



# Paragon Analytics

## Radiochemistry Case Narrative

### Gamma Spectroscopy

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#### **New Horizons**

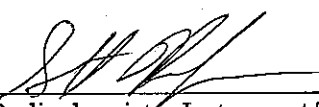
CSMRI / 2135  
Paragon Work Order 0404283

1. The following report consists of analysis results for three soil samples received by Paragon on 4/28/04.
2. The results for these samples are reported on a 'dry weight' basis in units of pCi/gram.
3. These samples were prepared according to Paragon Analytics procedure PA SOP739R8. The samples were sealed in steel cans on 5/04/04 and stored for at least 21 days to allow Rn-222 to approach equilibrium with its progeny. The degree of ingrowth achieved prior to analysis on 6/6/04 is at least 97.8%. Conservatively assuming a radon emanation efficiency of approximately 50%, the effective radon progeny ingrowth for these samples would be greater than 98.9%.
4. The samples were analyzed for the presence of gamma emitting radionuclides according to Paragon Analytics procedure PA SOP713R8. The analyses were completed on 6/6/04.
5. PA has observed a reproducible low bias in Ra-226 results (about -30% for the geometry in question) when using a mixed gamma source for the calibration of HPGe detectors for solid samples. This bias is eliminated by calibration using a NIST traceable Ra-226 source in the same geometry and configuration as the samples.
6. The library used for calibration and analysis employs multiple peaks for the Ra-226 progeny, Pb-214 (352 and 295 keV) and Bi-214 (609 and 1120 keV). Using these peaks avoids the use of the problematic Ra-226 photopeak at 186 keV, which suffers from poorly resolvable interference from U-235 at the same energy. Final activity results for Ra-226 are calculated, using the uncertainty-weighted mean of the activities for the four photopeaks, by the Seeker gamma spectroscopy software assuming secular equilibrium.
7. There are cases where the sample density is less than the associated calibration standard density. Cases that exceed the limit of +/- 15% of the density of the calibration standard are flagged with a 'G', denoting a significant density difference between the sample and calibration standard. Consequently, the results may be biased high for the flagged results in this work order. If requested, Paragon Analytics will perform a transmission spike in order to estimate a magnitude of this bias. The results are reported without further qualification.
8. Activity concentrations above the calculated MDC are reported in some instances where minimum nuclide identification criteria are not met. Such tentative identifications result when the software attempts to calculate net activity concentrations for analytes where either one or both of the following criteria are not satisfied: the 'diagnostic' peak for a nuclide must be

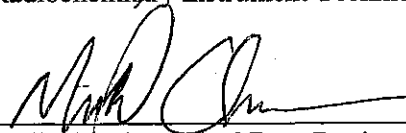
identified above the critical level, or the minimum library peak abundance must be attained. Nuclides not meeting these requirements have been flagged with a "TI" qualifier.

9. Paragon Analytics has found there to be a significant low bias to Pb-214 and Bi-214 results when using a mixed nuclide gamma source for efficiency calibrations. The magnitude of this bias has been determined to be approximately 32% for Bi-214, and 23% for Pb-214. Therefore, any reported results for Pb-214 and Bi-214 are flagged with a "J" qualifier, indicating the activity values to be an estimated value. Results are reported without further qualification.
10. In cases where Cd-109 is identified at a level greater than the MDC, an "SI" flag is assigned denoting spectral interference. This interference occurs with the  $K_{\beta}$  x-rays of Pb, which occur at an energy of 87 keV.
11. Duplicate analysis results above the DER warning limit of 1.42 have been flagged as "W" for Warn. For gamma spectroscopic analysis, SOP 715R13 states that 75% of the nuclides must be within the 2-sigma control limit to meet DER requirements. Elevated DER values may be attributable to sample inhomogeneity.
12. Paragon Analytics follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.
13. Due to elevated activity and subsequent elevated background from the Compton Continuum, the client requested MDC of 0.2 pCi/g for Ra-228 and 0.5 pCi/g for Ra-226 could not be met for several samples in this work order. As there is significant activity in the samples, results are submitted without further qualification.
14. The client requested MDC of 0.2 pCi/g was not achieved in the method blank associated with this batch. The blank was counted for the same duration as the samples. Per project manager's instructions, results are submitted.
15. No problems were encountered with either the client samples or the associated quality control samples. All quality control criteria were met.

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

  
\_\_\_\_\_  
Radiochemistry Instrument Technician

6/14/04  
Date

  
\_\_\_\_\_  
Radiochemistry Final Data Review

6-14-04  
Date

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area I Bottom

Lab ID: 0404283-1

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 041167D01A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
15262-20-1	Ra-228	2.32 +/- 0.63	1.12	M3,G
14391-76-5	Ag-110m	-0.14 +/- 0.17	0.30	U,G
14682-66-7	Al-26	-0.04 +/- 0.12	0.22	U,G
14596-10-2	Am-241	-0.2 +/- 1.4	2.3	U,G
13966-02-4	Be-7	-0.4 +/- 2.1	3.6	U,G
14913-49-6	Bi-212	2.8 +/- 2.2	3.4	U,G
14733-03-0	Bi-214	26.1 +/- 3.2	0.6	G,J
14109-32-1	Cd-109	31.2 +/- 9.0	12.6	G,SI
13982-30-4	Ce-139	0.09 +/- 0.20	0.34	U,G
14762-78-8	Ce-144	-0.5 +/- 1.4	2.3	U,G
14093-03-9	Co-56	2.1 +/- 1.1	1.6	G,TI
13981-50-5	Co-57	0.06 +/- 0.18	0.30	U,G
13981-38-9	Co-58	0.17 +/- 0.34	0.56	U,G
10198-40-0	Co-60	-0.17 +/- 0.18	0.34	U,G
14392-02-0	Cr-51	-40 +/- 35	61	U,G

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area I Bottom  
Lab ID: 0404283-1

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04  
Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1

Run ID: GS040504-7A  
Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 041167D01A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-70-9	Cs-134	0.1 +/- 2.4	3.9	U,G
10045-97-3	Cs-137	-0.13 +/- 0.24	0.43	U,G
14683-23-9	Eu-152	1.7 +/- 1.1	1.8	U,G
15585-10-1	Eu-154	0.70 +/- 0.94	1.55	U,G
14391-16-3	Eu-155	-0.49 +/- 0.79	1.35	U,G
14596-12-4	Fe-59	-0.36 +/- 0.58	1.04	U,G
10043-66-0	I-131	0.2 +/- 4.9	8.4	U,G
13966-00-2	K-40	24.5 +/- 4.2	3.2	G
13966-31-9	Mn-54	-0.02 +/- 0.27	0.45	U,G
13966-32-0	Na-22	-0.08 +/- 0.28	0.50	U,G
14681-63-1	Nb-94	0.10 +/- 0.17	0.28	U,G
13967-76-5	Nb-95	-1.53 +/- 0.52	0.96	U,G
15100-28-4	Pa-234m	16 +/- 28	47	U,G
15092-94-1	Pb-212	2.78 +/- 0.59	0.72	G
15067-28-4	Pb-214	26.4 +/- 3.2	0.6	G,J

### Comments:

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R - Nuclide has exceeded 8 half-lives.

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

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area 1 Bottom

Lab ID: 0404283-1

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QC Batch ID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 041167D01A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-48-1	Ru-106	0 +/- 1.5	2.6	U,G
14683-10-4	Sb-124	-0.04 +/- 0.27	0.46	U,G
14234-35-6	Sb-125	-0.20 +/- 0.47	0.82	U,G
13967-63-0	Sc-46	-0.07 +/- 0.24	0.41	U,G
15623-47-9	Th-227	1.3 +/- 1.8	2.8	U,G
15065-10-8	Th-234	11.6 +/- 4.2	6.2	G, TI
14913-50-9	Tl-208	0.71 +/- 0.21	0.26	G
15117-96-1	U-235	1.1 +/- 1.3	2.1	U,G
13982-39-3	Zn-65	-2.00 +/- 0.84	1.56	U,G

### Comments:

#### Qualifiers/Flags:

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MDC - Minimum Detectable Concentration (see PAI SOP 709)

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SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8  
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area I Bottom  
Lab ID: 0404283-1

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04  
Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1

Run ID: GS040504-7A  
Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 041167D01B

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13982-63-3	Ra-226	34.6 +/- 4.2	0.8	M3,G

## Comments:

### Qualifiers/Flags:

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Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
Y2 - Chemical Yield outside default limits.  
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MDC - Minimum Detectable Concentration (see PAI SOP 709)  
BDL - Below Detection Limit

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

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area 1 Bottom  
Lab ID: 0404283-1DUP

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 27-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QC Batch ID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 138 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040877D02A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
15262-20-1	Ra-228	3.05 +/- 0.93	1.58	M3,G
14391-76-5	Ag-110m	-0.09 +/- 0.23	0.42	U,G
14682-66-7	Al-26	0.06 +/- 0.21	0.38	U,G
14596-10-2	Am-241	0.5 +/- 1.9	3.2	U,G
13966-02-4	Be-7	-1.7 +/- 2.9	5.4	U,G
14913-49-6	Bi-212	3.5 +/- 3.2	5.1	U,G
14733-03-0	Bi-214	32.9 +/- 4.2	0.8	G,J
14109-32-1	Cd-109	42 +/- 11	14	G,SI
13982-30-4	Ce-139	-0.05 +/- 0.22	0.39	U,G
14762-78-8	Ce-144	-1.1 +/- 1.3	2.3	U,G
14093-03-9	Co-56	2.5 +/- 1.6	2.3	G,TI
13981-50-5	Co-57	0.14 +/- 0.16	0.25	U,G
13981-38-9	Co-58	-0.09 +/- 0.31	0.57	U,G

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

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

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area I Bottom

Lab ID: 0404283-1DUP

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QC Batch ID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 138 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040877D02A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10198-40-0	Co-60	0.02 +/- 0.25	0.45	U,G
14392-02-0	Cr-51	-41 +/- 47	86	U,G
13967-70-9	Cs-134	0.03 +/- 0.22	0.38	U,G
10045-97-3	Cs-137	0.09 +/- 0.34	0.57	U,G
14683-23-9	Eu-152	4.0 +/- 1.7	2.1	G,TI
15585-10-1	Eu-154	0.4 +/- 1.3	2.2	U,G
14391-16-3	Eu-155	0.98 +/- 0.75	1.18	U,G
14596-12-4	Fe-59	0.43 +/- 0.87	1.47	U,G
10043-66-0	I-131	1.9 +/- 6.8	11.6	U,G
13966-00-2	K-40	27.2 +/- 5.7	3.8	G
13966-31-9	Mn-54	-0.08 +/- 0.26	0.47	U,G
13966-32-0	Na-22	-0.20 +/- 0.27	0.53	U,G
14681-63-1	Nb-94	-0.13 +/- 0.24	0.44	U,G

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

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

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1



# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area 1 Bottom

Lab ID: 0404283-1DUP

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QC Batch ID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 138 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040877D02A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-76-5	Nb-95	-0.78 +/- 0.68	1.28	U,G
15100-28-4	Pa-234m	2 +/- 40	72	U,G
15092-94-1	Pb-212	3.21 +/- 0.68	0.75	G
15067-28-4	Pb-214	37.3 +/- 4.6	1.0	W,G,J
13967-48-1	Ru-106	1.0 +/- 2.0	3.5	U,G
14683-10-4	Sb-124	0.05 +/- 0.33	0.57	U,G
14234-35-6	Sb-125	0.12 +/- 0.71	1.21	U,G
13967-63-0	Sc-46	0.07 +/- 0.35	0.60	U,G
15623-47-9	Th-227	2.0 +/- 1.5	2.3	U,G
15065-10-8	Th-234	6.2 +/- 5.8	9.5	U,G
14913-50-9	Tl-208	0.92 +/- 0.33	0.42	G
15117-96-1	U-235	1.5 +/- 1.5	2.5	U,G
13982-39-3	Zn-65	-0.28 +/- 0.81	1.50	U,W,G

### Comments:

#### Qualifiers/Flags:

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

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

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M - The requested MDC was not met.

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

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D - DER is greater than Control Limit of 2.13

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area 1 Bottom

Lab ID: 0404283-1DUP

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 138 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040877D02B

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13982-63-3	Ra-226	45.0 +/- 5.4	1.1	M3,W,G

### Comments:

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

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PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area K Bottom

Lab ID: 0404283-2

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040811D07A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
15262-20-1	Ra-228	2.9 +/- 1.2	2.4	M3,G
14391-76-5	Ag-110m	-0.06 +/- 0.30	0.54	U,G
14682-66-7	Al-26	-0.12 +/- 0.30	0.62	U,G
14596-10-2	Am-241	0.41 +/- 0.56	0.92	U,G
13966-02-4	Be-7	0 +/- 3.3	5.9	U,G
14913-49-6	Bi-212	3.8 +/- 4.2	6.8	U,G
14733-03-0	Bi-214	31.3 +/- 5.5	3.4	G,J
14109-32-1	Cd-109	30.2 +/- 7.5	9.5	G,SI
13982-30-4	Ce-139	-0.06 +/- 0.24	0.42	U,G
14762-78-8	Ce-144	-0.3 +/- 1.5	2.6	U,G
14093-03-9	Co-56	4.2 +/- 2.1	2.8	G,TI
13981-50-5	Co-57	0.07 +/- 0.19	0.32	U,G
13981-38-9	Co-58	-0.08 +/- 0.33	0.63	U,G
10198-40-0	Co-60	-0.17 +/- 0.31	0.61	U,G
14392-02-0	Cr-51	1 +/- 51	88	U,G

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area K Bottom

Lab ID: 0404283-2

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040811D07A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-70-9	Cs-134	0.13 +/- 0.28	0.47	U,G
10045-97-3	Cs-137	0.21 +/- 0.51	0.83	U,G
14683-23-9	Eu-152	3.3 +/- 2.0	2.9	G,TI
15585-10-1	Eu-154	0.4 +/- 1.7	3.0	U,G
14391-16-3	Eu-155	0.29 +/- 0.58	0.96	U,G
14596-12-4	Fe-59	-0.22 +/- 0.94	1.77	U,G
10043-66-0	I-131	-3.3 +/- 7.8	14.0	U,G
13966-00-2	K-40	27.2 +/- 6.5	4.8	G
13966-31-9	Mn-54	-0.23 +/- 0.33	0.62	U,G
13966-32-0	Na-22	-0.14 +/- 0.33	0.63	U,G
14681-63-1	Nb-94	0.24 +/- 0.27	0.43	U,G
13967-76-5	Nb-95	-0.89 +/- 0.81	1.53	U,G
15100-28-4	Pa-234m	44 +/- 55	89	U,G
15092-94-1	Pb-212	2.27 +/- 0.62	0.77	G
15067-28-4	Pb-214	35.7 +/- 4.4	1.0	G,J

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8  
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area K Bottom

Lab ID: 0404283-2

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 27-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 142 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040811D07A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-48-1	Ru-106	0.4 +/- 2.4	4.2	U,G
14683-10-4	Sb-124	0.04 +/- 0.42	0.74	U,G
14234-35-6	Sb-125	0.51 +/- 0.73	1.21	U,G
13967-63-0	Sc-46	-0.40 +/- 0.43	0.84	U,G
15623-47-9	Th-227	1.4 +/- 2.2	3.5	U,G
15065-10-8	Th-234	1.1 +/- 2.7	4.5	U,G
14913-50-9	Tl-208	0.64 +/- 0.38	0.56	G
15117-96-1	U-235	0.5 +/- 1.5	2.5	U,G
13982-39-3	Zn-65	-1.0 +/- 1.1	2.2	U,G

## Comments:

### Qualifiers/Flags:

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

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area K Bottom

Lab ID: 0404283-2

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 142 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040811D07B

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13982-63-3	Ra-226	43.4 +/- 5.3	1.2	M3,G

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H-10-2  
Lab ID: 0404283-3

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 26-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 157 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040874D08A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
15262-20-1	Ra-228	0.5 +/- 4.3	7.2	U,M,G
14391-76-5	Ag-110m	0.19 +/- 0.84	1.41	U,G
14682-66-7	Al-26	-0.52 +/- 0.83	1.48	U,G
14596-10-2	Am-241	0.2 +/- 2.0	3.3	U,G
13966-02-4	Be-7	-24 +/- 17	29	U,G
14913-49-6	Bi-212	1 +/- 13	21	U,G
14733-03-0	Bi-214	719 +/- 84	3	G,J
14109-32-1	Cd-109	376 +/- 52	42	G,SI
13982-30-4	Ce-139	-0.19 +/- 0.92	1.53	U,G
14762-78-8	Ce-144	2.0 +/- 4.8	8.0	U,G
14093-03-9	Co-56	-1.0 +/- 9.5	15.8	U,G
13981-50-5	Co-57	0.52 +/- 0.61	0.99	U,G
13981-38-9	Co-58	0.8 +/- 1.9	3.1	U,G
10198-40-0	Co-60	-0.3 +/- 1.1	1.9	U,G
14392-02-0	Cr-51	-20 +/- 190	320	U,G

### Comments:

#### Qualifiers/Flags:

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

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)  
MDC - Minimum Detectable Concentration (see PAI SOP 709)  
BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H-10-2

Lab ID: 0404283-3

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 26-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 157 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040874D08A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-70-9	Cs-134	1.24 +/- 0.86	1.38	U,G
10045-97-3	Cs-137	0.6 +/- 1.3	2.2	U,G
14683-23-9	Eu-152	-6 +/- 15	26	U,G
15585-10-1	Eu-154	-1.4 +/- 5.5	9.4	U,G
14391-16-3	Eu-155	0.6 +/- 2.2	3.6	U,G
14596-12-4	Fe-59	2.4 +/- 4.8	7.8	U,G
10043-66-0	I-131	10 +/- 27	45	U,G
13966-00-2	K-40	15 +/- 11	18	U,G
13966-31-9	Mn-54	1.1 +/- 1.4	2.3	U,G
13966-32-0	Na-22	0.6 +/- 1.1	1.9	U,G
14681-63-1	Nb-94	3.21 +/- 0.97	1.38	G
13967-76-5	Nb-95	1.8 +/- 1.8	2.9	U,G
15100-28-4	Pa-234m	60 +/- 170	290	U,G
15092-94-1	Pb-212	2.4 +/- 1.7	2.7	U,G
15067-28-4	Pb-214	733 +/- 86	3	G,J

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

Data Package ID: GSS0404283-1



# Gamma Spectroscopy Results

PAI 713 Rev 8

## Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H-10-2  
Lab ID: 0404283-3

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 26-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 157 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040874D08A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-48-1	Ru-106	-1.5 +/- 7.9	13.4	U,G
14683-10-4	Sb-124	0.1 +/- 1.3	2.2	U,G
14234-35-6	Sb-125	4.2 +/- 2.7	4.5	U,G
13967-63-0	Sc-46	-0.1 +/- 1.5	2.5	U,G
15623-47-9	Th-227	17.6 +/- 5.5	8.1	G
15065-10-8	Th-234	19.4 +/- 7.5	16.3	G
14913-50-9	Tl-208	-0.3 +/- 1.0	2.4	U,G
15117-96-1	U-235	9.2 +/- 5.6	8.9	G
13982-39-3	Zn-65	-0.3 +/- 3.3	5.5	U,G

### Comments:

#### Qualifiers/Flags:

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

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)  
MDC - Minimum Detectable Concentration (see PAI SOP 709)  
BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8  
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H-10-2  
Lab ID: 0404283-3

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 26-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 157 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040874D08B

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13982-63-3	Ra-226	950 +/- 110	0	M3,G

## Comments:

### Qualifiers/Flags:

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

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide Identification and/or quantitation is tentative.

TI - Nuclide Identification is tentative.

R - Nuclide has exceeded 8 half-lives.

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

### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: GS040504-7MB

Sample Matrix: SOIL

Prep Batch: GS040504-7

Final Aliquot: 215 g

Prep SOP: PAI 739 Rev 8

QC Batch ID: GS040504-7-1

Result Units: pCi/g

Date Collected: 04-May-04

Run ID: GS040504-7A

File Name: 041168D01A

Date Prepared: 04-May-04

Count Time: 30 minutes

Library: FANP\_NEW-HO

Date Analyzed: 06-Jun-04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
15262-20-1	Ra-228	-0.26 +/- 0.27	0.51	U,M
14391-76-5	Ag-110m	-0.002 +/- 0.055	0.099	U
14682-66-7	Al-26	-0.019 +/- 0.054	0.109	U
14596-10-2	Am-241	-0.29 +/- 0.40	0.73	U
13966-02-4	Be-7	-0.30 +/- 0.41	0.78	U
14913-49-6	Bi-212	-0.16 +/- 0.82	1.49	U
14733-03-0	Bi-214	0.15 +/- 0.17	0.28	U,J
14109-32-1	Cd-109	-2.5 +/- 1.6	3.0	U
13982-30-4	Ce-139	-0.016 +/- 0.040	0.073	U
14762-78-8	Ce-144	-0.15 +/- 0.31	0.56	U
14093-03-9	Co-56	0.112 +/- 0.081	0.116	U
13981-50-5	Co-57	0.017 +/- 0.043	0.074	U
13981-38-9	Co-58	0.014 +/- 0.056	0.098	U
10198-40-0	Co-60	-0.033 +/- 0.061	0.120	U
14392-02-0	Cr-51	0.5 +/- 3.9	6.8	U

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: GS040504-7MB

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1

Final Aliquot: 215 g  
Result Units: pCi/g  
File Name: 041168D01A

Date Collected: 04-May-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Run ID: GS040504-7A  
Count Time: 30 minutes

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-70-9	Cs-134	-0.090 +/- 0.081	0.148	U
10045-97-3	Cs-137	-0.029 +/- 0.059	0.111	U
14683-23-9	Eu-152	0.02 +/- 0.29	0.54	U
15585-10-1	Eu-154	-0.15 +/- 0.34	0.64	U
14391-16-3	Eu-155	-0.06 +/- 0.20	0.35	U
14596-12-4	Fe-59	0.06 +/- 0.10	0.17	U
10043-66-0	I-131	0.023 +/- 0.053	0.091	U
13966-00-2	K-40	-0.02 +/- 0.73	1.33	U
13966-31-9	Mn-54	0.004 +/- 0.061	0.108	U
13966-32-0	Na-22	0.021 +/- 0.060	0.106	U
14681-63-1	Nb-94	0.057 +/- 0.065	0.106	U
13967-76-5	Nb-95	-0.045 +/- 0.058	0.111	U
15100-28-4	Pa-234m	-4.7 +/- 9.9	18.8	U
15092-94-1	Pb-212	-0.03 +/- 0.10	0.18	U
15067-28-4	Pb-214	0.05 +/- 0.12	0.20	U,J

### Comments:

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU  
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
Y2 - Chemical Yield outside default limits.  
LT - Result is less than Requested MDC, greater than sample specific MDC.  
SQ - Spectral quality prevents accurate quantitation.  
SI - Nuclide identification and/or quantitation is tentative.  
TI - Nuclide identification is tentative.  
R - Nuclide has exceeded 8 half-lives.  
M - Requested MDC not met.  
B - Analyte concentration greater than MDC.  
B3 - Analyte concentration greater than MDC but less than Requested MDC.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)  
MDC - Minimum Detectable Concentration (see PAI SOP 709)  
BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: GS040504-7MB

Sample Matrix: SOIL

Prep Batch: GS040504-7

Final Aliquot: 215 g

Prep SOP: PAI 739 Rev 8

QCBatchID: GS040504-7-1

Result Units: pCi/g

Date Collected: 04-May-04

Run ID: GS040504-7A

File Name: 041168D01A

Date Prepared: 04-May-04

Count Time: 30 minutes

Library: FANP\_NEW-HO

Date Analyzed: 06-Jun-04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13967-48-1	Ru-106	-0.65 +/- 0.58	1.12	U
14683-10-4	Sb-124	-0.135 +/- 0.089	0.165	U
14234-35-6	Sb-125	0.13 +/- 0.13	0.21	U
13967-63-0	Sc-46	-0.027 +/- 0.057	0.108	U
15623-47-9	Th-227	0.02 +/- 0.33	0.58	U
15065-10-8	Th-234	0.9 +/- 1.1	1.8	U
14913-50-9	Tl-208	0.030 +/- 0.064	0.109	U
15117-96-1	U-235	-0.01 +/- 0.31	0.55	U
13982-39-3	Zn-65	0.11 +/- 0.13	0.21	U

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

SQ - Spectral quality prevents accurate quantitation.

S1 - Nuclide identification and/or quantitation is tentative.

T1 - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: GS040504-7MB

Sample Matrix: SOIL

Prep Batch: GS040504-7

Final Aliquot: 215 g

Prep SOP: PAI 739 Rev 8

QCBatchID: GS040504-7-1

Result Units: pCi/g

Date Collected: 04-May-04

Run ID: GS040504-7A

File Name: 041168D01B

Date Prepared: 04-May-04

Count Time: 30 minutes

Library: FANP\_NEW-HO

Date Analyzed: 06-Jun-04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
13982-63-3	Ra-226	0.06 +/- 0.15	0.26	U

### Comments:

#### Qualifiers/Flags:

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

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

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: GS040504-7ALCS

Sample Matrix: SOIL

Prep Batch: GS040504-7

Final Aliquot: 215 g

Prep SOP: PAI 739 Rev 8

QCBatchID: GS040504-7-1

Result Units: pCi/g

Date Collected: 04-May-04

Run ID: GS040504-7A

File Name: 040812D07A

Date Prepared: 04-May-04

Count Time: 30 minutes

Library: FANP\_NEW-HO

Date Analyzed: 06-Jun-04

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13982-63-3	Ra-226	460 +/- 54	2	471	97.6	85 - 115	P

### Comments:

#### Qualifiers/Flags:

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

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide Identification and/or quantitation is tentative.

TI - Nuclide Identification is tentative.

R - Nuclide has exceeded 8 half-lives.

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: GS040504-7LCS

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes

Final Aliquot: 215 g  
Result Units: pCi/g  
File Name: 040878D02A

Library: FANP\_NEW-HO

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14596-10-2	Am-241	459 +/- 54	8	470	97.6	85 - 115	P
10198-40-0	Co-60	172 +/- 20	1	181	95.1	85 - 115	P
10045-97-3	Cs-137	186 +/- 22	1	176	106	85 - 115	P

### Comments:

#### Qualifiers/Flags:

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

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

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

#### Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

Data Package ID: GSS0404283-1



# Gamma Spectroscopy Results

PAI 713 Rev 8

## Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area 1 Bottom  
Lab ID: 0404283-1DUP

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 27-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QCBatchID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 138 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040877D02A

Library: FANP\_NEW-HO

CASNO	Analyte	Sample Result +/- 2 s TPU	Duplicate Result +/- 2 s TPU	DER	Control Limit	Lab Qualifiers
15262-20-1	Ra-228	2.32 +/- 0.63	3.05 +/- 0.93	0.65	2.13	M3,G
14391-76-5	Ag-110m	-0.14 +/- 0.17	-0.09 +/- 0.23	0.17	2.13	U,G
14682-66-7	Al-26	-0.04 +/- 0.12	0.06 +/- 0.21	0.41	2.13	U,G
14596-10-2	Am-241	-0.2 +/- 1.4	0.5 +/- 1.9	0.28	2.13	U,G
13966-02-4	Be-7	-0.4 +/- 2.1	-1.7 +/- 2.9	0.36	2.13	U,G
14913-49-6	Bi-212	2.8 +/- 2.2	3.5 +/- 3.2	0.17	2.13	U,G
14733-03-0	Bi-214	26.1 +/- 3.2	32.9 +/- 4.2	1.30	2.13	G,J
14109-32-1	Cd-109	31.2 +/- 9.0	42 +/- 11	0.75	2.13	G,SI
13982-30-4	Ce-139	0.09 +/- 0.20	-0.05 +/- 0.22	0.49	2.13	U,G
14762-78-8	Ce-144	-0.5 +/- 1.4	-1.1 +/- 1.3	0.33	2.13	U,G
14093-03-9	Co-56	2.1 +/- 1.1	2.5 +/- 1.6	0.23	2.13	G,TI
13981-50-5	Co-57	0.06 +/- 0.18	0.14 +/- 0.16	0.34	2.13	U,G
13981-38-9	Co-58	0.17 +/- 0.34	-0.09 +/- 0.31	0.56	2.13	U,G
10198-40-0	Co-60	-0.17 +/- 0.18	0.02 +/- 0.25	0.62	2.13	U,G
14392-02-0	Cr-51	-40 +/- 35	-41 +/- 47	0.01	2.13	U,G
13967-70-9	Cs-134	0.1 +/- 2.4	0.03 +/- 0.22	0.01	2.13	U,G
10045-97-3	Cs-137	-0.13 +/- 0.24	0.09 +/- 0.34	0.54	2.13	U,G

### Comments:

#### Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

#### Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported
- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 halfives.
- G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area I Bottom  
Lab ID: 0404283-1DUP

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 27-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QC Batch ID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 138 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040877D02A

Library: FANP\_NEW-HO

14683-23-9	Eu-152	1.7 +/- 1.1	4.0 +/- 1.7	1.15	2.13	G, TI
15585-10-1	Eu-154	0.70 +/- 0.94	0.4 +/- 1.3	0.20	2.13	U, G
14391-16-3	Eu-155	-0.49 +/- 0.79	0.98 +/- 0.75	1.36	2.13	U, G
14596-12-4	Fe-59	-0.36 +/- 0.58	0.43 +/- 0.87	0.75	2.13	U, G
10043-66-0	I-131	0.2 +/- 4.9	1.9 +/- 6.8	0.20	2.13	U, G
13966-00-2	K-40	24.5 +/- 4.2	27.2 +/- 5.7	0.39	2.13	G
13966-31-9	Mn-54	-0.02 +/- 0.27	-0.08 +/- 0.26	0.14	2.13	U, G
13966-32-0	Na-22	-0.08 +/- 0.28	-0.20 +/- 0.27	0.32	2.13	U, G
14681-63-1	Nb-94	0.10 +/- 0.17	-0.13 +/- 0.24	0.80	2.13	U, G
13967-76-5	Nb-95	-1.53 +/- 0.52	-0.78 +/- 0.68	0.88	2.13	U, G
15100-28-4	Pa-234m	16 +/- 28	2 +/- 40	0.27	2.13	U, G
15092-94-1	Pb-212	2.78 +/- 0.59	3.21 +/- 0.68	0.47	2.13	G
15067-28-4	Pb-214	26.4 +/- 3.2	37.3 +/- 4.6	1.97	2.13	W, G, J
13967-48-1	Ru-106	0 +/- 1.5	1.0 +/- 2.0	0.43	2.13	U, G
14683-10-4	Sb-124	-0.04 +/- 0.27	0.05 +/- 0.33	0.19	2.13	U, G
14234-35-6	Sb-125	-0.20 +/- 0.47	0.12 +/- 0.71	0.37	2.13	U, G
13967-63-0	Sc-46	-0.07 +/- 0.24	0.07 +/- 0.35	0.32	2.13	U, G
15623-47-9	Th-227	1.3 +/- 1.8	2.0 +/- 1.5	0.31	2.13	U, G
15065-10-8	Th-234	11.6 +/- 4.2	6.2 +/- 5.8	0.75	2.13	U, G

### Comments:

#### Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

#### Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported
- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 half-lives.
- G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area I Bottom  
Lab ID: 0404283-1DUP

Sample Matrix: SOIL  
Prep SOP: PAI 739 Rev 8  
Date Collected: 27-Apr-04  
Date Prepared: 04-May-04  
Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7  
QC Batch ID: GS040504-7-1  
Run ID: GS040504-7A  
Count Time: 30 minutes  
Report Basis: Dry Weight

Final Aliquot: 138 g  
Prep Basis: Dry Weight  
Moisture(%): NA  
Result Units: pCi/g  
File Name: 040877D02A

Library: FANP\_NEW-HO

14913-50-9	TI-208	0.71 +/- 0.21	0.92 +/- 0.33	0.56	2.13	G
15117-96-1	U-235	1.1 +/- 1.3	1.5 +/- 1.5	0.19	2.13	U,G
13982-39-3	Zn-65	-2.00 +/- 0.84	-0.28 +/- 0.81	1.47	2.13	U,W,G

### Comments:

#### Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
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- P - LCS, Matrix Spike Recovery within control limits.
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#### Abbreviations:

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- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
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- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 half-lives.
- G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS0404283-1

# Gamma Spectroscopy Results

PAI 713 Rev 8

## Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0404283

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: Area 1 Bottom

Lab ID: 0404283-1DUP

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 8

Date Collected: 27-Apr-04

Date Prepared: 04-May-04

Date Analyzed: 06-Jun-04

Prep Batch: GS040504-7

QCBatchID: GS040504-7-1

Run ID: GS040504-7A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 138 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 040877D02B

Library: FANP\_NEW-HO

CASNO	Analyte	Sample Result +/- 2 s TPU	Duplicate Result +/- 2 s TPU	DER	Control Limit	Lab Qualifiers
13982-63-3	Ra-226	34.6 +/- 4.2	45.0 +/- 5.4	1.52	2.13	M3,W,G

### Comments:

#### Duplicate Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

#### Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported
- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 half-lives.
- G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS0404283-1