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

July 16, 2008

SUBJECT: BRC Tronox Parcel C/D/F/G, Data Validation

Dear Ms. Barajas-Albalawi

Enclosed are the final validation reports for the fractions listed below. This SDG was received on June 27, 2008. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 19034:

SDG #	Fraction
209755	Perchlorate, 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 Organic Data Review, October 1999
- 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; IIIB, November 2004; Update IV, February 2007

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

Sincerely,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

699 Pages-CD

Attachment 1

EDD 80/20

LDC #19034 (ERM-Sacramento / BRC Tronox Parcel C/D/F/G/H)

LDC	SDG#	DATE REC'D	(3) DATE DUE	CLO_4 (314.0)		Ra-226 (903.1)		Ra-228 (904.0)		Iso. Th (300)		Iso. U (300)																							
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	209755	06/27/08	07/21/08	0	5	0	5	0	5	0	5	0	5																						
A	209755	06/27/08	07/21/08	0	1	0	1	0	1	0	1	0	1																						
Total	T/LR			0	6	0	6	0	6	0	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30

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

19034ST.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D/F/G/H

Collection Date: June 4, 2008

LDC Report Date: July 11, 2008

Matrix: Soil

Parameters: Perchlorate

Validation Level: EPA Level III & IV

Laboratory: GEL Laboratories, LLC.

Sample Delivery Group (SDG): 209755

Sample Identification

TSB-GJ-09-0
TSB-GJ-09-FD-0
TSB-GJ-08-0
TSB-FJ-06-2-0**
TSB-FR-02-02-0
TSB-FJ-02-02-0
TSB-GJ-09-0MS
TSB-GJ-09-0MSD
TSB-GJ-09-0DUP

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 9 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 314.0 for Perchlorate.

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 IX.

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.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. 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.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

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.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No perchlorate was found in the initial, continuing and preparation blanks.

No field blanks were identified in this SDG.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

V. Duplicates

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

VI. Laboratory Control Samples

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

VII. 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.

VIII. Overall Assessment of Data

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

IX. Field Duplicates

Samples TSB-GJ-09-0 and TSB-GJ-09-FD-0 were identified as field duplicates. No perchlorate was detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/Kg)		RPD (Limits)	Difference (Limits)	Flag	A or P
	TSB-GJ-09-0	TSB-GJ-09-FD-0				
Perchlorate	138000	124000	11 (≤50)	-	-	-

BRC Tronox Parcel C/D/F/G/H
Perchlorate - Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H
Perchlorate - Laboratory Blank Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H
Perchlorate - Field Blank Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

LDC #: 19034A6 **VALIDATION COMPLETENESS WORKSHEET** Date: 7-10-08
SDG #: 209755 Level III/IV Page: 1 of 1
Laboratory: GEL Laboratories LLC Reviewer: MG
2nd Reviewer: W

METHOD: (Analyte) Perchlorate (EPA Method 314.0)

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: 6-4-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (SDG: 209765)
V	Duplicates	A	DUP (↓)
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	A	Not reviewed for Level III validation.
VIII.	Overall assessment of data	A	
IX.	Field duplicates	SW	D = 1+2
X	Field blanks	N	

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
all Soil

1	TSB-GJ-09-0	11		21		31	
2	TSB-GJ-09-FD-0	12		22		32	
3	TSB-GJ-08-0	13		23		33	
4	TSB-FJ-06-2-0**	14		24		34	
5	TSB-FR-02-02-0	15		25		35	
6	TSB-FJ-02-02-0	16		26		36	
7	TSB-GJ-09-0MS	17		27		37	
8	TSB-GJ-09-0MSD	18		28		38	
9	TSB-GJ-09-0DUP	19		29		39	
10	PBS	20		30		40	

Notes: _____

LDC #: 19034A6
SDG #: 209755

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer:

Method: Inorganics (EPA Method 314.0)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) 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/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 19034A6
SDG #: 209755

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 19034A6
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd reviewer: W

METHOD: Inorganics, Method 314.0

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

Analyte	Concentration (ug/kg) 1	Concentration (ug/kg) 2	RPD (Limit)	Difference (Limit)	Qualifier
ClO_4	138000.	124000.	11 (≤ 50)		

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

Analyte	Concentration ( )		RPD (Limit)	Difference (Limit)	Qualifier

LDC #: 19034A6
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

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

METHOD: Inorganics, Method 314.0

The correlation coefficient (r) for the calibration of ClO_4 was recalculated. Calibration date: 6-17-08

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

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

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte		Conc (units)	Area (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	ClO_4	Blank	0.0 (µg/L)	0	$r^2 = 0.999617$	$r^2 = 0.999617$	Y
Calibration verification		Standard 1	4.0 (|)	4841			
		Standard 2	10.0 (|)	13177			
		Standard 3	25.0 (|)	32298			
		Standard 4	50.0 (|)	68365			
		Standard 5	100.0 (↓)	140138			
		Standard 6	–	–			
		Standard 7	–	–			
Calibration verification	ClO_4	1201 CCV	75.56 (µg/L)	75 (µg/L)	101	101	↓
Calibration verification	–	–	–	–	–	–	–
Calibration verification	–	–	–	–	–	–	–

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

LDC #: 19034A6
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method 314.0

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

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

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

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1848 LCS	Laboratory control sample	ClO_4	498.6 (µg/kg)	500 (µg/kg)	100	100	Y
1314 7	Matrix spike sample	ClO_4	(SSR-SR) -7991.9 (µg/kg)	101 (µg/kg)	-7913	not reported	↓
1237 /1256 9	Duplicate sample	ClO_4	138441.9 (µg/kg)	136519.8 (µg/kg)	1	1	↓

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 #: 19034A6
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method 314.0

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?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #4, ClO_4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $Y = mx + b$
where $m = 0.0007116$
$b = 0.8054$
$dil = 200x$

Recalculation:
$ClO_4 = 200\,[0.0007116\,(47181) + 0.8054]$
$= 6875.88$ mg/L
then $\rightarrow \frac{(6875.88\ mg/L)(0.040L)}{(0.00404\ kg)(0.984)} = 69184.98\ mg/kg$

#	Sample ID	Analyte	Reported Concentration (mg/kg)	Calculated Concentration (mg/kg)	Acceptable (Y/N)
1.	4	ClO_4	69200.	69200.	Y

Note: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D/F/G/H

Collection Date: June 4, 2008

LDC Report Date: July 10, 2008

Matrix: Soil

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III & IV

Laboratory: GEL Laboratories, LLC.

Sample Delivery Group (SDG): 209755

Sample Identification

TSB-GJ-09-0
TSB-GJ-09-FD-0
TSB-GJ-08-0
TSB-FJ-06-2-0**
TSB-FR-02-02-0
TSB-FJ-02-02-0

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 6 soil samples listed on the cover sheet. The analyses were per EPA Method 903.1 modified for Radium-226 and EPA Method 904.0 modified 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).

No field blanks were identified in this SDG.

IV. Accuracy and Precision Data

a. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

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.

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-GJ-09-0 and TSB-GJ-09-FD-0 were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

Isotope	Concentration (pCi/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	TSB-GJ-09-0	TSB-GJ-09-FD-0				
Radium-228	2.32	0.850	-	1.470 (≤1.00)	J (all detects)	A
Radium-226	1.07	0.920	-	0.150 (≤1.00)	J (all detects)	A

BRC Tronox Parcel C/D/F/G/H
Radium-226 & Radium-228 - Data Qualification Summary - SDG 209755

SDG	Sample	Isotope	Flag	A or P	Reason
209755	TSB-GJ-09-0 TSB-GJ-09-FD-0	Radium-228 Radium-226	J (all detects) J (all detects)	A	Field duplicates (difference)

BRC Tronox Parcel C/D/F/G/H
Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H
Radium-226 & Radium-228 - Field Blank Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

LDC #: 19034A29 **VALIDATION COMPLETENESS WORKSHEET** Date: 7-10-08

SDG #: 209755 Level III/IV Page: 1 of 1

Laboratory: GEL Laboratories LLC Reviewer: MG

qm B 2nd Reviewer: ✓

Mod Mod

METHOD: Radium 226 (EPA Method 903.1~~/GL-RAD-A-008 REV #12)~~ Radium 228 (EPA Method 904.0~~/GL-RAD-A-009 REV#14)~~

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: 6-4-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD/DUP (SDG: 209765)
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	
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
XIV	Field blanks	N	

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

all soil

1	TSB-GJ-09-0	11		21		31	
2	TSB-GJ-09-FD-0	12		22		32	
3	TSB-GJ-08-0	13		23		33	
4	TSB-FJ-06-2-0**	14		24		34	
5	TSB-FR-02-02-0	15		25		35	
6	TSB-FJ-02-02-0	16		26		36	
7	PBS	17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 19034A29
SDG #: 209755

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: W

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 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) $\leq$1.42?.	✓			
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 #: 19034A29
SDG #: 209755

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: V

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 #: 19034A29
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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	Activity (pCi/g) 2	by difference Qual parent only ~~RPD~~
Ra-228	2.32	0.850	1.470 pCi/g (≤1.00) J dets/A
Ra-226	1.07	0.920	0.150 ↓ (↓)

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC #: 19034A29
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [signature]

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:

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

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	Ra-226	11.5 (ug/kg)	11.1 (ug/kg)	104	103	Y
TRX-HR-04-0 MS	Matrix spike sample	Ra-226	11.39 (ug/kg)	11.8 (ug/kg)	97	96	
TRX-HR-04-0 DUP	Duplicate RPD	Ra-228	2.93 (ug/kg)	2.35 (ug/kg)	22	22	
4	Chemical recovery	Ba-133 for Ra-228	323.5 (cpm)	327.2 (cpm)	99	99	

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 #: 19034A29
SDG #: 209755

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 #4, Ra-228 reported with a positive detect were recalculated and verified using the following equation:

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

Recalculation:

$$\frac{(228/70) - 0.640}{(2.22)(0.6416)(0.5000_g)(0.9887)} \times \frac{1}{0.995} \times \frac{1}{0.735} \times 1.067 = 5.423 \text{ pCi/g}$$

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

#	Sample ID	Analyte	Reported Concentration (pCi/g)	Calculated Concentration (pCi/g)	Acceptable (Y/N)
1	4	Ra-228	5.43	5.42	Y
		Ra-226	1.53	1.54	↓

Note: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: BRC Tronox Parcel C/D/F/G/H

Collection Date: June 4, 2008

LDC Report Date: July 10, 2008

Matrix: Soil

Parameters: Isotopic Uranium & Isotopic Thorium

Validation Level: EPA Level III & IV

Laboratory: GEL Laboratories, LLC.

Sample Delivery Group (SDG): 209755

Sample Identification

TSB-GJ-09-0
TSB-GJ-09-FD-0
TSB-GJ-08-0
TSB-FJ-06-2-0**
TSB-FR-02-02-0
TSB-FJ-02-02-0

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers 6 soil samples listed on the cover sheet. The analyses were per DOE EML HASL-300 Method and U-02-RC Method modified for Isotopic Uranium and DOE EML HASL-300 Method and Th-01-RC Method modified 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.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. 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.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

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/g)	Associated Samples
PBS	Thorium-228	0.342	All samples in SDG 209755

Sample concentrations were compared to concentrations detected in the method blanks as required by the QAPP. No sample data was qualified.

No field blanks were identified in this SDG.

IV. Accuracy and Precision Data

a. Matrix Spike/(Matrix Spike) Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

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 EPA 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-GJ-09-0 and TSB-GJ-09-FD-0 were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

Isotope	Concentration (pCi/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	TSB-GJ-09-0	TSB-GJ-09-FD-0				
Thorium-228	1.51	1.76	-	0.25 (≤1.00)	-	-
Thorium-230	0.933	1.03	-	0.097 (≤1.00)	-	-
Thorium-232	1.28	1.52	-	0.24 (≤1.00)	-	-
Uranium-233/234	1.41	1.18	-	0.23 (≤1.00)	-	-
Uranium-233/234	0.897	0.659	-	0.238 (≤1.00)	-	-

BRC Tronox Parcel C/D/F/G/H
Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H
Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H
Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG 209755

No Sample Data Qualified in this SDG

LDC #: 19034A59 **VALIDATION COMPLETENESS WORKSHEET** Date: 7-10-08
SDG #: 209755 Level III/IV Page: 1 of 1
Laboratory: GEL Laboratories LLC Reviewer: MG
2nd Reviewer: ✓

METHOD: Isotopic Uranium (DOE EML HASL-300, U-02-RC Modified),Isotopic Thorium (DOE EML HASL-300, Th-01-RC Modified)

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: 6-4-08
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD/DUP (SDG: 209765)
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
X.	Field blanks	N	

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
all soil

1	TSB-GJ-09-0	11		21		31	
2	TSB-GJ-09-FD-0	12		22		32	
3	TSB-GJ-08-0	13		23		33	
4	TSB-FJ-06-2-0**	14		24		34	
5	TSB-FR-02-02-0	15		25		35	
6	TSB-FJ-02-02-0	16		26		36	
7	PBS	17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 19034A59
SDG #: 209755

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

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 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) $\leq$1.42?.	✓			
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 #: 19034A59
SDG #: 209755

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 #: 19034A59
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Radiochemistry (Method: See cover)

(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/g Associated Samples: all

Isotope	Blank ID	Blank Action Level	Sample Identification									
	PBS		—	—	No samples were qualified				—	—	—	
< RL Th-228	0.342											

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 #: 19034A59
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: MG
2nd reviewer: [signature]

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	Activity (pCi/g) 2	by difference RPD ~~RPD~~
Th-228	1.51	1.76	0.25 pCi/g (≤ 1.00)
Th-230	0.933	1.03	0.097 ( )
Th-232	1.28	1.52	0.24 ( )
U-233/234	1.41	1.18	0.23 ( )
U-238	0.897	0.659	0.238 ( )

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

Isotopes	Activity ( )		RPD

LDC #: 19034A59
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [signature]

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	Th-232	6.59 (pCi/g)	7.00 (pCi/g)	94	94	Y
TRX-HR-04-0 MS	Matrix spike sample	U-238	8.35 (pCi/g)	9.53 (pCi/g)	88	88	
TRX-HR-04-0 DUP	Duplicate RPD	Th-228	1.99 (pCi/g)	1.72 (pCi/g)	15	15	
4	Chemical recovery	U-232	4.96855 (dpm)	5.31040 (dpm)	94	94	

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 #: 19034A59
SDG #: 209755

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

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 #4 Th-228 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:

$$\frac{*\ \text{Corrected net area (tracer impurity)}}{(2.22)(E)(Vol)(CF)} = \frac{*(82.572/240)}{(2.22)(0.313315)(0.279\,g)(0.92838)(0.9994)} = 1.911\ pCi/g$$

#	Sample ID	Analyte	Reported Concentration (pCi/g)	Calculated Concentration (pCi/g)	Acceptable (Y/N)
1	4	Th-228	1.94	1.91	Y
		Th-230	1.01	1.01	
		Th-232	1.72	1.72	
		U-233/234	1.11	1.11	
		U-238	1.15	1.15	

Note: _____