LABORATORY DATA CONSULTANTS, INC.
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ERM
2525 Natomas Park Drive, Suite 350
Sacramento, CA 95833
ATTN: Ms. Maria Barajas-Albalawi

January 22, 2008

SUBJECT: BRC Tronox Parcel C/D, Data Validation

Dear Ms. Barajas-Albalawi

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on January 2, 2008. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 18035:

SDG #	Fraction
TRNC/D-3RD, TRNC/D-5RD, TRNC/D-6RD, TRNC/D-7RD	Radium-226 & Radium-228, Isotopic Uranium & Isotopic Thorium

The data validation was performed under EPA Level III and Level IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

Sincerely,

Erlinda T. Rauto
Operations Manager/Senior Chemist

6,723 Pages-CD

Attachment 1

80/20

LDC #18035 (ERM - Sacramento / BRC Tronox Parcel C/D)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Iso. Thorium (5087)		Iso. U (5067)		Ra-226 (5005)		Ra-228 (5005)																									
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	TRNC/D-3RD	01/02/08	01/23/08	1	16	1	17	1	17	1	17																								
B	TRNC/D-5RD	01/02/08	01/23/08	1	16	1	16	1	16	1	16																								
C	TRNC/D-6RD	01/02/08	01/23/08	1	15	1	15	1	15	1	15																								
D	TRNC/D-7RD	01/02/08	01/23/08	1	1	1	1	1	1	1	1																								
D	TRNC/D-7RD	01/02/08	01/23/08	0	13	0	13	0	13	0	13																								
Total	T/LR			4	61	4	62	4	62	4	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	263

Shaded cells indicate Level IV validation (all other cells are Level IIII validation). These sample counts do not include MS/MSD, and DUPs

18035ST.wpd

BRC Tronox Parcel C/D
Data Validation Reports
LDC# 18035

Radium-226 & Radium-228

LDC Report# 18035A29

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 13, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-3RD

Sample Identification

TSB-DR-06-0'
TSB-DR-06-10'
TSB-DR-05-0'
TSB-DR-05-0'-FD
TSB-DR-05-10'
TSB-DR-03-0'
TSB-DR-03-10'
TSB-DJ-01-0'
TSB-DJ-01-10'
TSB-DR-04-0'
TSB-DR-04-10'
TSB-CR-04-0'
TSB-CR-04-10'
TSB-CR-05-0'
TSB-CR-05-10'
TSB-CR-06-0'
TSB-CR-06-10'
RINSATE-2
TSB-DR-03-0'DUP

Introduction

This data review covers 18 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-RC5005 for water samples for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE-2" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Chemical Recovery

All chemical recoveries were within validation criteria for the water samples in this SDG.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-DR-05-0' and TSB-DR-05-0'-FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-DR-05-0'	TSB-DR-05-0'-FD				
Radium-226	1.07	0.971	10 (≤50)	-	-	-
Radium-228	1.63	1.64	1 (≤50)	-	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

LDC #: 18035A29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08

SDG #: TRNC/D-3RD Level III Page: 1 of 1

Laboratory: Test America Reviewer: MG

2nd Reviewer: V

gmb Soil : Radium-226, Radium-228 (EPA Meth 901.1/RICH-RC-5017)
Water ↘

METHOD: Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-13-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	Water only
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D = 3+4
XIV	Field blanks	ND	R = 18

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	TSB-DR-06-0' S	11	TSB-DR-04-10' S	21 [1]	PBS	31	
2	TSB-DR-06-10'	12	TSB-CR-04-0'	22 [2]	PBW	32	
3	TSB-DR-05-0'	13	TSB-CR-04-10'	23		33	
4	TSB-DR-05-0'-FD	14	TSB-CR-05-0'	24		34	
5	TSB-DR-05-10'	15	TSB-CR-05-10'	25		35	
6	TSB-DR-03-0'	16	TSB-CR-06-0'	26		36	
7	TSB-DR-03-10'	17	TSB-CR-06-10'	27		37	
8	TSB-DJ-01-0'	18 [2]	RINSATE-2 W	28		38	
9	TSB-DJ-01-10' D	19	TSB-DR-03-0'DUP S	29		39	
10	TSB-DR-04-0'	20		30		40	

gmb

Notes: _____

LDC #: 18035A29
SDG #: TRNC/D-3RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Radiochemistry (Method: see cover)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g) 3	Activity (pCi/g) 4	RPD
Ra-226	1.07	0.971	10 (≤ 50)
Ra-228	1.63	1.64	1 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 15, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-5RD

Sample Identification

TSB-FJ-03-0'
TSB-FJ-03-0'-FD
TSB-FJ-03-10'
TSB-FJ-10-0'
TSB-FJ-10-10'
TSB-FJ-04-0'
TSB-FJ-04-10'
TSB-FJ-02-0'
TSB-FJ-02-0'-FD
TSB-FJ-02-10'
TSB-FR-02-0'
TSB-FR-02-10'
TSB-FJ-09-0'
TSB-FJ-09-10'
TSB-FR-03-0'
TSB-FR-03-10'
RINSATE 3
TSB-FJ-03-10'DUP
TSB-FR-02-0'DUP

Introduction

This data review covers 18 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-RC5005 for water samples for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 3" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Chemical Recovery

All chemical recoveries were within validation criteria for the water samples in this SDG.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-FJ-03-0' and TSB-FJ-03-0'-FD and samples TSB-FJ-02-0' and TSB-FJ-02-0'-FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FJ-03-0'	TSB-FJ-03-0'-FD				
Radium-226	1.02	0.916	11 (≤50)	-	-	-
Radium-228	1.50	1.70	12 (≤50)	-	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FJ-02-0'	TSB-FJ-02-0'-FD				
Radium-226	1.04	0.945	10 (≤50)	-	-	-
Radium-228	1.74	1.81	4 (≤50)	-	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

LDC #: 18035B29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08

SDG #: TRNC/D-5RD Level III Page: 1 of 1

Laboratory: Test America Reviewer: MG

MG Soil : Radium-226, Radium-228 (EPA Meth 901.1/ RICH-RC-5017) 2nd Reviewer: [illegible]

Water

METHOD: Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-15-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	Water only
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D = 1+2, D = 8+9
XIV	Field blanks	ND	R = 17

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	TSB-FJ-03-0' S	11	TSB-FR-02-0' S	21 1	PBS	31	
2	TSB-FJ-03-0'-FD	12	TSB-FR-02-10'	22 2	PBW	32	
3	TSB-FJ-03-10'	13	TSB-FJ-09-0'	23		33	
4	TSB-FJ-10-0'	14	TSB-FJ-09-10'	24		34	
5	TSB-FJ-10-10'	15	TSB-FR-03-0'	25		35	
6	TSB-FJ-04-0'	16	TSB-FR-03-10'	26		36	
7	TSB-FJ-04-10'	17 2	RINSATE 3 W	27		37	
8	TSB-FJ-02-0'	18	TSB-FJ-03-10'DUP S	28		38	
9	TSB-FJ-02-0'-FD	19	TSB-FR-02-0'DUP	29		39	
10	TSB-FJ-02-10'	20		30		40	

Notes: _____

LDC #: 18035B29
SDG #: TRNC/D-5RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer:

METHOD: Radiochemistry (Method: see cover)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g) 1	2	RPD
Ra-226	1.02	0.916	11 (≤50)
Ra-228	1.50	1.70	12 (↓)

Isotopes	Activity (pCi/g) 8	9	RPD
Ra-226	1.04	0.945	10 (≤50)
Ra-228	1.74	1.81	4 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC Report# 18035C29

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 16, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-6RD

Sample Identification

TSB-FJ-08-0'
TSB-FJ-08-10'
TSB-FR-05-0'
TSB-FR-05-10'
TSB-FR-04-0'
TSB-FR-04-0'-FD
TSB-FR-04-10'
TSB-GR-01-0'
TSB-GR-01-5'
TSB-GJ-06-0'
TSB-GJ-06-5'
TSB-FJ-01-0'
TSB-FJ-01-10'
TSB-GJ-01-0'
TSB-GJ-01-5'
RINSATE 4
TSB-FR-04-0'DUP
TSB-FJ-01-0'DUP

Introduction

This data review covers 17 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-RC5005 for water samples for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 4" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Duplicate error ratios (DER) were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Isotope	RPD (Limits)	DER (Limits)	Flag	A or P
TSB-FR-04-0'DUP (All soil samples in SDG TRNC/D-6RD)	Ra-226	-	2.8 (≤2.58)	J (all detects) UJ (all non-detects)	A

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Chemical Recovery

All chemical recoveries were within validation criteria for the water samples in this SDG.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-FR-04-0' and TSB-FR-04-0'-FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FR-04-0'	TSB-FR-04-0'-FD				
Radium-226	1.03	0.814	23 (≤50)	-	-	-
Radium-228	2.02	1.73	15 (≤50)	-	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-6RD

SDG	Sample	Isotope	Flag	A or P	Reason
TRNC/D-6RD	TSB-FJ-08-0' TSB-FJ-08-10' TSB-FR-05-0' TSB-FR-05-10' TSB-FR-04-0' TSB-FR-04-0'-FD TSB-FR-04-10' TSB-GR-01-0' TSB-GR-01-5' TSB-GJ-06-0' TSB-GJ-06-5' TSB-FJ-01-0' TSB-FJ-01-10' TSB-GJ-01-0' TSB-GJ-01-5'	Ra-226	J (all detects) UJ (all non-detects)	A	Duplicate analysis (DER)

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

LDC #: 18035C29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08

SDG #: TRNC/D-6RD Level III Page: 1 of 1

Laboratory: Test America Reviewer: MG

2nd Reviewer:

~~Soil~~ Soil: Radium-226, Radium-228 (EPA Meth 901.1/RICH-RC-5017)
Water

METHOD: Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-16-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	SW	DUP
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	Water only
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D = 5+6
XIV	Field blanks	ND	R = 16

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	TSB-FJ-08-0' S	11	TSB-GJ-06-5' S	21		31	
2	TSB-FJ-08-10'	12	TSB-FJ-01-0'	22		32	
3	TSB-FR-05-0'	13	TSB-FJ-01-10'	23		33	
4	TSB-FR-05-10'	14	TSB-GJ-01-0'	24		34	
5	TSB-FR-04-0'	15	TSB-GJ-01-5'	25		35	
6	TSB-FR-04-0'-FD	16 2	RINSATE 4 W	26		36	
7	TSB-FR-04-10'	17	TSB-FR-04-0'DUP S	27		37	
8	TSB-GR-01-0'	18	TSB-FJ-01-0'DUP	28		38	
9	TSB-GR-01-5'	19 1	PBS	29		39	
10	TSB-GJ-06-0'	20 2	PBW	30		40	

Notes:

LDC #: 18035C29
SDG #: TRNC/D-6RD

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Reviewer: MG
2nd Reviewer: L

METHOD: Radiochemistry (Method: see cover)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a duplicate sample analyzed the required frequency of 5% in this SDG?

Y (N) N/A Were all duplicate sample duplicate error ratio (DER) $\leq$ 1.42? $DER = \frac{|Act_1 - Act_2|}{2\,|\delta_1^2 + \delta_2^2|^{1/2}}$ Act = sample activity δ = 1 sigma error

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Duplicate ID	Matrix	Isotope	DER (Limits)	Associated Samples	Qualifications
1	17	soil	Ra-226	2.8 (≤ 2.58)	all soil	J/UJ/A

Comments:

LDC #: 18035C29
SDG #: TRNC/D-6RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Radiochemistry (Method: see cover)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g)		RPD
	5	6	
Ra-226	1.03	0.814	23 (≤50)
Ra-228	2.02	1.73	15 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 19, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III & IV

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-7RD

Sample Identification

TSB-GR-02-0'**
TSB-GR-02-0'-FD**
TSB-GR-02-5'**
TSB-GJ-04-0'**
TSB-GJ-04-5'**
TSB-GJ-02-0'**
TSB-GJ-02-0'-FD**
TSB-GJ-02-5'**
TSB-GJ-07-0'**
TSB-GJ-07-5'**
TSB-GJ-05-0'**
TSB-GJ-05-5'**
TSB-GJ-03-0'**
TSB-GJ-03-5'
RINSATE 5
TSB-GJ-04-0'DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 soil samples and one water sample listed on the cover sheet. The analyses were per EPA Method 901.1/Method RICH-RC5017 for soil samples for Radium-226 and Radium-228, EPA Method 903.1/Method RICH-RC5005 for water samples for Radium-226, and EPA Method 904.0/Method RICH-RC5005 for water samples for Radium-228.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each detector and each radionuclide.

Self absorption factors were determined for each sample when applicable.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within laboratory control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 5" was identified as a rinsate. No radium-226 or radium-228 was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Chemical Recovery

All chemical recoveries were within validation criteria for the water samples in this SDG.

V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

All sample result verifications were acceptable for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-GR-02-0'** and TSB-GR-02-0'-FD** and samples TSB-GJ-02-0'** and TSB-GJ-02-0'-FD** were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-GR-02-0'**	TSB-GR-02-0'-FD**				
Radium-226	1.03	1.02	1 (≤50)	-	-	-
Radium-228	1.67	1.97	16 (≤50)	-	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-GJ-02-0'**	TSB-GJ-02-0'-FD**				
Radium-226	1.30	1.28	2 (≤50)	-	-	-
Radium-228	1.62	2.04	23 (≤50)	-	-	-

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

LDC #: 18035D29 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08

SDG #: TRNC/D-7RD Level III/IV Page: 1 of 1

Laboratory: Test America Reviewer: MG

2nd Reviewer: W

mg Soil: Radium-226, Radium-228 (EPA 901.1/RICH-RC-5017)
Water →

METHOD: Radium 226 (EPA Method 903.1/Method RICH-RC5005) Radium 228 (EPA Method 904.0/Method RICH-RC5005)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-19-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	water only
V.	Sample result verification	A	Not reviewed for Level III validation.
VI.	Minimum dectectable activity (MDA)	A	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	SW	D= 1+2, D= 6+7
XIV	Field blanks	ND	R=15

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation

1	TSB-GR-02-0'** S	11	TSB-GJ-05-0'** S	21		31	
2	TSB-GR-02-0'-FD**	12	TSB-GJ-05-5'**	22		32	
3	TSB-GR-02-5'**	13	TSB-GJ-03-0'**	23		33	
4	TSB-GJ-04-0'**	14	TSB-GJ-03-5'	24		34	
5	TSB-GJ-04-5'**	15 2	RINSATE 5 W	25		35	
6	TSB-GJ-02-0'**	16	TSB-GJ-04-0'DUP S	26		36	
7	TSB-GJ-02-0'-FD**	17 1	PBS	27		37	
8	TSB-GJ-02-5'**	18 2	PBW	28		38	
9	TSB-GJ-07-0'**	19		29		39	
10	TSB-GJ-07-5'**	20		30		40	

Notes: _____

LDC #: 18035D29
SDG #: TRNC/D-7RD

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Radiochemistry (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments and detectors calibration as required?	✓			
Were NIST traceable standards used for all calibrations?	✓			
Was the check source identified by activity and radionuclide?	✓			
Were check sources including background counts analyzed at the requirled frequency and within laboratory control limits?	✓			
III. Blanks				
Were blank analyses performed as required?	✓			
Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spikes and Duplicates				
Were a matrix spike (MS) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. (Soil) Water.		✓		
Were the MS percent recoveries (%R) within the QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Was a duplicate sample anaylzed at the required frequency of 5% in this SDG?	✓			
Were all duplicate sample duplicate error rations (DER) ~~≤1.42~~? 2.58	✓			
V. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	✓			
VI. Sample Chemical/Carrier Recovery				
Was a tracer/carrier added to each sample?	✓			
Were tracer/carrier recoveries within the QC limits?	✓			
VII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
VIII. Sample Result Verification				
Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were the Minimum Detectable Activities (MDA) < RL?	✓			

Validation Area	Yes	No	NA	Findings/Comments
IX. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
X. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XI. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 18035D29
SDG #: TRNC/D-TRD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Radiochemistry (Method: see cover)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g)		RPD
	1	2	
Ra-226	1.03	1.02	1 (≤50)
Ra-228	1.67	1.97	16 (≤50)

Isotopes	Activity (pCi/g)		RPD
	6	7	
Ra-226	1.30	1.28	2 (≤50)
Ra-228	1.62	2.04	23 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC #: 18035D29
SDG #: TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Radiochemistry (Method: see cover)

Percent recoveries (%R) for a laboratory control sample, a matrix spike and a matrix spike duplicate sample were recaluculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = activity of each analyte measured in the analysis of the sample.
True = activity of each analyte in the source.

A matrix spike and matrix spike duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample activity
D = Duplicate sample activity

Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	Recalculated %R or RPD	Reported %R or RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Cs-137	7.92 (pCi/g)	7.97 (pCi/g)	99	99	Y
—	Matrix spike sample	—	—	—	—	—	—
16	Duplicate RPD	Ra-228	1.72 (pCi/g) ± 0.14 (1σ)	1.86 (pCi/g) ± 0.15 (1σ)	RER2 0.7	RER2 0.7	Y
—	Chemical recovery	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 18035D29
SDG #: TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer:

METHOD: Radiochemistry (Method: see cover)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?

Analyte results for # 11, Ra-226 reported with a positive detect were recalculated and verified using the following equation:

Activity = (cpm - bckgrd cpm) / (2.22)(E)(Vol)(CF)

E = Efficiency
Vol = Volume
CF = %R, Self-absorbance, abundance, ect.

Recalculation:

$$\frac{(1510/1000)}{(2.22)(0.03510)(0.4630)(45.80\,g)} = 0.9138\ pCi/g$$

#	Sample ID	Analyte	Reported Concentration (pCi/g)	Calculated Concentration (pCi/g)	Acceptable (Y/N)
1	1	Ra-226	1.03	1.03	Y
		Ra-228	1.67	1.66	↓
2	11	Ra-226	0.914	0.914	
		Ra-228	1.69	1.67	↓

Note:

BRC Tronox Parcel C/D
Data Validation Reports
LDC# 18035

Isotopic Uranium & Isotopic Thorium

LDC Report# 18035A59

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 13, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-3RD

Sample Identification

TSB-DR-06-0'
TSB-DR-06-10'
TSB-DR-05-0'
TSB-DR-05-0'-FD
TSB-DR-05-10'
TSB-DR-03-0'
TSB-DR-03-10'
TSB-DJ-01-0'
TSB-DJ-01-10'
TSB-DR-04-0'
TSB-DR-04-10'
TSB-CR-04-0'
TSB-CR-04-10'
TSB-CR-05-0'
TSB-CR-05-10'
TSB-CR-06-0'
TSB-CR-06-10'
RINSATE-2
TSB-DR-03-0'DUP
RINSATE-2DUP

Introduction

This data review covers 18 soil samples and 2 water samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA) with the following exceptions:

Method Blank ID	Isotope	Activity (pCi/L)	Associated Samples
PBW	U-233/234	0.313 pCi/L	All water samples in SDG TRNC/D-3RD

No sample data were qualified based on the contaminants found in the method blanks.

Sample "RINSATE-2" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Duplicate error ratios (DER) were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Isotope	RPD (Limits)	DER (Limits)	Flag	A or P
RINSATE-2DUP (All water samples in SDG TRNC/D-3RD)	U-233/234	-	4.1 (≤2.58)	J (all detects) UJ (all non-detects)	A

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Tracer Recovery

All tracer recoveries were within validation criteria.

V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-DR-05-0' and TSB-DR-05-0'-FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-DR-05-0'	TSB-DR-05-0'-FD				
Thorium-228	1.87	1.39	29 (≤50)	-	-	-
Thorium-230	0.998	1.02	2 (≤50)	-	-	-
Thorium-232	1.69	1.32	25 (≤50)	-	-	-
Uranium-233/234	0.229	0.241	-	0.01 pCi/g (≤0.6)	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-DR-05-0'	TSB-DR-05-0'-FD				
Uranium-235/236	0.0146	0.0124U	-	0.00 pCi/g (≤0.6)	-	-
Uranium-238	0.201	0.189	-	0.01 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-3RD

SDG	Sample	Isotope	Flag	A or P	Reason
TRNC/D-3RD	RINSATE-2	U-233/234	J (all detects) UJ (all non-detects)	A	Duplicate analysis (DER)

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-3RD

No Sample Data Qualified in this SDG

LDC #: 18035A59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08
SDG #: TRNC/D-3RD Level III Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer: ✓

METHOD: Isotopic Uranium (~~EPA Method 908~~/Method RICH-RC5067), Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-13-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	SW	DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 3+4
X	Field blanks	ND	R = 18

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1 [1]	TSB-DR-06-0' S	11 [1]	TSB-DR-04-10' S	21 [1]	PBS1	31	
2 [1]	TSB-DR-06-10'	12 [1]	TSB-CR-04-0'	22 [2]	PBS2 (Th)	32	
3 [1]	TSB-DR-05-0'	13 [1]	TSB-CR-04-10'	23 [3]	PBW	33	
4 [1,2]	TSB-DR-05-0'-FD	14 [1]	TSB-CR-05-0'	24		34	
5 [1]	TSB-DR-05-10'	15 [1]	TSB-CR-05-10'	25		35	
6 [1]	TSB-DR-03-0'	16 [1]	TSB-CR-06-0'	26		36	
7 [1]	TSB-DR-03-10'	17 [1]	TSB-CR-06-10'	27		37	
8 [1,2]	TSB-DJ-01-0'	18 [3]	RINSATE-2 W	28		38	
9 [1]	TSB-DJ-01-10' D	19 [1]	TSB-DR-03-0'DUP (U,Th) S	29		39	
10 [1]	TSB-DR-04-0'	20 [3]	RINSATE-2DUP (U,Th) W	30		40	

Notes: Isotopic Uranium only for # 1

LDC #: 18035A59
SDG #: TRNC/D - 3RD

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer: LA

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087

(Y) N N/A Were blank analyses performed as required? If no, please see qualifications below.
(Y) N N/A Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.

Units: pCi/L Associated Samples: all water (N.D.)

Isotope	Blank ID	Blank Action Level	Sample Identification									
	PBW		—	—	No sample was qualified					—	—	
U-233/234	0.313											

Units: _____ Associated Samples: _____

Isotope	Blank ID	Blank Action Level	Sample Identification									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
If there is activity in the blank above the MDA, sample results within 10x the blank activity will be qualified as not detected "U".

LDC #: 18035A59
SDG #: TRNC/D-3RD

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Reviewer: MG
2nd Reviewer: [signature]

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a duplicate sample analyzed the required frequency of 5% in this SDG?

Y (N) N/A Were all duplicate sample duplicate error ratio (DER) $\leq$ ~~1.42~~ 2.58 DER = $\frac{|Act_1 - Act_2|}{2\,|\delta_1^2 + \delta_2^2|^{1/2}}$ Act = sample activity δ = 1 sigma error

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Duplicate ID	Matrix	Isotope	DER (Limits)	Associated Samples	Qualifications
1	20	water	U-233/234	4.1 (≤ 2.58)	all water	J/UJ/A

Comments: _____

LDC #: 18035A59
SDG #: TRNC/D-3RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer:

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g) 3	4	RPD
Th-228	1.87	1.39	29 (≤50)
Th-230	0.998	1.02	2 (|)
Th-232	1.69	1.32	25 (↓)

Isotopes	Activity (pCi/g) 3	4	by difference ~~RPD~~
U-233/234	0.229	0.241	0.01 pCi/g (≤0.6 pCi/g)
U-235/236	0.0146	0.0124 U	0.00 ↓ (|)
U-238	0.201	0.189	0.01 ↓ (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 15, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-5RD

Sample Identification

TSB-FJ-03-0'
TSB-FJ-03-0'-FD
TSB-FJ-03-10'
TSB-FJ-10-0'
TSB-FJ-10-10'
TSB-FJ-04-0'
TSB-FJ-04-10'
TSB-FJ-02-0'
TSB-FJ-02-0'-FD
TSB-FJ-02-10'
TSB-FR-02-0'
TSB-FR-02-10'
TSB-FJ-09-0'
TSB-FJ-09-10'
TSB-FR-03-0'
TSB-FR-03-10'
RINSATE 3
TSB-FJ-03-0'DUP
TSB-FJ-03-0'-FDDUP
TSB-FR-02-0'DUP
RINSATE 3DUP

Introduction

This data review covers 19 soil samples and 2 water samples listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 3" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Tracer Recovery

All tracer recoveries were within validation criteria.

V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-FJ-03-0' and TSB-FJ-03-0'-FD and samples TSB-FJ-02-0' and TSB-FJ-02-0'-FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FJ-03-0'	TSB-FJ-03-0'-FD				
Uranium-233/234	0.479	0.685	-	0.21 pCi/g (≤0.6)	-	-
Uranium-235/236	0.00889U	0.0253	-	0.02 pCi/g (≤0.6)	-	-
Uranium-238	0.410	0.397	-	0.01 pCi/g (≤0.6)	-	-
Thorium-228	1.22	1.43	16 (≤50)	-	-	-
Thorium-230	0.958	1.31	31 (≤50)	-	-	-
Thorium-232	1.26	1.74	32 (≤50)	-	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FJ-02-0'	TSB-FJ-02-0'-FD				
Uranium-233/234	0.409	0.325	-	0.08 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0160	0.0239	-	0.01 pCi/g (≤0.6)	-	-
Uranium-238	0.391	0.278	-	0.11 pCi/g (≤0.6)	-	-
Thorium-228	1.84	1.37	29 (≤50)	-	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FJ-02-0'	TSB-FJ-02-0'-FD				
Thorium-230	1.26	1.35	7 (≤50)	-	-	-
Thorium-232	1.38	1.92	33 (≤50)	-	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-5RD

No Sample Data Qualified in this SDG

LDC #: 18035B59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-09
SDG #: TRNC/D-5RD Level III Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer:

METHOD: Isotopic Uranium (~~EPA Method 908/~~Method RICH-RC5067), Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-15-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 1+2, D = 8+9
X	Field blanks	ND	R = 17

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	TSB-FJ-03-0' S	11	TSB-FR-02-0' S	21 2	RINSATE 3DUP (U,Th) W	31	
2	TSB-FJ-03-0'-FD	12	TSB-FR-02-10'	22 1	PBS	32	
3	TSB-FJ-03-10'	13	TSB-FJ-09-0'	23 2	PBW	33	
4	TSB-FJ-10-0'	14	TSB-FJ-09-10'	24		34	
5	TSB-FJ-10-10'	15	TSB-FR-03-0'	25		35	
6	TSB-FJ-04-0'	16	TSB-FR-03-10'	26		36	
7	TSB-FJ-04-10'	17 2	RINSATE 3 W	27		37	
8	TSB-FJ-02-0'	18	TSB-FJ-03-0'DUP (U) S	28		38	
9	TSB-FJ-02-0'-FD	19	TSB-FJ-03-0'-FDDUP (Th)	29		39	
10	TSB-FJ-02-10'	20	TSB-FR-02-0'DUP (U,Th)	30		40	

Notes:

LDC #: 18035B59
SDG #: TRNC/D-5RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer:

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g) 1	2	by difference RPD
U-233/234	0.479	0.685	0.21 pCi/g (≤ 0.6 pCi/g)
U-235/236	0.00889 U	0.0253	0.02 ( )
U-238	0.410	0.397	0.01 ( )

Isotopes	Activity (pCi/g) 1	2	RPD
Th-228	1.22	1.43	16 (≤ 50)
Th-230	0.958	1.31	31 ( )
Th-232	1.26	1.74	32 ( )

Isotopes	Activity (pCi/g) 8	9	by difference RPD
U-233/234	0.409	0.325	0.08 pCi/g (≤ 0.6 pCi/g)
U-235/236	0.0160	0.0239	0.01 ( )
U-238	0.391	0.278	0.11 ( )

Isotopes	Activity (pCi/g) 8	9	RPD
Th-228	1.84	1.37	29 (≤ 50)
Th-230	1.26	1.35	7 ( )
Th-232	1.38	1.92	33 ( )

LDC Report# 18035C59

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 16, 2007

LDC Report Date: January 14, 2008

Matrix: Soil/Water

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-6RD

Sample Identification

TSB-FJ-08-0'
TSB-FJ-08-10'
TSB-FR-05-0'
TSB-FR-05-10'
TSB-FR-04-0'
TSB-FR-04-0'-FD
TSB-FR-04-10'
TSB-GR-01-0'
TSB-GR-01-5'
TSB-GJ-06-0'
TSB-GJ-06-5'
TSB-FJ-01-0'
TSB-FJ-01-10'
TSB-GJ-01-0'
TSB-GJ-01-5'
RINSATE 4
TSB-FJ-08-0'DUP
TSB-FR-05-10'DUP
TSB-FJ-01-0'DUP

Introduction

This data review covers 18 soil samples and one water sample listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 4" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Tracer Recovery

All tracer recoveries were within validation criteria.

V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

Raw data were not reviewed for this SDG.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-FR-04-0' and TSB-FR-04-0'-FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-FR-04-0'	TSB-FR-04-0'-FD				
Uranium-233/234	0.527	0.662	-	0.14 pCi/g (≤0.6)	-	-
Uranium-238	0.282	0.377	-	0.10 pCi/g (≤0.6)	-	-
Thorium-228	1.60	1.52	5 (≤50)	-	-	-
Thorium-230	1.11	0.970	13 (≤50)	-	-	-
Thorium-232	1.69	1.55	9 (≤50)	-	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-6RD

No Sample Data Qualified in this SDG

LDC #: 18035C59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08
SDG #: TRNC/D-6RD Level III Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer:

MG

METHOD: Isotopic Uranium (~~EPA Method 908~~/Method RICH-RC5067),Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-16-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP (SDG: TRNC/D-5RD)
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D= 5+6
X	Field blanks	ND	R = 16

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples:

1	TSB-FJ-08-0' S	11	TSB-GJ-06-5' S	21 1	PBS	31	
2	TSB-FJ-08-10'	12	TSB-FJ-01-0'	22 2	PBW	32	
3	TSB-FR-05-0'	13	TSB-FJ-01-10'	23		33	
4	TSB-FR-05-10'	14	TSB-GJ-01-0'	24		34	
5	TSB-FR-04-0'	15	TSB-GJ-01-5'	25		35	
6	TSB-FR-04-0'-FD	16 2	RINSATE 4 W	26		36	
7	TSB-FR-04-10'	17	TSB-FJ-08-0'DUP (Th) S	27		37	
8	TSB-GR-01-0'	18	TSB-FR-05-10'DUP (U)	28		38	
9	TSB-GR-01-5'	19	TSB-FJ-01-0'DUP (U,Th)	29		39	
10	TSB-GJ-06-0'	20		30		40	

Notes:

LDC #: 18035C59
SDG #: TRNC/D-6RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-RC-5087

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g) 5	6	by difference RPD
U-233/234	0.527	0.662	0.14 pCi/g (≤0.6 pCi/g)
U-238	0.282	0.377	0.10 ↓ (↓)

Isotopes	Activity (pCi/g) 5	6	RPD
Th-228	1.60	1.52	5 (≤50)
Th-230	1.11	0.970	13 (|)
Th-232	1.69	1.55	9 (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D

Collection Date: November 19, 2007

LDC Report Date: January 11, 2008

Matrix: Soil/Water

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III & IV

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): TRNC/D-7RD

Sample Identification

TSB-GR-02-0'**
TSB-GR-02-0'-FD**
TSB-GR-02-5'**
TSB-GJ-04-0'**
TSB-GJ-04-5'**
TSB-GJ-02-0'**
TSB-GJ-02-0'-FD**
TSB-GJ-02-5'**
TSB-GJ-07-0'**
TSB-GJ-07-5'**
TSB-GJ-05-0'**
TSB-GJ-05-5'**
TSB-GJ-03-0'**
TSB-GJ-03-5'
RINSATE 5
TSB-GJ-04-0'DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 15 soil samples and one water sample listed on the cover sheet. The analyses were per Method RICH-RC5067 for Isotopic Uranium and Method RICH-RC5087 for Isotopic Thorium.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section VIII.

Samples indicated by a double asterisk on the front cover underwent a EPA Level IV review. A EPA Level III review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level III criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

Detector efficiency was determined for each radionuclide of interest.

b. Continuing Calibration

Calibration verification and background determination were performed at the required frequencies. Results were within control limits.

III. Blanks

Method blanks were reviewed for each matrix as applicable. Blank results contained less than the minimum detectable activity (MDA).

Sample "RINSATE 5" was identified as a rinsate. No isotopic uranium or isotopic thorium was found in this blank.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) analyses were not required by the method.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

b. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

c. Tracer Recovery

All tracer recoveries were within validation criteria.

V. Minimum Detectable Activity (MDA)

All minimum detectable activities met required detection limits.

VI. Sample Result Verification

All sample result verifications were acceptable for samples on which a EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level III criteria.

VII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

VIII. Field Duplicates

Samples TSB-GR-02-0'** and TSB-GR-02-0'-FD** and samples TSB-GJ-02-0'** and TSB-GJ-02-0'-FD** were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-GR-02-0'**	TSB-GR-02-0'-FD**				
Thorium-228	1.69	1.66	2 (≤50)	-		
Thorium-230	1.17	1.10	6 (≤50)	-		
Thorium-232	1.44	1.22	17 (≤50)	-		
Uranium-233/234	0.393	0.302	-	0.09 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0240	0.0113U	-	0.01 pCi/g (≤0.6)	-	-
Uranium-238	0.292	0.295	-	0.00 pCi/g (≤0.6)	-	-

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-GJ-02-0'**	TSB-GJ-02-0'-FD**				
Thorium-228	1.64	1.87	13 (≤50)	-		
Thorium-230	1.76	1.61	9 (≤50)	-		
Thorium-232	1.42	1.44	1 (≤50)	-		

Isotope	Activity (pCi/g)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-GJ-02-0'**	TSB-GJ-02-0'-FD**				
Uranium-233/234	1.28	0.759	-	0.52 pCi/g (≤0.6)	-	-
Uranium-235/236	0.0340	0.0176	-	0.02 pCi/g (≤0.6)	-	-
Uranium-238	0.794	0.422	-	0.37 pCi/g (≤0.6)	-	-

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG TRNC/D-7RD

No Sample Data Qualified in this SDG

LDC #: 18035D59 **VALIDATION COMPLETENESS WORKSHEET** Date: 1-8-08
SDG #: TRNC/D-7RD Level III/IV Page: 1 of 1
Laboratory: Test America Reviewer: MG
2nd Reviewer:

METHOD: Isotopic Uranium (~~EPA Method 908/~~Method RICH-RC5067),Isotopic Thorium (Method RICH-RC-5087)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11-19-07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	DUP (SDG: TRNC/D-5RD)
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	A	Not reviewed for Level III validation.
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D= 1+2, D=6+7
X	Field blanks	ND	R = 15

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: ** Indicates sample underwent Level IV validation

1	TSB-GR-02-0'** S	11	TSB-GJ-05-0'** S	21		31	
2	TSB-GR-02-0'-FD**	12	TSB-GJ-05-5'**	22		32	
3	TSB-GR-02-5'**	13	TSB-GJ-03-0'**	23		33	
4	TSB-GJ-04-0'**	14	TSB-GJ-03-5'	24		34	
5	TSB-GJ-04-5'**	15 2	RINSATE 5 W	25		35	
6	TSB-GJ-02-0'**	16	TSB-GJ-04-0'DUP (Th,U) S	26		36	
7	TSB-GJ-02-0'-FD**	17 1	PBS	27		37	
8	TSB-GJ-02-5'**	18 3	PBW	28		38	
9	TSB-GJ-07-0'**	19		29		39	
10	TSB-GJ-07-5'**	20		30		40	

Notes:

LDC #: 18035D59
SDG #: TRNC/D - TRD

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Method: Radiochemistry (EPA Method RICH-RC-5067 / RICH-RC-5087

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments and detectors calibration as required?	✓			
Were NIST traceable standards used for all calibrations?	✓			
Was the check source identified by activity and radionuclide?	✓			
Were check sources including background counts analyzed at the requiried frequency and within laboratory control limits?	✓			
III. Blanks				
Were blank analyses performed as required?	✓			
Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spikes and Duplicates				
Were a matrix spike (MS) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. (Soil) / (Water)		✓		
Were the MS percent recoveries (%R) within the QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Was a duplicate sample anaylzed at the required frequency of 5% in this SDG?	✓			
Were all duplicate sample duplicate error rations (DER) ≤~~1.42?~~ 2.58	✓			
V. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	✓			
VI. Sample Chemical/Carrier Recovery				
Was a tracer/carrier added to each sample?	✓			
Were tracer/carrier recoveries within the QC limits?	✓			
VII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
VIII. Sample Result Verification				
Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were the Minimum Detectable Activities (MDA) < RL?	✓			

LDC #: 18035D59
SDG #: TRNC/D-7RD

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
IX. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
X. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XI. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 18035D59
SDG #: TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: L

METHOD: Radiochemistry (Method: RICH-RC-5067/RICH-)RC-5087

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target isotopes detected in the field duplicate pairs?

Isotopes	Activity (pCi/g) 1	2	RPD
Th-228	1.69	1.66	2 (≤50)
Th-230	1.17	1.10	6 (|)
Th-232	1.44	1.22	17 (↓)

Isotopes	Activity (pCi/g) 1	2	by difference ~~RPD~~
U-233/234	0.393	0.302	0.09 pCi/g (≤0.6 pCi/g)
U-235/236	0.0240	0.0113 U	0.01 (| |)
U-238	0.292	0.295	0.00 (↓ ↓)

Isotopes	Activity (pCi/g) 6	7	RPD
Th-228	1.64	1.87	13 (≤50)
Th-230	1.76	1.61	9 (|)
Th-232	1.42	1.44	1 (↓)

Isotopes	Activity (pCi/g) 6	7	by difference ~~RPD~~
U-233/234	1.28	0.759	0.52 pCi/g (≤0.6 pCi/g)
U-235/236	0.0340	0.0176	0.02 (| |)
U-238	0.794	0.422	0.37 (↓ ↓)

LDC #: 18035D59
SDG #: TRNC/D-TRD

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Radiochemistry (Method: SRICH-RC-5067/RICH-RC-5087

Percent recoveries (%R) for a laboratory control sample, a matrix spike and a matrix spike duplicate sample were recaluculated using the following formula:

$$\%R = \frac{\text{Found}}{\text{True}} \times 100$$

Where, Found = activity of each analyte measured in the analysis of the sample.
True = activity of each analyte in the source.

A matrix spike and matrix spike duplicate relative percent difference (RPD) was recalculated using the following formula:

$$RPD = \frac{|S-D|}{(S+D)/2} \times 100$$

Where, S = Original sample activity
D = Duplicate sample activity

Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	Recalculated %R or RPD	Reported %R or RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Th-230	2.19 (pCi/g)	2.30 (pCi/g)	95	96	Y
—	Matrix spike sample	—	—	—	—	—	—
16	Duplicate RPD	U-233/234	1.23 ± 0.12 (1σ) (pCi/g)	1.17 ± 0.11 (1σ) (pCi/g)	RER2 0.4	RER2 0.3	* N
1	Chemical recovery	Th-234	447.06 (dpm)	592.23 (dpm)	75	75	Y

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.
* Both values in limits; no qual.

LDC #: 18035D59
SDG #: TRNC/D-7RD

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: L

METHOD: Radiochemistry (Method: RICH-RC-5067 / RICH-RC-5087

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?

(Y) N N/A Are results within the calibrated range of the instruments?

Analyte results for #1, U-235/236 reported with a positive detect were recalculated and verified using the following equation:

Activity = $\frac{(cpm - bckgrd\ cpm)}{(2.22)(E)(Vol)(CF)}$

E = Efficiency
Vol = Volume
CF = %R, Self-absorbance, abundance, ect.

Recalculation:

$$\frac{(8/200.117) - (1/1000.183)}{(2.22)(0.38124)(2.01g)(0.95)} = 0.0241\ pCi/L$$

#	Sample ID	Analyte	Reported Concentration (pCi/g)	Calculated Concentration (pCi/g)	Acceptable (Y/N)
1	1	Th-228	1.69	1.70	Y
		Th-230	1.17	1.18	
		Th-232	1.44	1.45	
		U-233/234	0.393	0.395	
		U-235/236	0.0240	0.0241	
		U-238	0.292	0.293	
2	11	Th-228	1.78	1.79	
		Th-230	1.05	1.06	
		Th-232	1.90	1.90	
		U-233/234	0.440	0.443	
		U-238	0.321	0.322	

Note: