

**U.S.ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY  
540 S. MORRIS AVE., MONTGOMERY, AL 36115  
U ANALYSES**

**REPORT OF SAMPLE DELIVERY GROUP #1400013**

Project: Petcoke Dust Investigation, Southeast Chicago, IL  
 Analysis method: Actinides (Uranium) by Extraction Chromatography  
 Report ID: 1400013-U  
 Report type: Original  
 Date reported: 04/17/2014  
 Total pages in report: 21

**SAMPLES**

<b>NAREL Sample #</b>	<b>Client Sample ID</b>	<b>Location</b>	<b>Matrix</b>	<b>Date Collected</b>	<b>Date Received</b>
B4.02512P	S-1	IL:CHICAGO	SOIL	03/03/2014	03/06/2014
B4.02513Q	S-2	IL:CHICAGO	SOIL	03/03/2014	03/06/2014
B4.02514R	S-3	IL:CHICAGO	SOIL	03/03/2014	03/06/2014
B4.02515T	S-4	IL:CHICAGO	SOIL	03/03/2014	03/06/2014
B4.02516U	S-5	IL:CHICAGO	SOIL	03/03/2014	03/06/2014
B4.02517V	S-6	IL:CHICAGO	SOIL	03/03/2014	03/06/2014
B4.02518W	N-1	IL:CHICAGO	SOIL	03/04/2014	03/06/2014
B4.02519X	N-2	IL:CHICAGO	SOIL	03/04/2014	03/06/2014
B4.02520P	N-3	IL:CHICAGO	SOIL	03/04/2014	03/06/2014
B4.02521Q	N-4	IL:CHICAGO	SOIL	03/04/2014	03/06/2014
B4.02522R	N-5	IL:CHICAGO	SOIL	03/04/2014	03/06/2014
B4.02523T	N-6	IL:CHICAGO	SOIL	03/04/2014	03/06/2014
B4.02524U	N-2 DUP	IL:CHICAGO	SOIL	03/04/2014	03/06/2014

**EXCEPTIONS**

1. **Packaging and shipping** – Included in the shipment was an empty jar labeled “Blank Rad.” This jar was not logged as a sample, and the client was informed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – No problems were encountered.
4. **Analysis** – No problems were encountered.
5. **Holding times** – No holding times were specified.

**QUALITY CONTROL**

1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Yields** – All chemical yields were within acceptance limits.
3. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

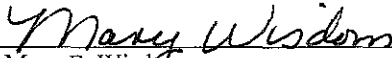
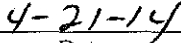
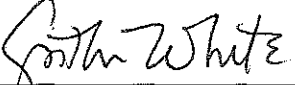
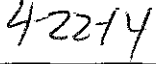
## ACCREDITATION



All analyses included in this data package are accredited by the Oregon Environmental Laboratory Accreditation Program (ORELAP) to the TNI standard.

## CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

 _____ Mary F. Wisdom Quality Assurance Manager, NAREL	 _____ Date
 _____ Cynthia White Director, Center for Environmental Radioanalytical Laboratory Science	 _____ Date

## GENERAL INFORMATION

### SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

### ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample, or blank spike
MS	Matrix spike
MSD	Matrix spike duplicate (not currently analyzed)
RBK	Method blank
STD	External standard (used for <sup>228</sup> Ra yield determination)

### QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

### RADIOCHEMICAL DATA

Radiochemical analyses usually require the subtraction of an instrument background measurement result from a gross sample measurement result. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical importance, as for example in the evaluation of trends or the comparison of two groups of samples.

To the extent practical, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the “2-sigma” measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The measurement result, uncertainty, and MDC are always expressed in the same unit of measurement.

### EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using “Z scores.” A Z score is the number of standard deviations by which the QC result differs from its ideal value. Generally the score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference. The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference.

NAREL reports the “relative percent difference,” or RPD, between duplicate results and the “percent recovery,” or %R, for spiked analyses, but does not use these values for evaluation of most analyses. An exception is the use of %R in the evaluation of gross alpha matrix spike results. A gross alpha matrix spike result is considered acceptable if either  $|Z| \leq 3$  or  $60 \leq \%R \leq 110$ .

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
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**SDG #1400013**

**ANALYSIS SUMMARY**

Analysis method: NAREL U-EICHROM  
Title: Actinides (Uranium) by Extraction Chromatography

NAREL Sample #	Client Sample ID	QC Type	Date Completed	Preparation Batch #	Assay Batch #
B4.02512P	S-1		04/12/2014	0010881Q	0018036D
B4.02513Q	S-2		04/12/2014	0010881Q	0018036D
B4.02514R	S-3		04/12/2014	0010881Q	0018036D
B4.02515T	S-4		04/12/2014	0010881Q	0018036D
B4.02515T	S-4	DUP	04/12/2014	0010881Q	0018036D
B4.02516U	S-5		04/12/2014	0010881Q	0018036D
B4.02517V	S-6		04/12/2014	0010881Q	0018036D
B4.02518W	N-1		04/12/2014	0010881Q	0018036D
B4.02519X	N-2		04/12/2014	0010881Q	0018036D
B4.02520P	N-3		04/12/2014	0010881Q	0018036D
B4.02521Q	N-4		04/12/2014	0010881Q	0018036D
B4.02522R	N-5		04/12/2014	0010881Q	0018036D
B4.02523T	N-6		04/12/2014	0010881Q	0018036D
B4.02524U	N-2 DUP		04/12/2014	0010881Q	0018036D
LCS-00687698L *		LCS	04/12/2014	0010881Q	0018036D
RBK-00687697K *		RBK	04/12/2014	0010881Q	0018036D

\* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02512P	Amount analyzed:	1.055e+00 GDRY
Client sample ID:	S-1	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 08:30 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	90.95 %	Analyst:	AS
Ash/dry weight:	0.55 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS71	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	2.69e-02	2.3e-02	3.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	0.00e+00	8.5e-03	2.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	3.36e-02	2.3e-02	1.7e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02513Q	Amount analyzed:	1.054e+00 GDRY
Client sample ID:	S-2	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 09:50 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	95.20 %	Analyst:	AS
Ash/dry weight:	0.49 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS72	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	3.19e-02	2.2e-02	2.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	3.96e-03	1.2e-02	2.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	2.97e-02	2.1e-02	1.7e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02514R	Amount analyzed:	1.031e+00 GDRY
Client sample ID:	S-3	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 10:40 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	92.65 %	Analyst:	AS
Ash/dry weight:	0.81 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS73	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	3.04e-02	2.4e-02	3.3e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	5.69e-03	1.7e-02	3.2e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	7.60e-03	1.6e-02	3.0e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02515T	Amount analyzed:	1.053e+00 GDRY
Client sample ID:	S-4	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 11:15 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	92.88 %	Analyst:	AS
Ash/dry weight:	2.71 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS74	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	6.11e-02	3.3e-02	2.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	-4.88e-03	1.6e-02	4.4e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	2.72e-02	2.5e-02	3.3e-02	PCI/GDRY	04/11/2014 13:31 CDT



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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02515T	Amount analyzed:	1.053e+00 GDRY
Client sample ID:	S-4	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 11:15 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	92.88 %	Analyst:	AS
Ash/dry weight:	2.71 %	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS75	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	5.02e-02	2.8e-02	3.3e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	1.43e-02	1.8e-02	2.9e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	4.34e-02	2.6e-02	3.1e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02516U	Amount analyzed:	1.030e+00 GDRY
Client sample ID:	S-5	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 13:10 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	91.89 %	Analyst:	AS
Ash/dry weight:	0.37 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS76	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	4.74e-02	3.7e-02	3.9e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	1.59e-02	2.8e-02	4.7e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	2.46e-02	2.9e-02	3.9e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02517V	Amount analyzed:	1.038e+00 GDRY
Client sample ID:	S-6	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-03 13:35 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	90.96 %	Analyst:	AS
Ash/dry weight:	1.56 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS79	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	6.86e-02	2.9e-02	1.9e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	1.73e-02	1.8e-02	2.3e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	3.07e-02	2.1e-02	2.3e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02518W	Amount analyzed:	1.069e+00 GDRY
Client sample ID:	N-1	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 08:38 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	94.98 %	Analyst:	AS
Ash/dry weight:	0.84 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS80	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	6.97e-02	3.1e-02	1.6e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	1.01e-02	1.6e-02	2.3e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	2.43e-02	1.9e-02	2.0e-02	PCI/GDRY	04/11/2014 13:31 CDT

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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02519X	Amount analyzed:	1.055e+00 GDRY
Client sample ID:	N-2	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 09:10 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	94.84 %	Analyst:	AS
Ash/dry weight:	0.92 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS83	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	3.36e-02	2.3e-02	1.7e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	0.00e+00	8.5e-03	2.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	2.24e-02	1.9e-02	2.1e-02	PCI/GDRY	04/11/2014 13:31 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02520P	Amount analyzed:	1.067e+00 GDRY
Client sample ID:	N-3	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 10:30 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	91.44 %	Analyst:	AS
Ash/dry weight:	0.61 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS84	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	1.98e-02	2.5e-02	3.3e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	0.00e+00	1.4e-02	3.2e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	5.40e-03	1.6e-02	2.7e-02	PCI/GDRY	04/11/2014 13:31 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02521Q	Amount analyzed:	1.047e+00 GDRY
Client sample ID:	N-4	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 09:50 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	87.42 %	Analyst:	AS
Ash/dry weight:	0.32 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS85	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	2.60e-02	2.5e-02	2.8e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	3.66e-03	1.6e-02	3.4e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	1.22e-02	1.9e-02	2.8e-02	PCI/GDRY	04/11/2014 13:31 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02522R	Amount analyzed:	1.058e+00 GDRY
Client sample ID:	N-5	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 12:50 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	94.56 %	Analyst:	AS
Ash/dry weight:	1.39 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS86	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	4.86e-02	3.5e-02	2.7e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	-2.15e-03	1.4e-02	4.0e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	3.60e-03	1.6e-02	3.3e-02	PCI/GDRY	04/11/2014 13:31 CDT



**U.S. ENVIRONMENTAL PROTECTION AGENCY  
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**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02523T	Amount analyzed:	1.059e+00 GDRY
Client sample ID:	N-6	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 13:20 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	91.09 %	Analyst:	AS
Ash/dry weight:	0.95 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS88	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	2.70e-02	2.3e-02	2.6e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	4.41e-03	1.3e-02	2.2e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	1.72e-02	1.8e-02	2.3e-02	PCI/GDRY	04/11/2014 13:31 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	B4.02524U	Amount analyzed:	1.053e+00 GDRY
Client sample ID:	N-2 DUP	Preparation batch #:	0010881Q
Matrix:	SOIL	Assay batch #:	0018036D
Collected:	2014-03-04 09:10 CST	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	95.06 %	Analyst:	AS
Ash/dry weight:	0.85 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS97	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234 J	4.18e-02	2.6e-02	2.2e-02	PCI/GDRY	04/11/2014 13:31 CDT
U235	1.29e-02	2.0e-02	3.3e-02	PCI/GDRY	04/11/2014 13:31 CDT
U238	5.38e-02	2.9e-02	1.8e-02	PCI/GDRY	04/11/2014 13:31 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	LCS-00687698L	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0010881Q
Matrix:	N/A	Assay batch #:	0018036D
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS98	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	1.97e+00	2.6e-01	3.8e-02	PCI	04/11/2014 13:31 CDT
U235	1.08e-01	5.2e-02	3.2e-02	PCI	04/11/2014 13:31 CDT
U238	2.39e+00	3.0e-01	2.7e-02	PCI	04/11/2014 13:31 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1400013**

**SAMPLE ANALYSIS REPORT**

Lab sample #:	RBK-00687697K	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0010881Q
Matrix:	N/A	Assay batch #:	0018036D
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/11/2014 13:31	1000.0	AS99	CEB

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
U234	0.00e+00	1.7e-02	4.2e-02	PCI	04/11/2014 13:31 CDT
U235	6.68e-03	1.9e-02	3.4e-02	PCI	04/11/2014 13:31 CDT
U238	1.12e-02	2.0e-02	2.8e-02	PCI	04/11/2014 13:31 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL ANALYTICAL RADIATION ENVIRONMENTAL LABORATORY**

**SDG 1400013**

**PREPARATION BATCH SUMMARY**

Preparation batch #: 0010881Q  
Analysis method: NAREL U-EICHROM  
Preparation procedure: N/A

NAREL Sample #	Client Sample ID	Analysis #	QC Type	Yield	$\pm 2 \sigma$ Uncertainty	Analyst
B4.02512P	S-1	00686322A	DUP	78.13 %	6.98 %	AS
B4.02513Q	S-2	00686328G		80.52 %	7.16 %	AS
B4.02514R	S-3	00686334E		79.61 %	6.88 %	AS
B4.02515T	S-4	00686340C		53.72 %	5.16 %	AS
B4.02515T	S-4	00687696J		82.69 %	6.85 %	AS
B4.02516U	S-5	00686346J		46.23 %	4.87 %	AS
B4.02517V	S-6	00686352G		82.73 %	7.06 %	AS
B4.02518W	N-1	00686358N		85.74 %	7.56 %	AS
B4.02519X	N-2	00686364L		80.63 %	7.36 %	AS
B4.02520P	N-3	00686370J		49.91 %	5.30 %	AS
B4.02521Q	N-4	00686376Q		61.31 %	6.12 %	AS
B4.02522R	N-5	00686382N		52.07 %	5.51 %	AS
B4.02523T	N-6	00686388V		72.31 %	6.78 %	AS
B4.02524U	N-2 DUP	00686394T	74.95 %	6.96 %	AS	
LCS-00687698L *		00687698L	LCS	64.17 %	6.23 %	AS
RBK-00687697K *		00687697K	RBK	50.80 %	5.33 %	AS

\* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**QC RESULTS FOR BATCH 0010881Q**

NAREL Sample #	Analysis #	QC Type	Analyte	%R	RPD	Z	Evaluation
B4.02515T	00687696J	DUP	U234		19.6	-0.50	PASS
B4.02515T	00687696J	DUP	U235		408.0	1.56	PASS
B4.02515T	00687696J	DUP	U238		46.0	0.90	PASS
LCS-00687698L	00687698L	LCS	U234	95.0		-0.79	PASS
LCS-00687698L	00687698L	LCS	U235	111.1		0.42	PASS
LCS-00687698L	00687698L	LCS	U238	113.0		1.79	PASS
RBK-00687697K	00687697K	RBK	U234				PASS
RBK-00687697K	00687697K	RBK	U235				PASS
RBK-00687697K	00687697K	RBK	U238				PASS