



Paragon Analytics

Radiochemistry Case Narrative

Isotopic Thorium

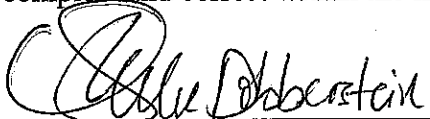
New Horizons

CSMRI / 2135

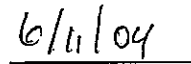
PA WO 0405025


1. This report consists of the analytical results for seven soil samples received by Paragon on 05/04/04.
2. These samples were prepared according to Paragon Analytics procedures PA SOP773R8, PA SOP777R7, and PA SOP721R10.
3. The samples were analyzed for the presence of isotopic thorium according to Paragon Analytics procedure PA SOP714R8. The analyses were completed on 06/02/04.
4. The isotopic analysis results for these samples are reported on a dry weight basis in units of pCi/gram.
5. Sample IC1007 (PA ID 0405025-14) did not meet the requested MDC of 0.1 pCi/g for Th-228, however the reported activity exceeds the achieved MDC value. This sample is flagged with an "M3" flag on the final reports.
6. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

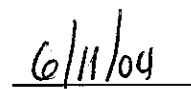
The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.


Skye Dobberstein

Radiochemistry Instrumentation


Date


Radiochemistry Final Data Review


Date

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040518-3MB

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 18-May-04
Date Prepared: 18-May-04
Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
Count Time: 300 minutes

Final Aliquot: 2.00 g
Result Units: pCi/g
File Name: T5183B

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.026 +/- 0.031	0.059	U
14269-63-7	Th-230	0.029 +/- 0.039	0.077	U
7440-29-1	Th-232	0.028 +/- 0.022	0.028	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.252	1.54	pCi/g	68.6	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Lab ID: AS040518-3LCS	Sample Matrix: SOIL Prep SOP: PAI 777 Rev 7 Date Collected: 18-May-04 Date Prepared: 18-May-04 Date Analyzed: 02-Jun-04	Prep Batch: AS040518-3 QCBatchID: AS040518-3-1 Run ID: AS040518-3a Count Time: 300 minutes	Final Aliquot: 2.00 g Result Units: pCi/g File Name: T5183L
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CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14289-63-7	Th-230	2.43 +/- 0.45	0.08	2.30	106	85 - 121	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.252	1.43	pCi/g	63.7	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1001

Lab ID: 0405025-2DUP

Sample Matrix: SOIL

Prep SOP: PAI 777 Rev 7

Date Collected: 29-Apr-04

Date Prepared: 18-May-04

Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3

QCBatchID: AS040518-3-1

Run ID: AS040518-3a

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: TR50252D

CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	2.13 +/- 0.40	2.71 +/- 0.51	0.90	2.13	
14289-63-7	Th-230	1.66 +/- 0.32	2.09 +/- 0.40	0.83	2.13	
7440-29-1	Th-232	1.87 +/- 0.36	2.48 +/- 0.46	1.04	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1001
Lab ID: 0405025-2

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 29-Apr-04
Date Prepared: 18-May-04
Date Analyzed: 31-May-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
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: T50252

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.13 +/- 0.40	0.08	
14269-63-7	Th-230	1.66 +/- 0.32	0.08	
7440-29-1	Th-232	1.87 +/- 0.36	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.232	1.42	pCi/g	63.4	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1001	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.04 g
Lab ID: 0405025-2DUP	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 29-Apr-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 02-Jun-04	Report Basis: Dry Weight	File Name: TR50252D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.71 +/- 0.51	0.10	
14269-63-7	Th-230	2.09 +/- 0.40	0.08	
7440-29-1	Th-232	2.48 +/- 0.46	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.207	1.40	pCi/g	63.6	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1002	Sample Matrix: SOIL	Prep Batch: AS040518-3	Final Aliquot: 2.09 g
Lab ID: 0405025-4	Prep SOP: PAI 777 Rev 7	QCBatchID: AS040518-3-1	Prep Basis: Dry Weight
	Date Collected: 29-Apr-04	Run ID: AS040518-3a	Moisture(%): NA
	Date Prepared: 18-May-04	Count Time: 300 minutes	Result Units: pCi/g
	Date Analyzed: 31-May-04	Report Basis: Dry Weight	File Name: T50254

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.34 +/- 0.43	0.07	
14269-63-7	Th-230	1.81 +/- 0.34	0.07	
7440-29-1	Th-232	2.11 +/- 0.39	0.02	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.153	1.44	pCi/g	67.1	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1003

Lab ID: 0405025-6

Sample Matrix: SOIL

Prep SOP: PAI 777 Rev 7

Date Collected: 29-Apr-04

Date Prepared: 18-May-04

Date Analyzed: 31-May-04

Prep Batch: AS040518-3

QCBatchID: AS040518-3-1

Run ID: AS040518-3a

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: T50256

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.25 +/- 0.44	0.09	
14269-63-7	Th-230	1.78 +/- 0.36	0.09	
7440-29-1	Th-232	2.02 +/- 0.40	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.212	1.30	pCi/g	58.6	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: KC1004
Lab ID: 0405025-8

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 29-Apr-04
Date Prepared: 18-May-04
Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
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: T50258

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.68 +/- 0.32	0.06	
14269-63-7	Th-230	1.29 +/- 0.26	0.08	
7440-29-1	Th-232	1.52 +/- 0.29	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.222	1.44	pCi/g	65.0	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1005

Lab ID: 0405025-10

Sample Matrix: SOIL

Prep SOP: PAI 777 Rev 7

Date Collected: 03-May-04

Date Prepared: 18-May-04

Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3

QCBatchID: AS040518-3-1

Run ID: AS040518-3a

Count Time: 300 minutes

Report Basis: Dry Weight

Final Aliquot: 2.10 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: T502510

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.58 +/- 0.31	0.09	
14269-63-7	Th-230	5.8 +/- 1.0	0.1	
7440-29-1	Th-232	1.31 +/- 0.26	0.01	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.141	1.45	pCi/g	67.8	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1006

Lab ID: 0405025-12

Sample Matrix: SOIL

Prep SOP: PAI 777 Rev 7

Date Collected: 03-May-04

Date Prepared: 18-May-04

Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3

QCBatchID: AS040518-3-1

Run ID: AS040518-3a

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: T502512

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.41 +/- 0.46	0.06	
14269-63-7	Th-230	1.62 +/- 0.32	0.08	
7440-29-1	Th-232	2.36 +/- 0.45	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.229	1.39	pCi/g	62.4	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: TH0405025-1

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 8

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0405025

Client Name: New Horizons

ClientProject ID: CSMRI 2135

Field ID: IC1007
Lab ID: 0405025-14

Sample Matrix: SOIL
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 18-May-04
Date Analyzed: 02-Jun-04

Prep Batch: AS040518-3
QCBatchID: AS040518-3-1
Run ID: AS040518-3a
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: T502514

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.73 +/- 0.51	0.11	M3
14269-63-7	Th-230	3.02 +/- 0.56	0.08	
7440-29-1	Th-232	2.47 +/- 0.46	0.04	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	2.222	1.33	pCi/g	59.8	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: TH0405025-1