



Paragon Analytics

Radiochemistry Case Narrative

Isotopic Thorium

New Horizons

CSMRI / 2135

PA WO 0405169

1. This report consists of the analytical results for seven soil samples received by Paragon on 05/19/04.
2. These samples were prepared according to Paragon Analytics procedures PA SOP721R10, PA SOP773R8, and PA SOP777R7.
3. The samples were analyzed for the presence of isotopic thorium according to Paragon Analytics procedure PA SOP714R8. The analyses were completed on 06/21/04.
4. The isotopic analysis results for these samples are reported on a dry weight basis in units of pCi/gram.
5. 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.
6. Sample SDA064 (PA ID 0405169-13) was prepared at a greatly reduced aliquot (0.04-g versus 2.0-g standard aliquot) in a separate batch due to elevated activity detected in the prescreen results. Due to the reduced aliquot, the requested MDC of 0.1 pCi/g was not achieved, however the reported activity in the sample exceeds its achieved MDC values. It is identified with "M3" flags on the final reports.
7. Likewise, the method blank associated with 0405169-13 (AS040610-3MB) was prepared at an analogous reduced aliquot to this sample. It did not meet the requested MDC and was given an extended count of 1000 minutes in order to lower all associated MDC and uncertainty values. Th-228 activity is also reported in this method blank above the MDC value. The measured blank Th-228 activity is not less than one-fifth the Th-228 activity reported in sample 0405169-13. Therefore, the results of this sample are potentially biased high as is indicated by the elevated blank

activity. At the client's request, the results of this sample and its associated quality control samples are submitted in this report without further qualification. Please refer to NCR 5739 included with this data package.

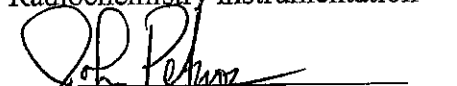
8. A few other samples did not meet the requested MDC of 0.1 pCi/g for Th-228 and/or Th-230. The reported activity in these samples exceeds their achieved MDC values in each case. They are identified with an "M3" flag on the final reports.
9. The magnitude of the negative Th-230 activity for method blank AS040610-4MB is greater than the 2 sigma TPU. The analyst's review of the data does not indicate a problem with the instrument data or the subsequent reporting systems. The data quality is not believed to be affected and the results are submitted without qualification. Under typical conditions, where background level sample data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time.
10. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.

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



Skye Dobberstein
Radiochemistry Instrumentation

6/24/04
Date



John Peterson
Radiochemistry Final Data Review

6/24/04
Date

CONTROLLED NON-CONFORMANCE REPORT

Initiated by sm Date 6-18-04
 Reason: Non-Conformance
 Client Inquiry
 Other

Method/Procedure Iso Th
 Work Orders Affected 0405169
AS040610-4
 Clients New Horizons

SECTION I TYPE OF EVENT (circle as appropriate)

- 1. LCS / Surrogate / IS / Tracer or Chemical Yield Criteria Not Met
- 2. Calibration Criteria Not Met (ICAL, ICV, CCV)
- 3. Method Requirements Not Met (HTV, MB)
- 4. Deviation from LQAP / SOP (i.e., PAI criteria not met)
- 5. Client Criteria Not Met (MDC, DER, _____)
- 6. Equipment Failure or Laboratory Incident / Error
- 7. Other _____

Explanation: The method blank Th-228 activity is above the achieved MDC (1.05 pCi/g) requested MDC (0.1 pCi/g) at 1.2 pCi/g.
The client samples don't have Th-228 activity 5X greater than the activity of the blank. Sample were aliquoted at 0.041g due to elevated alpha activity. Suggest re-prep samples at 0.5g. 6/18/04
Note reg. Th-230 act.

Actions to Prevent Recurrence (Retrain, etc.):

→ N/A - characteristic of sm. aliquot size / inc. uncertainty
 SD 6/21/04

SECTION II NOTIFICATION

Client Contacted? (Y) Name: Sally Cuffin Date: 6/18/04 Time: 1020

SECTION III CORRECTIVE ACTIONS

- 1. Submit for Re-Prep. or Clean-up
- 2. Re-analyze
- 3. Resubmit Data (hc, edd, narrative)
- 4. Document in Narrative
- 5. Other _____

Approved by: DS DPM D PM

SECTION IV REQUEST FOR REWORK

Initial Batch ID: _____ Date: _____
 Reworked Batch ID: _____ Date: _____
 Outcome: _____

Approved by: SD 6/21/04
 Matrix Effect or Elevated / Sample Activity Suspected? (circle applicable)

SECTION V DISPOSITION

Use as is Repair Reject

SECTION VI COMMENTS

Narrate and flag data appropriately -

SECTION VII APPROVAL SIGNATURES

Project Manager (PM) Debbie Esler Date 6/18/04
 Department Manager (DPM) [Signature] Date 6/21/04 (Verification of Disposition)
 QA Manager [Signature] Date 6/21/04

SECTION VIII DISTRIBUTION PM DS Dept. Manager KDC Lab Director _____ Rpt. Group or Rad

RG

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040610-2MB

Sample Matrix: SOIL

Prep Batch: AS040610-2

Final Aliquot: 2.00 g

Prep SOP: PAI 777 Rev 7

QCBatchID: AS040610-2-2

Result Units: pCi/g

Date Collected: 10-Jun-04

Run ID: AS040610-2a

File Name: T6102B

Date Prepared: 10-Jun-04

Count Time: 300 minutes

Date Analyzed: 21-Jun-04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.007 +/- 0.024	0.055	U
14269-63-7	Th-230	-0.014 +/- 0.031	0.078	U
7440-29-1	Th-232	0.003 +/- 0.013	0.019	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.309	1.69	pCi/g	73.1	30 - 110 %	

Comments:

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.

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

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040610-4MB

Sample Matrix: SOIL

Prep Batch: AS040610-4

Final Aliquot: 0.0397 g

Prep SOP: PAI 777 Rev 7

QCBatchID: AS040610-4-1

Result Units: pCi/g

Date Collected: 10-Jun-04

Run ID: AS040610-4A

File Name: T6104B

Date Prepared: 10-Jun-04

Count Time: 1000 minutes

Date Analyzed: 17-Jun-04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.19 +/- 0.76	1.06	B,M
14269-63-7	Th-230	-1.22 +/- 0.95	1.83	U,M
7440-29-1	Th-232	0.44 +/- 0.45	0.70	U,M

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	116.3	94	pCi/g	81.0	30 - 110 %	

Comments:

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.

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

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040610-2LCS

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 10-Jun-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes

Final Aliquot: 2.00 g
Result Units: pCi/g
File Name: T6102L

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14269-63-7	Th-230	2.38 +/- 0.43	0.08	2.30	104	85 - 121	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.309	1.88	pCi/g	81.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
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)

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040610-4LCS

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 10-Jun-04
Date Prepared: 10-Jun-04
Date Analyzed: 16-Jun-04

Prep Batch: AS040610-4
QCBatchID: AS040610-4-1
Run ID: AS040610-4A
Count Time: 300 minutes

Final Aliquot: 0.0397 g
Result Units: pCi/g
File Name: T6104L

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14269-63-7	Th-230	126 +/- 23	4	116	109	85 - 121	P,M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	116.5	81	pCi/g	69.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
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)

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1008
Lab ID: 0405169-2DUP

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 2.04 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T51692D

CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	2.39 +/- 0.46	2.51 +/- 0.47	0.18	2.13	
14269-63-7	Th-230	1.23 +/- 0.26	1.18 +/- 0.24	0.17	2.13	
7440-29-1	Th-232	2.11 +/- 0.41	2.23 +/- 0.42	0.21	2.13	

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: SDA064
Lab ID: 0405169-13DUP

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 13-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 17-Jun-04

Prep Batch: AS040610-4
QCBatchID: AS040610-4-1
Run ID: AS040610-4A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0406 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T516913D

CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	3.7 +/- 1.5	3.4 +/- 1.2	0.11	2.13	M3
14269-63-7	Th-230	146 +/- 23	137 +/- 21	0.29	2.13	M3
7440-29-1	Th-232	0.99 +/- 0.52	1.20 +/- 0.51	0.28	2.13	M3

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405169
Client Name: New Horizons
ClientProject ID: CSMRI 2135

Field ID: IC1008
Lab ID: 0405169-2

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 2.03 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T51692

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.39 +/- 0.46	0.06	
14269-63-7	Th-230	1.23 +/- 0.26	0.09	
7440-29-1	Th-232	2.11 +/- 0.41	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.274	1.23	pCi/g	54.1	30 - 110 %	

Comments:

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.
- 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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1008
Lab ID: 0405169-2DUP

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 2.04 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T51692D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.51 +/- 0.47	0.06	
14269-63-7	Th-230	1.18 +/- 0.24	0.08	
7440-29-1	Th-232	2.23 +/- 0.42	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.266	1.39	pCi/g	61.1	30 - 110 %	

Comments:

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.
- 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 thereported activity is greater than the reported MDC.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13

Abbreviations:

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8
Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1025
Lab ID: 0405169-4

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 04-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 2.01 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T51694

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.42 +/- 0.29	0.09	
14269-63-7	Th-230	2.78 +/- 0.52	0.08	
7440-29-1	Th-232	1.42 +/- 0.28	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.301	1.33	pCi/g	58.0	30 - 110 %	

Comments:

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.

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1028
Lab ID: 0405169-6

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 04-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 2.02 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T51696

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.31 +/- 0.45	0.11	M3
14269-63-7	Th-230	1.79 +/- 0.36	0.09	
7440-29-1	Th-232	2.24 +/- 0.43	0.05	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.291	1.21	pCi/g	52.9	30 - 110 %	

Comments:

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.
- 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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H214	Sample Matrix: SOIL	Prep Batch: AS040610-2	Final Aliquot: 2.04 g
Lab ID: 0405169-8	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040610-2-2	Prep Basis: Dry Weight
	Date Collected: 04-May-04	Run ID: AS040610-2a	Moisture(%): NA
	Date Prepared: 10-Jun-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 21-Jun-04	Report Basis: Dry Weight	File Name: T51698

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.41 +/- 0.29	0.06	
14269-63-7	Th-230	27.6 +/- 4.7	0.1	
7440-29-1	Th-232	1.35 +/- 0.27	0.01	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.260	1.36	pCi/g	60.0	30 - 110 %	

Comments:

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.
- 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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: H236
Lab ID: 0405169-10

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 05-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.03 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T516910

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.03 +/- 0.43	0.17	M3
14269-63-7	Th-230	146 +/- 25	0	M3
7440-29-1	Th-232	2.03 +/- 0.42	0.08	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.503	2.89	pCi/g	64.2	30 - 110 %	

Comments:

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.

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: E32
Lab ID: 0405169-12

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 10-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 21-Jun-04

Prep Batch: AS040610-2
QCBatchID: AS040610-2-2
Run ID: AS040610-2a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.505 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T516912

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.85 +/- 0.60	0.19	M3
14269-63-7	Th-230	65 +/- 11	0	M3
7440-29-1	Th-232	2.93 +/- 0.61	0.09	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	9.136	7.2	pCi/g	79.2	30 - 110 %	

Comments:

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.

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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: SDA064
Lab ID: 0405169-13

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 13-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 17-Jun-04

Prep Batch: AS040610-4
QCBatchID: AS040610-4-1
Run ID: AS040610-4A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0406 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T516913

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	3.7 +/- 1.5	2.0	M3
14269-63-7	Th-230	146 +/- 23	2	M3
7440-29-1	Th-232	0.99 +/- 0.52	0.54	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	113.8	86	pCi/g	75.5	30 - 110 %	

Comments:

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.
- 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

Data Package ID: TH0405169-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0405169

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: SDA064
Lab ID: 0405169-13DUP

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 13-May-04
Date Prepared: 10-Jun-04
Date Analyzed: 17-Jun-04

Prep Batch: AS040610-4
QCBatchID: AS040610-4-1
Run ID: AS040610-4A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0406 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T516913D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	3.4 +/- 1.2	1.4	M3
14269-63-7	Th-230	137 +/- 21	2	M3
7440-29-1	Th-232	1.20 +/- 0.51	0.33	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	113.8	90	pCi/g	79.3	30 - 110 %	

Comments:

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.
- 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 thereported activity is greater than the reported MDC.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13

Abbreviations:

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

Data Package ID: TH0405169-1