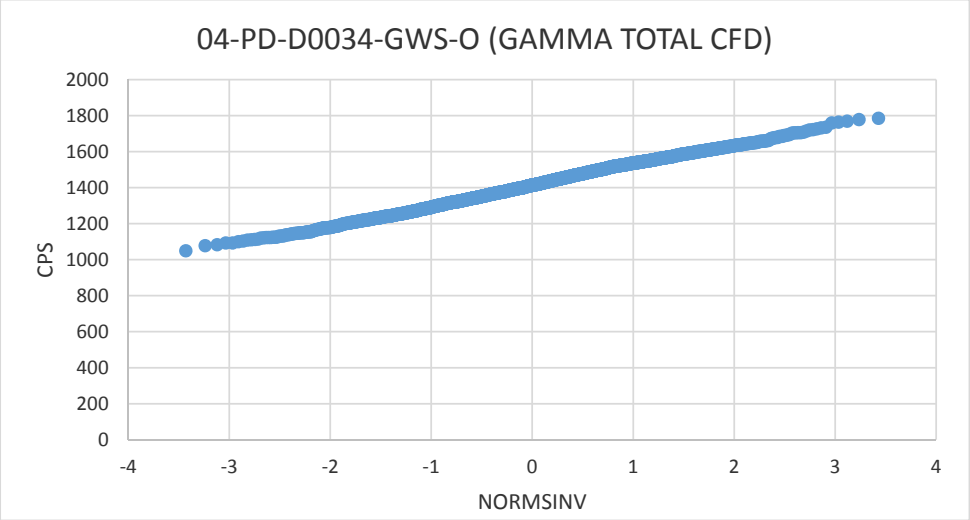
Analyte	MSS Result	MSS TPU	Result	TPU	MDA	Project MDA	RPD	Lim	RER	Lim
Americium-241	-0.03894 U	0.1931	-0.02823 U	0.1927	0.1574		NC	40	NC	1
Bismuth-212	0.3559	0.4154	0.3295	0.4371	0.2576		8	40	0.031	1
Bismuth-214	0.4186	0.08173	0.3309	0.08251	0.03892		23	40	0.534	1
Cesium-137	0.01149 U	0.02438	-0.002224 U	0.02514	0.02050	0.07	NC	40	NC	1
Cobalt-60	-0.001389 U	0.02383	0.005488 U	0.01642	0.01894		NC	40	NC	1
Europium-152	0.04649 U	0.06302	-0.001255 U	0.002634	0.05823		NC	40	NC	1
Europium-154	-0.06683 U	0.2055	-0.05958 U	0.2050	0.1627		NC	40	NC	1
Lead-212	0.3655	0.07947	0.3206	0.07461	0.03934		13	40	0.291	1
Lead-214	0.4609	0.07936	0.3879	0.08356	0.04190		17	40	0.448	1
Potassium-40	14.61	1.338	14.87	1.353	0.1724		2	40	0.094	1
Protactinium-234	0.03312 U	0.07586	-0.002414 U	0.1097	0.09027		NC	40	NC	1
Radium-226 (By Bismuth-214)	0.4186	0.08173	0.3309	0.08251	0.03892	0.2	23	20	0.534	1
Thallium-208	0.1028	0.03195	0.1372	0.03802	0.01791		29	40	0.491	1
Thorium-232 (By Actinium-228)	0.4068	0.1137	0.4452	0.1171	0.05183		9	40	0.166	1
Thorium-234	1.277	1.559	0.1156 U	0.1016	1.342		NC	40	NC	1
Uranium-235	0.03961 U	0.03483	0.07305 U	0.04235	0.1426		NC	40	NC	1

U= Not Detected
NC= Not Calculated
MDA= estimate of the measured concentration that gives 99% confidence the analyte is present
RER= Relative Error Ratio
RPD= Relative Percent Difference
TPU= Total Propagated Uncertainty

04-PD-D0034-GWS-O_PROCESSED

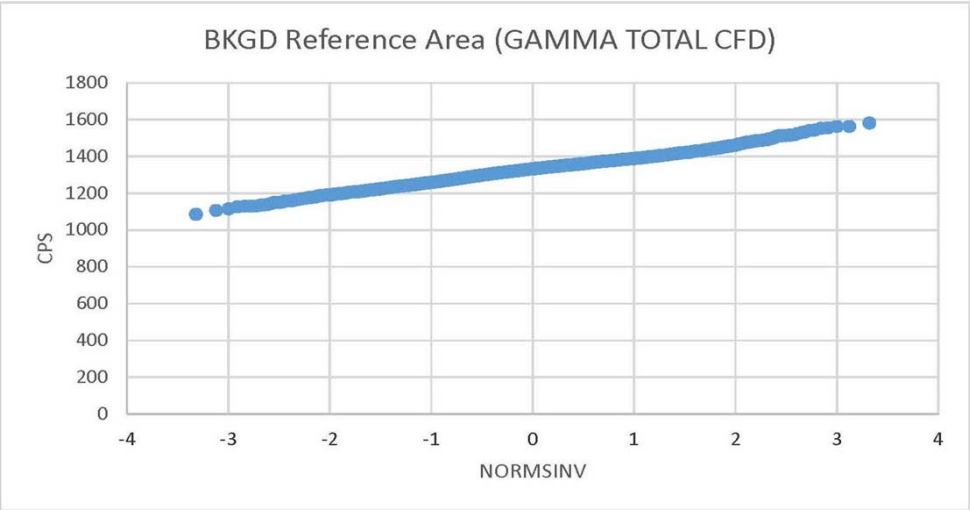
GWS SUMMARY STATISTICS

Statistical Parameter	Results (cps)
Mean	1412
Median	1412
Mode	1412
Low CPS	1048
High CPS	1784
Range	736
Standard Deviation	117
# of Data Points	3316

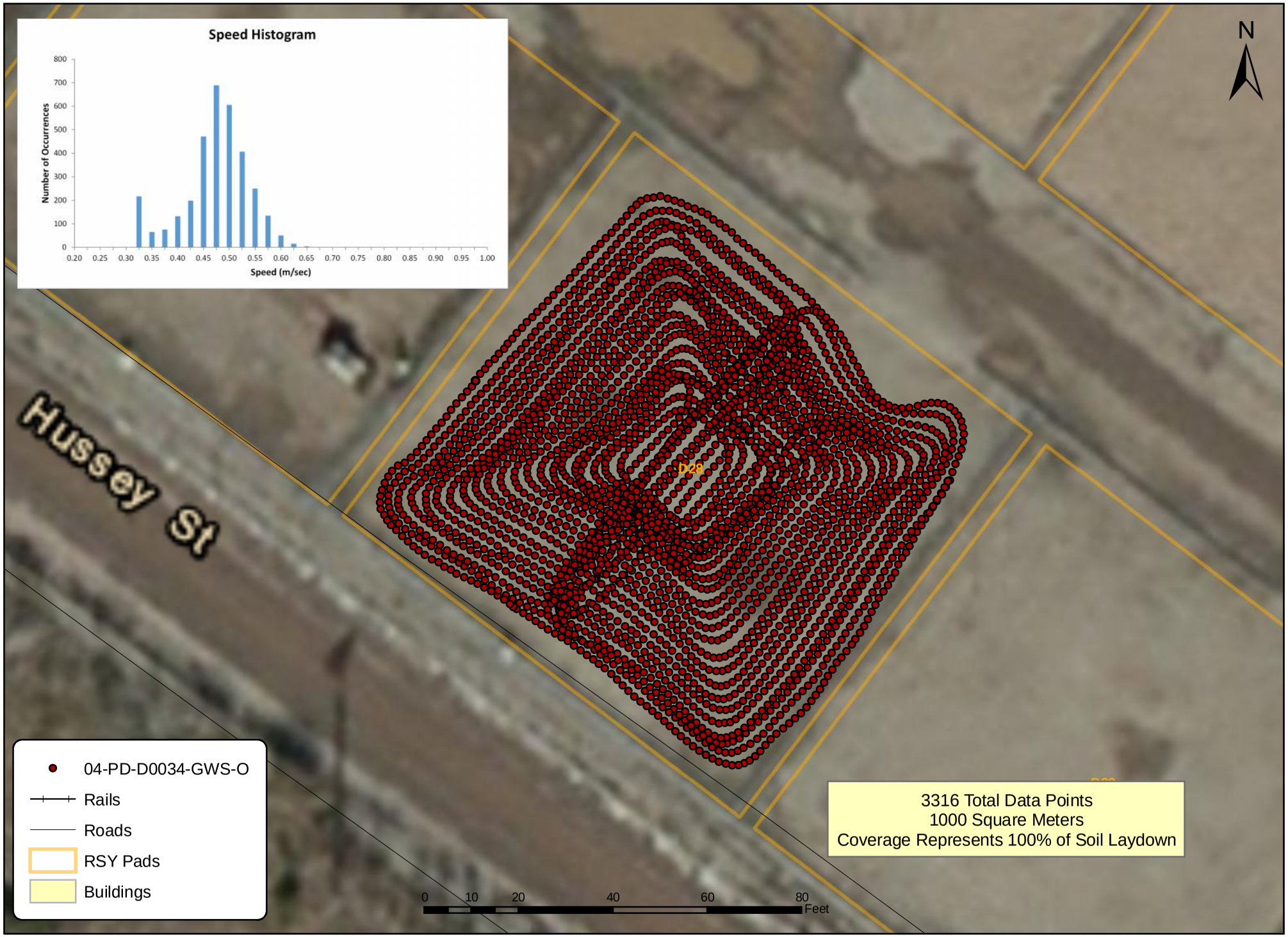


BACKGROUND REFERENCE AREA SUMMARY STATISTICS

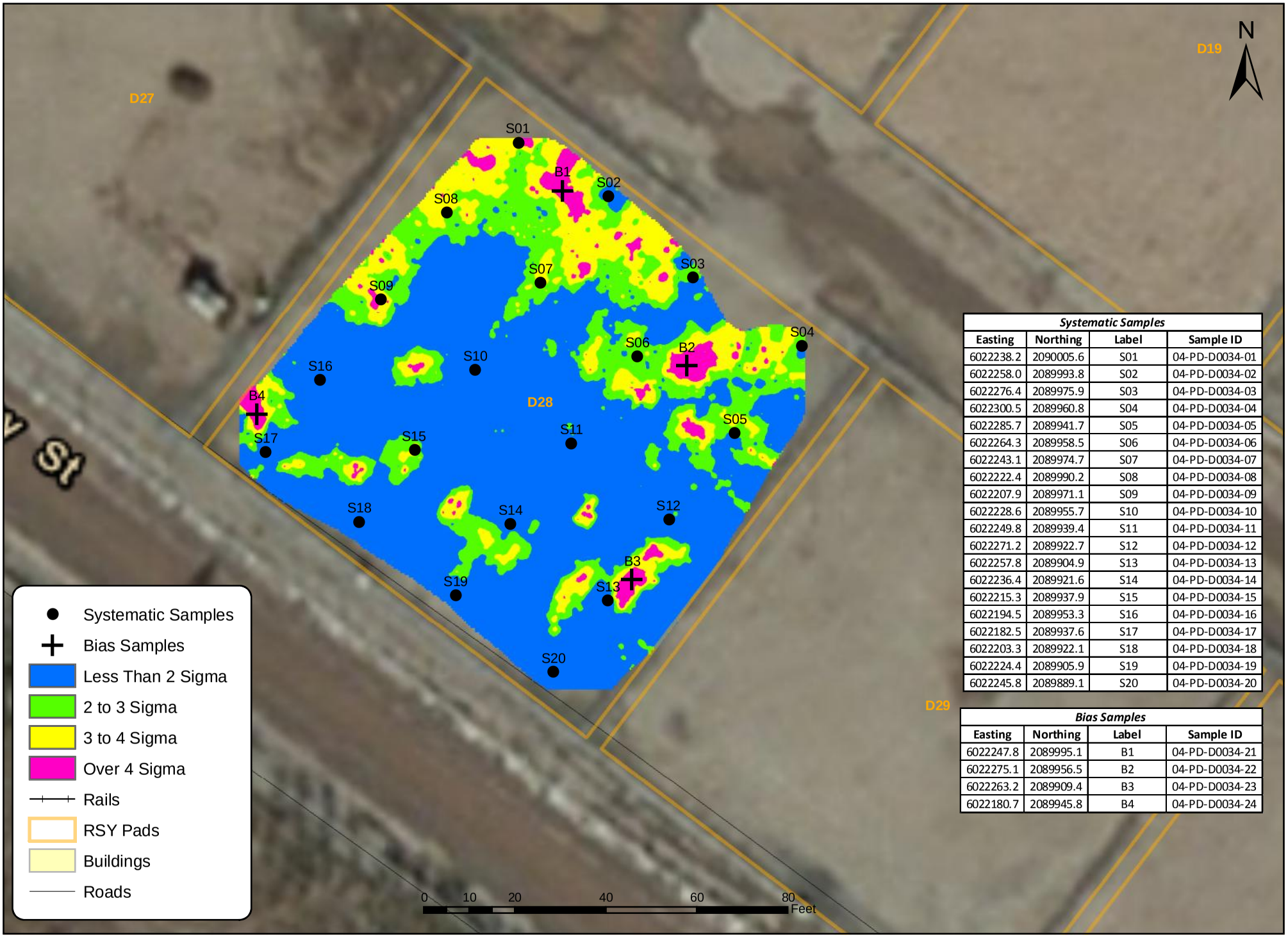
Statistical Parameter	Results (cps)
Mean (BKGD Reference)	1328
Median (BKGD Reference)	1332
Mode (BKGD Reference)	1292
Low CPS (BKGD Reference)	1085
High CPS (BKGD Reference)	1581
Range (BKGD Reference)	496
Standard Deviation (BKGD Reference)	67



04-PD-D0034-GWS-O
Coverage Area



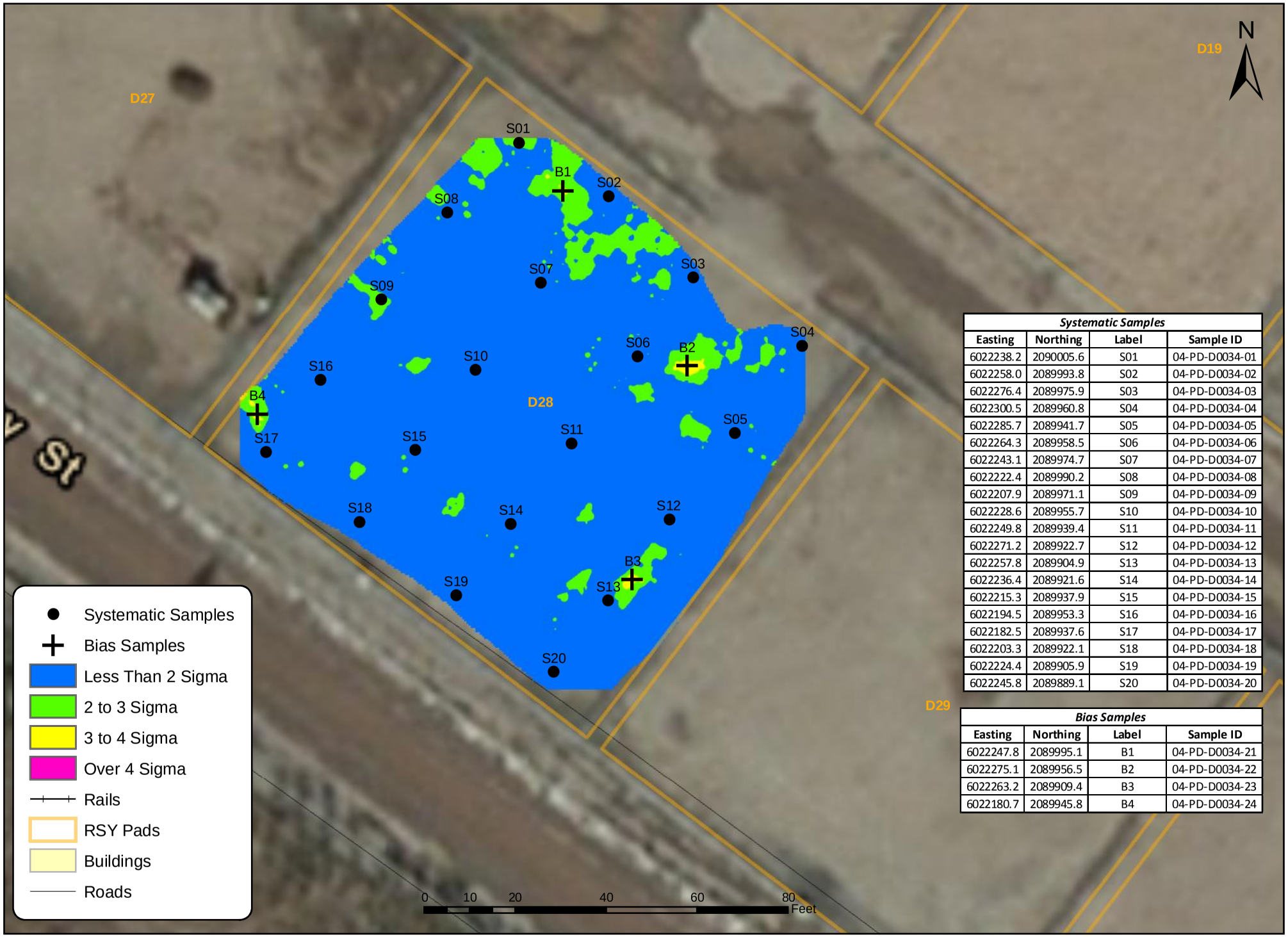
04-PD-D0034-GWS-O
Sample Locations / Background Area Sigma Values



Systematic Samples			
Easting	**Northing**	**Label**	**Sample ID**
6022238.2	2090005.6	S01	04-PD-D0034-01
6022258.0	2089993.8	S02	04-PD-D0034-02
6022276.4	2089975.9	S03	04-PD-D0034-03
6022300.5	2089960.8	S04	04-PD-D0034-04
6022285.7	2089941.7	S05	04-PD-D0034-05
6022264.3	2089958.5	S06	04-PD-D0034-06
6022243.1	2089974.7	S07	04-PD-D0034-07
6022222.4	2089990.2	S08	04-PD-D0034-08
6022207.9	2089971.1	S09	04-PD-D0034-09
6022228.6	2089955.7	S10	04-PD-D0034-10
6022249.8	2089939.4	S11	04-PD-D0034-11
6022271.2	2089922.7	S12	04-PD-D0034-12
6022257.8	2089904.9	S13	04-PD-D0034-13
6022236.4	2089921.6	S14	04-PD-D0034-14
6022215.3	2089937.9	S15	04-PD-D0034-15
6022194.5	2089953.3	S16	04-PD-D0034-16
6022182.5	2089937.6	S17	04-PD-D0034-17
6022203.3	2089922.1	S18	04-PD-D0034-18
6022224.4	2089905.9	S19	04-PD-D0034-19
6022245.8	2089889.1	S20	04-PD-D0034-20

Bias Samples			
Easting	**Northing**	**Label**	**Sample ID**
6022247.8	2089995.1	B1	04-PD-D0034-21
6022275.1	2089956.5	B2	04-PD-D0034-22
6022263.2	2089909.4	B3	04-PD-D0034-23
6022180.7	2089945.8	B4	04-PD-D0034-24

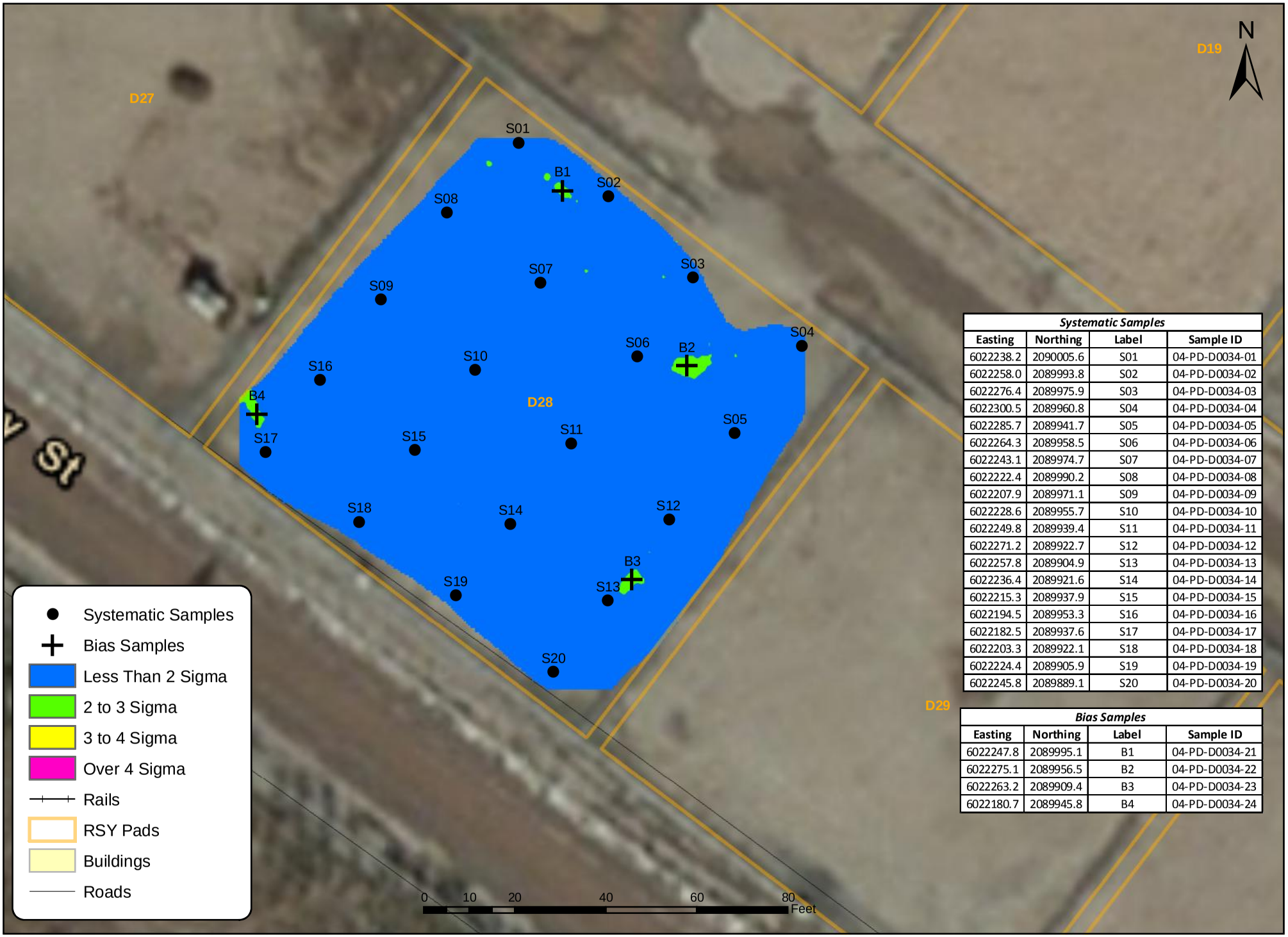
04-PD-D0034-GWS-O
Sample Locations / Combined Areas Sigma Values



Systematic Samples			
Easting	**Northing**	**Label**	**Sample ID**
6022238.2	2090005.6	S01	04-PD-D0034-01
6022258.0	2089993.8	S02	04-PD-D0034-02
6022276.4	2089975.9	S03	04-PD-D0034-03
6022300.5	2089960.8	S04	04-PD-D0034-04
6022285.7	2089941.7	S05	04-PD-D0034-05
6022264.3	2089958.5	S06	04-PD-D0034-06
6022243.1	2089974.7	S07	04-PD-D0034-07
6022222.4	2089990.2	S08	04-PD-D0034-08
6022207.9	2089971.1	S09	04-PD-D0034-09
6022228.6	2089955.7	S10	04-PD-D0034-10
6022249.8	2089939.4	S11	04-PD-D0034-11
6022271.2	2089922.7	S12	04-PD-D0034-12
6022257.8	2089904.9	S13	04-PD-D0034-13
6022236.4	2089921.6	S14	04-PD-D0034-14
6022215.3	2089937.9	S15	04-PD-D0034-15
6022194.5	2089953.3	S16	04-PD-D0034-16
6022182.5	2089937.6	S17	04-PD-D0034-17
6022203.3	2089922.1	S18	04-PD-D0034-18
6022224.4	2089905.9	S19	04-PD-D0034-19
6022245.8	2089889.1	S20	04-PD-D0034-20

Bias Samples			
Easting	**Northing**	**Label**	**Sample ID**
6022247.8	2089995.1	B1	04-PD-D0034-21
6022275.1	2089956.5	B2	04-PD-D0034-22
6022263.2	2089909.4	B3	04-PD-D0034-23
6022180.7	2089945.8	B4	04-PD-D0034-24

04-PD-D0034-GWS-O
Sample Locations / Investigated Area Sigma Values



Systematic Samples			
Easting	**Northing**	**Label**	**Sample ID**
6022238.2	2090005.6	S01	04-PD-D0034-01
6022258.0	2089993.8	S02	04-PD-D0034-02
6022276.4	2089975.9	S03	04-PD-D0034-03
6022300.5	2089960.8	S04	04-PD-D0034-04
6022285.7	2089941.7	S05	04-PD-D0034-05
6022264.3	2089958.5	S06	04-PD-D0034-06
6022243.1	2089974.7	S07	04-PD-D0034-07
6022222.4	2089990.2	S08	04-PD-D0034-08
6022207.9	2089971.1	S09	04-PD-D0034-09
6022228.6	2089955.7	S10	04-PD-D0034-10
6022249.8	2089939.4	S11	04-PD-D0034-11
6022271.2	2089922.7	S12	04-PD-D0034-12
6022257.8	2089904.9	S13	04-PD-D0034-13
6022236.4	2089921.6	S14	04-PD-D0034-14
6022215.3	2089937.9	S15	04-PD-D0034-15
6022194.5	2089953.3	S16	04-PD-D0034-16
6022182.5	2089937.6	S17	04-PD-D0034-17
6022203.3	2089922.1	S18	04-PD-D0034-18
6022224.4	2089905.9	S19	04-PD-D0034-19
6022245.8	2089889.1	S20	04-PD-D0034-20

Bias Samples			
Easting	**Northing**	**Label**	**Sample ID**
6022247.8	2089995.1	B1	04-PD-D0034-21
6022275.1	2089956.5	B2	04-PD-D0034-22
6022263.2	2089909.4	B3	04-PD-D0034-23
6022180.7	2089945.8	B4	04-PD-D0034-24

GILBANE		RADIOLOGICAL SURVEY FORM
CONTRACT NO / TO NO: N62473-10-D-0808	PROJECT TITLE / LOCATION: Rad Remediation D-1, Phase II / HPNS	ITSI GILBANE PROJECT NO: 07204.0004

Survey No.: 07204.0004-0589-G	Date: 1/3/14	Location: Zone O	Survey Type: Gamma
Kyle Gordon		Ed Palser	
Tech Printed Name	Signature	RSO Printed Name	Signature

Instrument(s)

Model	Serial	Cal Due Date	Probe Model	Probe Serial	Cal Due Date	BKG α	BKG β	BKG γ	BKG μr/Hr	Eff. α	Eff. β
2221	152186	10/11/14	44-10	RN21185	10/11/14	n/a	n/a	4377	n/a	n/a	n/a

Map

Soil D0034
Zone O

Sample Location	Gamma Readings
1	6690
2	6060
3	6230
4	6131
5	5962
6	6568
7	6336
8	5811
9	6448
10	6111
11	5279
12	5211
13	5562
14	6047
15	5613
16	6432
17	6081
18	5631
19	5712
20	5490
21	6502
22	6036
23	6178
24	6033

Comments: Gamma BKGD values represent the average CPM of the background reference area for the specfic instrument. The 3 sigma investigative value for instrument 152186/RN21185 is 5413 CPM. All static locations are co-located with the sample locations. Elevated readings are consistant with the BKGD values for the specfic area being surveyed. Please refer to the sample analysis for all static readings above the 3 sigma value.