

# LABORATORY DATA CONSULTANTS, INC.

7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

July 31, 2008

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

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

Dear Ms. Barajas-Albalawi

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on July 17, 2008. Attachment 1 is a summary of the samples that were reviewed for each analysis.

#### LDC Project # 19125:

\_ \_\_ \_\_ ...

<u>SDG #</u>	Fraction
210150, 210228, 210334	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,

Erlinda T. Rauto Operations Manager/Senior Chemist

			T		T	1			1	-	Y	- T-	-	-	-		_	-	-		-		-			_	_			_				_	_	
			Ľ																																110	
		<b></b>	≧		+	+.	-	+	_		╞	_					-																		0	
			v.							-	⊥				ļ													L							0	
		<u> </u>	∣≥	:		ļ					$\bot$																								0	
			0	<u>'</u>																															0	
		L	3	Ŀ																							Γ			Γ		Γ			0	
			v.	, 																										Γ					0	
			≥																			Γ						Γ			Ī			Π	0	
			v,																									1				1			0	
			3																	Γ	Γ		Γ	Γ						1					0	
			_ v																					Γ					1						0	
	ÎÎ		∣≥																		Ι														0	
	0		S															Τ		Τ	Γ														0	
	H۲		≥															Γ	Τ	Γ	Τ	Γ													0	
	อิ		S																																~	
	Ce		≥													Γ		Γ																	0	
	Par		S													Γ						Τ													0	Č
	Ň		<u> </u> ≥																		Γ	Γ	1												0	ļ
	ŭ		S																			Γ													0	
	LDC #19125 (ERM-Sacramento / BRC Tronox Parcel C/D/F/G/H)		3																			Γ													0	-
nt 1	N N N		S																	Γ		Γ													0	
Attachment 1			≥																		$\square$									-					0	
ttac	1 Se		s S																	Γ			1												0	4
٩	a a a		3								1							╞	F	┢	$\vdash$	$\square$											-		-	
	cra	6_0	S	6	0.1 10	∞	~					┢				$\square$		┢	1-		†														20	
	Sa	[ <u>s</u> o. 300 ⊂	3	0	0	-	-					$\square$					Γ				$\square$	$\uparrow$	<b> </b>					-							2	Thee
	Ň	4-0	S	9			2		$\square$			1				$\square$		$\square$			1-	┢													20	(uni
	U.	300 ⊐ Iso	3	0	i a	-	-					<u> </u>											†										$\square$		2	chiler
	25	228 L.0)	S	۵		ø	2															┢													20	
	19	Ra-228 (904.0)	≥	0	0	1	-																											-+	2	ve le
	# U	Ra-226 (903.1)	S	9		8	2																					i			_			_	ខ្ល	die an
	2	(90 (90	≥	0		1	1																		_							_			2	2 Z
		0,0 (0,0	S	9		8	2																												8	
		CLO4 (314.0)	3	0	0	1	-																Π											_	~	ation (
						7/08	7/08																		-1									+	╢	Shaded cells indicate Level IV validation (all other cells are Level IIII validation). These samue counts do not inducte MS Arch. 200 Disc
		(3) DATE DUE		08/07/08	08/07/08	08/07/08	08/07/08																													lei V
		щĢ																-														-	_	-+		te Lev
	_	DATE REC'D		07/17/08	07/17/08	07/17/08	07/17/08																													indica
es-C[	80/20			_	-	-	_							_										-	-		$\dashv$				-	-	-	-+		sleo
2,681 Pages-CD	~	洗	'/Soil	22	20	38	8																													aded
2,681	EDD	*908	Water/Soil	210150	210150	210228	210334																												1/LR	ų
							-																													
		LDC	Matrix:	٩	۲	æ	ပ																					╡	_			╡	+	+	otal	

## LDC Report# 19125A6

# Laboratory Data Consultants, Inc. Data Validation Report

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

Collection Date: June 10, 200	3
-------------------------------	---

LDC Report Date: July 29, 2008

Matrix: Soil

Parameters: Perchlorate

Validation Level: EPA Level III & IV

Laboratory: GEL Laboratories, LLC.

## Sample Delivery Group (SDG): 210150

#### Sample Identification

TSB-FJ-06-02-10\*\* TSB-FJ-06-02-20 TSB-FJ-06-02-30\*\* TSB-FR-02-02-10 TSB-FR-02-02-10-FD TSB-FR-02-02-20\*\* TSB-FR-02-02-30 TSB-FJ-02-02-20 TSB-FJ-02-02-30

\*\*Indicates sample underwent EPA Level IV review

#### Introduction

This data review covers 10 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-FR-02-02-10 and TSB-FR-02-02-10-FD were identified as field duplicates. No perchlorate was detected in any of the samples with the following exceptions:

	Concentra	ation (ug/Kg)					
Analyte	TSB-FR-02-02-10	TSB-FR-02-02-10-FD	RPD (Limits)	Difference (Limits)	Flag	A or P	
Perchlorate	62.8	61.0	-	1.8 (≤46.1)	-	-	

# BRC Tronox Parcel C/D/F/G/H Perchlorate - Data Qualification Summary - SDG 210150

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H Perchlorate - Laboratory Blank Data Qualification Summary - SDG 210150

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H Perchlorate - Field Blank Data Qualification Summary - SDG 210150

No Sample Data Qualified in this SDG

19125A6W.wpd	

## VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Date: 7-22-03 Page:\_\_\_of\_\_\_ Reviewer: MG 2nd Reviewer: \_\_\_\_\_

#### 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** 6-10-03 A 1. Technical holding times Sampling dates: A lla. Initial calibration llb А Calibration verification A III. Blanks (SDGs: 210228, A MS/MSD 210334 IV Matrix Spike/Matrix Spike Duplicates A v DUP Ł L Duplicates А LCS VI. Laboratory control samples A VII. Sample result verification Not reviewed for Level III validation. A VIII. Overall assessment of data SW D = 4 + 5IX. Field duplicates N X Field blanks

A = Acceptable Note: N = Not provided/applicable SW = See worksheet

ND = No compounds detected R = Rinsate

FB = Field blank

D = Duplicate TB = Trip blank EB = Equipment blank

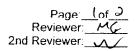
Validated Samples: \*\* Indicates sample underwent Level IV validation all soil

	UII 3011					
1	TSB-FJ-06-02-10**	11	PBS	21	31	
2	TSB-FJ-06-02-20	12		22	32	
3	TSB-FJ-06-02-30**	13		23	33	
4	TSB-FR-02-02-10	14		24	34	
5	TSB-FR-02-02-10-FD	15		25	35	
6	TSB-FR-02-02-20**	16		26	36	
7	TSB-FR-02-02-30	17		27	37	
8	TSB-FJ-02-02-10**	18		28	38	
9	TSB-FJ-02-02-20	19		29	39	
10	TSB-FJ-02-02-30	20		30	40	

Notes:

LDC #: 19125A6 SDG #: 210150 Laboratory: GEL Laboratories LLC -

#### VALIDATION FINDINGS CHECKLIST



# Method: Inorganics (EPA Method 314.0)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times		эк. УК. Ас	ê îrê:	Sealer Helling and the
All technical holding times were met.	1			
Coolcr tomporeturo critorie was met.				
II. Calibration			<u>14.</u>	
Were all instruments calibrated daily, each set-up time?				
Were the proper number of standards used?	1		ļ	
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)	<b> </b>			
Were balance checks performed as required? (Level IV only)				
Was a method blank associated with every sample in this SDG?	$\checkmark$			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.				
IV Maux spike/Matrix spike duplicates and Duplicates			5.	
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.	1			
Were the MS/MSD or duplicate relative percent differences (RPD) $\leq$ 20% for waters and $\leq$ 35% for soil samples? A control limit of $\leq$ CRDL( $\leq$ 2X CRDL for soil) was used for samples that were $\leq$ 5X the CRDL, including when only one of the duplicate sample values were $\leq$ 5X the CRDL.	/			
V Laboratory Control samples				
Was an LCS anaylzed for this SDG?	$\checkmark$			
Was an LCS analyzed per extraction batch?	$\checkmark$			
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?		$\checkmark$	$\square$	
Were the performance evaluation (PF) samples within the acceptance limits?		[	~	

Page: 2 of 2 Reviewer: <u>MG</u> 2nd Reviewer: <u>M</u>

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Ventication	Ļ			
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 date				
Overall assessment of data was found to be acceptable.	$\checkmark$			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	1			
Target analytes were detected in the field duplicates.	1			
X. Field blanks				
Field blanks were identified in this SDG.		$\checkmark$		
Target analytes were detected in the field blanks.			$\checkmark$	

LDC #: 19125A6 SDG #: 210150

# VALIDATION FINDINGS WORKSHEET Field Duplicates

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

METHOD: Inorganics, Method 314.0

( <u>Y)n n/a</u> ( <u>Y)n n/a</u>	Were field duplicate pairs identified in this SDG?
<u>(Y)n n/a</u>	Were target analytes detected in the field duplicate pairs?

	Concentration	(mg/kg)			
Analyte	4	5	RPD (Limit)	Difference (Limit)	Qualifier
CIOy	62.8	61.0		1.8  mg/kg (= 46.1)	
				1	

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

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

Concentration (	)			
		RPD (Limit)	Difference (Limit)	Qualifier
		·····		
	Concentration (	Concentration ( )		

The correlation conflictent (i) for the calibration of	METHOD: Inorganics, Method		314.0						2nd Reviewer:
Thild of contructing calibration variation percent records (36) was recalculated for each type of analyse uning the following formula:         Sin = failed x to Tran       Weak, Fourtal = concentration of each analyse that (3/C or COX eaches)       Tran = concentration of each analyse that (3/C or COX eaches)         Sin = failed x       Meak, Fourtal = concentration of each analyse that (3/C or COX eaches)       Tran = concentration of each analyse that (3/C or COX eaches)       Tran = concentration of each analyse that (3/C or COX eaches)       Tran = concentration of each analyse that (3/C or COX eaches)         The of Athysis       Analyse       Conc.       Mark (1)       Vision       Tran = concentration of each analyse that (3/C or COX eaches)         The of Athysis       Analyse       Analyse       Analyse       Analyse       Analyse (1)       Tran = concentration of each analyse that (3/C or COX eaches)         The of Athysis       Analyse       Analyse       Analyse (1)       Y = 2, 0, 9134, 17       Y = 2, 0, 9134,	The correlation coeffic	sient (ı) for the c	alibration of	CIJ4	Was rec	alculated. Calibratic		08	
Main         Fourth - Construction of each analyte Internated in the analyte Internated in the construction of each analyte Internated in the construction of each analyte Internation of each each analyte Internation of each analyte Internation of each and and each each analyte Internation of each each and each each each each each each each each	An initial or continuing	j calibration veri	fication percent	recovery (%R)	was reca	iculated for each ty	pe of analysis using	the following form:	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	%R <del>= <u>Found</u> x 100</del> True	Where, Found True -	<ul> <li>concentration of</li> <li>concentration of</li> </ul>	each analyte <u>mea</u> each analyte in the	<u>isured</u> in the	emalysis of the ICV or ( source	CV solution	D	
The of AnalysisAnalysisConst. (man) $A - c c manAccentationInitial cultimationBlackc - c - (4g/L)d - c c manrevertinerevertineInitial cultimationBlackc - c - (4g/L)d - g - c - (1 - 1)d - g - c - (1 - 1)d - c - c - (1 - 1)Calibration verticationBlack1 - c - (1 - 1)d - g - c - (1 - 1)d - g - c - (1 - 1)d - c - c - c - c - c - c - c - c - c - $									
Initial calibration calibrationBinetic to 00.0( $R_3(L)$ to 00Calibration variations9.013.1779.941Seroferi 11.0.01.31773.3.393Surderi 27.01.0.01.0Surderi 35.01.0.01.0Surderi 450.01.01.140139Surderi 5100.01.01.140139Surderi 60.01.1401399.7Surderi 60.09.11.40139Surderi 60.00.11.101Surderi 70.01.100Surderi 80.00.1C 10C 101.3C 101.1367.5C 101.1367.5C 101.1367.5C 101.021.02C 101.021.02C 101.1367.5C 101.021.02C 101.021.02C 100.11.02C 101.021.02C 101.021.02C 100.11.02C 101.021.02C 100.11.02C 100.11.02C 100.11.02C 100.11.02C 100.11.02C 100.11.02C 100.11.02C 100.11.02C 100.1C 100.1C 100.1C 100.1 <t< th=""><th>Type of Analysis</th><th>Analyte</th><th></th><th></th><th>(unite)</th><th></th><th>Recalculated r or %R</th><th>Reported r or %R</th><th>Acceptable (V/N)</th></t<>	Type of Analysis	Analyte			(unite)		Recalculated r or %R	Reported r or %R	Acceptable (V/N)
Calibration         Spectrat $4,0$ $4,3$ $4,3$ $4,3$ $4,3$ $4,3$ $4,3$ $4,3$ $4,3$ $4,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,3$ $1,4$ $1,4$ $1,3$ $1,4$ $1,4$ $1,4$ $1,3$ $1,4$	Initial calibration		Blenk		(mg /r)	0			
$ \left( \begin{array}{c c c c c c c c c c c c c c c c c c c $	Calibration verification		Standard 1			4841			
$C [ O_{i_1}$ Surdate a Standard 5 $7.0$ $(1)$ $32.93$ $c.33.55$ $r^2$ $0.949_{G17}$ $r^2$ $r^2$ $0.949_{G17}$ $\gamma$ Surdater 5 $100.0$ $(1)$ $140133$ $140133$ $30.94_{G17}$ $r^2$ $r^2$ $249_{G17}$ $\gamma$ Sundator 6 $100.0$ $(1)$ $140133$ $37.0$ <td></td> <td></td> <td>Standard 2</td> <td>10.0</td> <td>( 1 )</td> <td>13177</td> <td></td> <td></td> <td></td>			Standard 2	10.0	( 1 )	13177			
C [ $O_{41}$ Bandrate (a)       So.0       (1) $c_{33}c_{5}$ $c_{0}$ $c_{33}c_{5}$ $c_{0}$ $c_{33}c_{5}$ $c_{0}$ $c_{33}c_{5}$ $c_{0}$ $c_{33}c_{5}$ $c_{0}$ $c_{1}c_{23}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{23}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{1}c_{2}c_{1}$ $c_{2}c_{1}c_{1}c_{1}c_{1}c_{1}c_{1}c_{1}c_{1$			Standard 3	25.0	](   )			6	
Standard E         (10).0         (1)         14/01230           Standard E         Standard E         - <td></td> <td>CIOH</td> <td>Standard 4</td> <td>50.0</td> <td>( )</td> <td></td> <td></td> <td>r=0.9999617</td> <td>&gt;</td>		CIOH	Standard 4	50.0	( )			r=0.9999617	>
Shardard F         - <th< td=""><td></td><td></td><td>Standard 5</td><td>100.0</td><td>( 1)</td><td>Γ</td><td></td><td></td><td></td></th<>			Standard 5	100.0	( 1)	Γ			
Collimation writeation       Standard 7       Standard 7 <thstandard 7<="" th="">       Standard 7       S</thstandard>	<del></del>		Stenderd 6	3		J	•		
Calibration verification $C_1O_4$ $C_cV$ $24$ , $24$ , $(ug_1L)$ $35$ . $(ug_1L)$ $q_7$ $q_7$ $q_7$ Calibration verification $c_1O_4$ $CcV$ $76$ , $51$ , $(ug_1L)$ $75$ . $(ug_1L)$ $102$ $102$ $102$ Calibration verification $c_1O_4$ $CcV$ $76$ , $51$ , $(ug_1L)$ $75$ . $(ug_1L)$ $102$ $102$ $102$ Calibration verification $c_1O_4$ $CcV$ $76$ , $51$ , $(ug_1L)$ $75$ . $(ug_1L)$ $102$ $10$			Stendard 7	)		,			
CIO 4       CC V $\partial H$ , $\partial H$ ( $ug(L)$ ) $\partial S$ . ( $ug(L)$ ) $\partial T$ $\partial T$ $\partial T$ Cellbration verification       c1Ou       CC V $\partial H$ , $\partial H$ $\partial T$ $\partial T$ $\partial T$ Callbration verification       c1Ou       CC V $76.51$ ( $ug(L)$ ) $75.$ ( $ug(L)$ ) $10.2$ $10.2$ $10.2$ Callbration verification $C$ $76.51$ ( $ug(L)$ ) $75.$ ( $ug(L)$ ) $10.2$ $10.2$ $10.2$ Callbration verification $C$ $76.51$ ( $ug(L)$ ) $75.$ ( $ug(L)$ ) $10.2$ $10.2$ $10.2$ Comments: Refer to Callbration Verification findings worksheet for list of qualifications and essociated samples when reported results do not agree within 10. $CALCLOB$ $CALCLOB$	Calibration verification		1639						
Calibration       (136       (136 $(136)$ $(136)$ $(136)$ $(136)$ $(136)$ $(136)$ $(136)$ $(102)$ $(102)$ $(102)$ Calibration verification       Colloration       Colloration $(136)$ $(136)$ $(136)$ $(102)$		c104	CCV	he.he	(~1 Gm)	-	67	47	
c $lO_{4}$ CC/       76.51 ( $\mu g/L$ )       75. ( $\mu g/L$ )       102       102       102         Calibration verification       Comments: Refer to Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.       Control       Contro	Celibration vertilcation		1136						
Calibration verification Gomments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10. of the recalculated results.		cloy	CCV	76.51	(mg/r)			102	→ 
Comments: Refer to Calibration Vertification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10. of the recalculated results.	Calibration verification	)		1.		).			
CALCLO.6	Comments: Refer to of the recalculated n	o Calibration Vel esults.	rtfication finding	s worksheet foi	r list of qu	alifications and ass	l ociated samples whe	l an reported results	l do not agree within 10.0
CALCLO.B									
	CALCLO.B		•.		•				
				•					
				·					•

.

	Page:   of   Reviewer: ~^(	2nd Reviewer:		concentration of each analyte <u>measured</u> in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result). concentration of each analyte in the source.		•	Reported	¥0		۹۵ ۲			6	R	qualifications and associated samples when reported results do not agree within 10.0% of the recalculated	
	t ET		listing the following	he analysis of the s ample result).	ä	· · · · · ·	Recalculated	%R / RPD		96		114		3	orted results do no	
	VGS WORKSHE ation Workshee		le were recalculated	alyte <u>measured</u> in the mple result) - SR (st alyte in the source.	the following formula	ation tration		(units)		500 (ug/ug)	8	231 (mg/m)	20	406 (mg/mg)	l samples when rep	
	VALIDATION FINDINGS WORKSHEET Level IV Recalculation Worksheet	-	a matrix spike samp	concentration of each analyte <u>measured</u> in the analysis o Found = SSR (spiked sample result) - SR (sample result). concentration of each analyte in the source.	PD) was recalculated using the following formula:	Original sample concentration Duplicate sample concentration	Found / S	(units)		421.6 (mg/m) 500 (mg/m)	(ssr-sr)	263 (mg/kg)	\$	393 (mg/mg) 406 (mg/mg)	UI tions and associated	
•	VAL	0	introl sample and	Found = conc Foun True = conc	ference (RPD) was			Element	- - -	C104		CION		CIOH	for list of qualifice	
	A O	ics, Method $3/4.0$	Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following to	o Where, Found	A sample and duplicate retative percent difference (R	00 Where, S = D =		lype of Analysis	Laboratory control sample		Matrix spike sample		Duplicate sample		Comments: Refer to appropriate worksheet for list of results.	
	LDC #: 19135A (5 SDG #: 21015 ()	METHOD: Inorganics, Method	Percent recoveries	%R = <u>Found</u> x 100 True	A sample and dupliv	RPD = <u>1S-D1</u> x 100 Where, (S+D)/2			Seri	<b>LCS</b>	0152	TSB-CJ-09-0 MS	0115/0133	758- cJ-09-0	Comments: Refer to results.	

.

•

LDC #: <u>19125</u>A6 SDG #: <u>21015</u>0

## VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:	of
Reviewer:	MG
2nd reviewer:	

METHOD: Inorganics, Method 314.0

Please see qua	difications 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?
(Ŷ) N N/A	Are results within the calibrated range of the instruments?
( <u>) N N/A</u> ( <u>) N N/A</u>	Are all detection limits below the CRQL?

Compound (analyte) results for  $\pm 1$ ,  $C1O_4$  reported with a positive detect were recalculated and verified using the following equation:

Concent Y Whe	ration = = M×+6 we M= 3.00071 6= 0.3054 di1= 10x	Recalculation: $CIO_{4} Mg/L = IO[0.0007]$ IG = 339.79 Mg/L $fhen \frac{(339.79 Mg/L)}{(0.004 Kg)}$	g/L		Mg/Kg
#	Sample ID	Analyte	Reported Concentration (Mg/Kg)	Calculated Concentration $(\mathcal{M}^{\mathcal{M}}_{\mathcal{J}}/\mathcal{K}_{\mathcal{Q}})$	Acceptable (Y/N)
(	1	CIQU	3620	3620	Ý
		······································			
		· · · · · · · · · · · · · · · · · · ·			
				ļ	
			+		
				1	
ļ					
L	l				

Note:\_

#### LDC Report# 19125B6

# Laboratory Data Consultants, Inc. Data Validation Report

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

LDC Report Date: July 30, 2008

Matrix: Soil/Water

Parameters: Perchlorate

Validation Level: EPA Level III

Laboratory: GEL Laboratories, LLC.

Sample Delivery Group (SDG): 210228

#### Sample Identification

TSB-GJ-08-10 TSB-GJ-08-20 TSB-GJ-08-30 TSB-GJ-08-40 TSB-GJ-09-10 TSB-GJ-09-20 TSB-GJ-09-30 TSB-GJ-09-40 Rinsate 1 TSB-GJ-08-10MS TSB-GJ-08-10MSD TSB-GJ-08-10DUP

#### Introduction

This data review covers 11 soil samples and one water sample 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.

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.

Sample "Rinsate 1" was identified as a rinsate. No perchlorate was found in this blank.

#### 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) and relative percent differences (RPD) were within QC limits.

#### VII. Sample Result Verification

Raw data were not reviewed for this SDG.

#### VIII. Overall Assessment of Data

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

# IX. Field Duplicates

No field duplicates were identified in this SDG.

## BRC Tronox Parcel C/D/F/G/H Perchlorate - Data Qualification Summary - SDG 210228

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H Perchlorate - Laboratory Blank Data Qualification Summary - SDG 210228

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H Perchlorate - Field Blank Data Qualification Summary - SDG 210228

No Sample Data Qualified in this SDG

LDC #:	19125B6	VALIDATION COMPLETENESS WORKSHEET
SDG #:_	210228	Level III
Laborato	ory: GEL Laboratories	LLC_

#### 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
Ι,	Technical holding times	A	Sampling dates: 6-11-08
lla.	Initial calibration	A	
IIb.	Calibration verification	Α	
111.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD ( SDG: 210334 )
v	Duplicates	A	
VI.	Laboratory control samples	A	LCS/LCSD
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
x	Field blanks	ND	R=9

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-GJ-08-10	S	11	TSB-GJ-08-10MSD	5	21	31
2	TSB-GJ-08-20		12	TSB-GJ-08-10DUP	ł	22	32
3	TSB-GJ-08-30		13	PBS		23	33
4	TSB-GJ-08-40		14 2	PBW		24	34
5	TSB-GJ-09-10		15			25	35
6	TSB-GJ-09-20		16			26	36
7	TSB-GJ-09-30		17			27	37
8	TSB-GJ-09-40	<u> </u>	18			28	38
92	Rinsate 1	$\checkmark$	19			29	39
10	TSB-GJ-08-10MS	<u> </u>	20			30	40

Notes:

## **LDC Report#** 19125C6

# Laboratory Data Consultants, Inc. Data Validation Report

- Project/Site Name: BRC Tronox Parcel C/D/F/G/H
- Collection Date: June 12, 2008

LDC Report Date: July 29, 2008

Matrix: Soil/Water

Parameters: Perchlorate

Validation Level: EPA Level III

Laboratory: GEL Laboratories, LLC.

Sample Delivery Group (SDG): 210334

#### Sample Identification

TSB-CJ-09-0 TSB-CJ-09-10 Rinsate 2 TSB-CJ-09-0MS TSB-CJ-09-0MSD TSB-CJ-09-0DUP

#### Introduction

This data review covers 5 soil samples and one water sample 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.

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.

Sample "Rinsate 2" was identified as a rinsate. No perchlorate was found in this blank.

#### 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) and relative percent differences (RPD) were within QC limits.

#### VII. Sample Result Verification

Raw data were not reviewed for this SDG.

#### VIII. Overall Assessment of Data

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

# **IX. Field Duplicates**

No field duplicates were identified in this SDG.

BRC Tronox Parcel C/D/F/G/H Perchlorate - Data Qualification Summary - SDG 210334

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H Perchlorate - Laboratory Blank Data Qualification Summary - SDG 210334

No Sample Data Qualified in this SDG

BRC Tronox Parcel C/D/F/G/H Perchlorate - Field Blank Data Qualification Summary - SDG 210334

No Sample Data Qualified in this SDG

LDC #: <u>19125C6</u>	VALIDATION COMPLETENESS WORKSHEET
SDG #:	Level III
Laboratory: GEL Laboratories	<u>LLC</u>

#### 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 - 10 - 08
lla.	Initial calibration	A	
llb.	Calibration verification	A	
III.	Blanks	A	
١٧	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (SDG: 210228)
v	Duplicates	A	
VI.	Laboratory control samples	A	LCS/LCSD
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
L x	Field blanks	ND	R= 3

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-CJ-09-0	S	11	21	3	31
2	TSB-CJ-09-10	Ţ	12	22	3	32
32	Rinsate 2	w	13	23	3	33
4	TSB-CJ-09-0MS	5	14	24	3	34
5	TSB-CJ-09-0MSD		15	25	3	35
6	TSB-CJ-09-0DUP	l	16	26	3	36
7 1	PBS		17	27	3	37
8 2	PBW		18	28	3	38
9			19	29	3	39
10			20	30	4	10

.

Notes:

## LDC Report# 19125A29

# Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:	BRC Tronox Parcel C/D/F/G/H
Collection Date:	June 10, 2008
LDC Report Date:	July 29, 2008
Matrix:	Soil
Parameters:	Radium-226 & Radium-228
Validation Level:	EPA Level III & IV
Laboratory:	GEL Laboratories, LLC.

Sample Delivery Group (SDG): 210150

## Sample Identification

TSB-FJ-06-02-10\*\* TSB-FJ-06-02-20 TSB-FJ-06-02-30\*\* TSB-FR-02-02-10 TSB-FR-02-02-10-FD TSB-FR-02-02-20\*\* TSB-FR-02-02-30 TSB-FJ-02-02-10\*\* TSB-FJ-02-02-20 TSB-FJ-02-02-30

\*\*Indicates sample underwent EPA Level IV review

#### Introduction

This data review covers 10 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 with the following exceptions:

DUP ID (Associated Samples)	Analyte	Difference (Limits)	Flag	A or P
TSB-GJ-08-10DUP (All samples in SDG 210150)	Radium-228	1.44 pCi/g (≤1.00)	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.

## V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

The QAPP reporting limits were met with the following exceptions:

Sample	Analyte	Sample MDA	Required Detection Limit (RDL)	Flag	A or P
TSB-FJ-06-02-10** TSB-FJ-06-02-30** TSB-FJ-02-02-10**	Radium-228	1.01 pCi/g	1.0 pCi/g	None	Р
TSB-FJ-06-02-20 TSB-FR-02-02-30			1.02 pCi/g 1.0 pCi/g		P
TSB-FR-02-02-10	Radium-228	1.10 pCi/g	1.0 pCi/g	None	Р
TSB-FR-02-02-10-FD	Radium-228	1.57 pCi/g	1.0 pCi/g	None	Р

#### 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-FR-02-02-10 and TSB-FR-02-02-10-FD were identified as field duplicates. No radium-226 or radium-228 was detected in any of the samples with the following exceptions:

	Concentr	ation (pCi/g)	555	D:#		A or P
Isotope	TSB-FR-02-02-10	TSB-FR-02-02-10-FD	RPD (Limits)	Difference (Limits)	Flags	
Radium-228	1.67	0.442U	-	1.228 (≤1.00)	J (all detects) UJ (all non-detects)	A
Radium-226	2.31	1.24	-	1.07 (≤1.00)	J (all detects)	A

## BRC Tronox Parcel C/D/F/G/H Radium-226 & Radium-228 - Data Qualification Summary - SDG 210150

SDG	Sample	Isotope	Flag	A or P	Reason
210150	TSB-FJ-06-02-10** TSB-FJ-06-02-20 TSB-FJ-06-02-30** TSB-FR-02-02-10 TSB-FR-02-02-10-FD TSB-FR-02-02-20** TSB-FR-02-02-30 TSB-FJ-02-02-20 TSB-FJ-02-02-30	Radium-228	J (all detects) UJ (all non-detects)	A	Duplicate analysis (Difference)
210150	TSB-FJ-06-02-10** TSB-FJ-06-02-30** TSB-FJ-02-02-10** TSB-FJ-06-02-20 TSB-FR-02-02-30 TSB-FR-02-02-10 TSB-FR-02-02-10-FD	Radium-228	None	Ρ	Minimum detectable activity
210150	TSB-FR-02-02-10 TSB-FR-02-02-10-FD	Radium-228	J (all detects) UJ (all non-detects)	A	Field duplicates (Difference)
210150	TSB-FR-02-02-10 TSB-FR-02-02-10-FD	Radium-226	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 210150

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 210150

No Sample Data Qualified in this SDG

19125A29W.wpd

## VALIDATION COMPLETENESS WORKSHEET

Level III/IV

SDG #: 210150 Laboratory: <u>GEL Laboratories LLC</u>

LDC #: 19125A29

ma

Mod . Mod . Method: Radium 226 (EPA Method 903.1<del>/GL-RAD-A-008 REV #12)</del> Radium 228 (EPA Method 904.0<del>/GL-RAD-A-009 REV#14)</del>

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 - 10 - 08
lla.	Initial calibration	A	
IIb.	Calibration verification	A	
- 111.	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	SW	MS/MSD/DUP (SDG: 210228, 210334)
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	
<b>V</b> .	Sample result verification	A	Not reviewed for Level III validation.
VI.	Minimum dectectable activity (MDA)	SW	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	รพ	D= 4+5
XIV	Field blanks	N	

Note: A = A

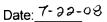
A = Acceptable N = Not provided/applicable SW = See worksheet ND = No compounds detected R = Rinsate FB = Field blank D = Duplicate TB = Trip blank EB = Equipment blank

Validated Samples: \*\* Indicates sample underwent Level IV validation

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

Notes:

dation areas. Vali



Page: <u>|</u>of | Reviewer: <u>M&</u>

2nd Reviewer:

۰.

i - i

# Method:Radiochemistry(EPA Method See cover )

Validation Area	Yes	B No	NA	Findings/Comments
I. Technical holding times				
Ail technical holding times were met.		1		
II. Calibration				
Were all instruments and detectors calibration as required?	12	1		
Were NIST traceable standards used for all calibrations?		1		
Was the check source identified by activity and radionuclide?	1	1		
Were check sources including background counts analyzed at the requiried frequency and within laboratory control limits?	17	1		
III. Blanks	- <u>-</u>	·	<u> </u>	
Were blank analyses performed as required?		ļ		•
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.	1			
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 anayized at the required frequency of 5% in this SDG?	1			
Were all duplicate sample duplicate error rations (DER) $\leq$ 1.42?.		$\checkmark$		
Y. Laboratory control samples				
Was an LCS analyzed per analytical batch?	1			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	$\checkmark$			
J. Sample Chemical/Carrier Recovery				
Nas a tracer/carrier added to each sample?	/			
Nere tracer/carrier recoveries within the QC limits?	$\checkmark$			
/II. Regional Quality Assurance and Quality Control				
Vere performance evaluation (PE) samples performed?		$\checkmark$		
Vere the performance evaluation (PE) samples within the acceptance limits?			<u> </u>	
(III. Sample Result Verification		······	<u> </u>	
Vere activities adjusted to reflect all sample dilutions and dry weight factors pplicable to level IV validation?	~			
Vere the Minimum Detectable Activities (MDA) < RL?		$\checkmark$		

.

LDC #: 19125 A29 SDG #: 210150

Validation Area	Yes	No	NA	Findings/Comments
IX. Overall assessment of data				
Overall assessment of data was found to be acceptable.	$\checkmark$			
X. Field duplicates				
Field duplicate pairs were identified in this SDG.	$\checkmark$			1
Target analytes were detected in the field duplicates.	$\checkmark$			
XI. Field blanks				
Field blanks were identified in this SDG.		$\checkmark$		
Target analytes were detected in the field blanks.				

1 .

ī

60856161	BIDIED
:#	#
LDC	SDG.

## VALIDATION FINDINGS WORKSHEET **Duplicate Analysis**

Lof 52 Page: Reviewer:\_ 2nd Reviewer:\_

> COVES Sec METHOD: Radiochemistry (Method:\_

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

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

Act = sample activity  $\delta = 1$  sigma error Was a unpilicate sample duplicate error ratio (DER)  $\leq$  1.42? DER =  $|Act_{1}$ - $Act_{2}|$  Were all duplicate sample duplicate error ratio (DER)  $\leq$  1.42? DER =  $|Act_{1}$ - $Act_{2}|$  +  $\delta_{2}^{2}|^{1/2}$ 

	Qualifications	J/UJ/A													
Accordiated Campbo															
by difference DER-tlimitat	1.44 PCi/ /21 nn/	122-1-2 B/													
lsotope	Ra-228		-												
Matrix	soil														
Duplicate ID	T58-6J-08-10	DUP													Commonte.
#	-					T				T	T	T	T	T	

DUP.35.DOC

19125A39	210150
.  #	; #
LDC	SDG

# VALIDATION FINDINGS WORKSHEET Minimum Detectable Activities

METHOD: Radiochemistry (Method: See Cover

Page: 1 of 1 Reviewer: 2nd Reviewer: 2nd Reviewer: 2

The following sample MDAs are above the RDL:

#	Sample ID	leotono	QAPP	LAB			F
-		Adotoel C	HUL (units)	MDA (units)	Finding	Qualifications	
_	-	Ka-338	1.0 (PCi/)	1.01 (pci/a)	ah Mn	No. CO	1
						VONE L	T
4	R	Ra-228		1 1 60-1			
5	3	Ra. 170					
	R	100 1211					
7	1	00, 220					
		000 - 201		1.10 (			<u> </u>
V		200 0					Т
	0	Ka - 198		1.57 ( )			T
							T
و	9	Ru-228		1 0 0 1			1
		)))					
Г	a	, , ,	~				Г
	0	Ka-228	<u>\</u>	( /) 10.1			Т
T					*	*	Т
							1
							7
							T
							T
							T
							- 1
							<u> </u>
							T
							Т
							7
							T
Comments:							7

### VALIDATION FINDINGS WORKSHEET Field Duplicates

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

METHOD: Radiochemistry (Method: See cover

<u>(Y) n n/a</u> MN N/A

Were field duplicate pairs identified in this SDG? Were target isotopes detected in the field duplicate pairs?

	Activity	(PCi/g)	by difference Qual parentonly
Isotopes	. 4	5	Qual parentonly
Ra-228	1.67	0.442 U	1.228 (=1.00) J/UJ/A.
Ra - 226	2.31	1.24	1.07 ( J ) Jolets/A

	Activity (	)	
Isotopes			RPD
			· · · · · · · · · · · · · · · · · · ·
			······································

	Activity (	)	
Isotopes			RPD
		•	
			· · · · · · · · · · · · · · · · · · ·

	Activity (	)	
Isotopes			RPD

LDC #: 19135A39 SDG #: 210150

## VALIDATION FINDINGS WORKSHEET Level IV Recalculation Worksheet

シア Page: / of | Reviewer: 2nd Reviewer:

11

See Cover METHOD: Radiochemistry (Method:\_\_\_ Percent recoveries (%R) for a laboratory control sample, a matrix spike and a matrix spike duplicate sample were recaluculated using the following formula:

Found = activity of each analyte <u>measured</u> in the analysis of the sample. True = activity of each analyte in the source.
Where,
%R = <u>Found</u> x 100 True

A matrix spike and matrix spike duplicate relative percent difference (RPD) was recaiculated using the following formula: S = Original sample activity D = Duplicate sample activity Where,  $\frac{\text{RPD}}{(S+D)/2} = \frac{1}{(S+D)/2} \times 100$ 

					Recalculated	Reported	
Sample ID	Type of Analysis	Analyte	Found/S (units)	True/D (units)	%R or BPD	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Acceptable
	Laboratory control sample						(N/X)
105		Ra-236	10.5 (PCi/4)	10.5 (PCi/4) 9.70 (PCi/4)	108	801	٢
	Matrix spike sample		>	•			
T58-6J-38-10 MS		8a-226	10.35 (PCi/g)	35 (PCi/4) 11.6 (PCi/4)	63	90	
	Duplicate RPD			9			
TSB-6J-09-10 DUP		Ra-228	2.73 U (PC:/4)	$(\mathbf{p}^{ci})$ 1.39 ( $\mathbf{p}^{ci}$ )	22	72	
	Chemical recovery	Ba-133	>	0			
		for Ra- 328	161.9 (cpm)	( 9 (cpm) 289.5 (cpm)	56	56	
							•

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.

SDG	#: <u>210150</u>	Sample Calculation	<u>Verification</u>	Revi	ewer: <u>MG</u> ewer: <u>MG</u>
MET	HOD: Radiochemistry	(Method: <u>see cover</u> )		2nd revi	ewer:
<u>(Y)</u> N	<u>I N/A</u> Have resul	elow for all questions answered "N". Not a Its been reported and calculated correctly within the calibrated range of the instrum	?	are identified as "	N/A".
Analy and N	/te results for $\underline{\#}$	$I_{Ra} - 228$ wing equation:	reported wit	h a positive detect	t were recalculated
(2.22 E = Ef Voi = 1	y = <u>m - bckgrd cpm)</u> 2)(E)(Vol)(CF) fficiency Volume %R, Self-absorbance, abun	Recalculation: (64/90) - 0.356 $\partial)(0.6792)(0.500g)(0.5592)$ × dance, ect.	$\frac{1}{0.999} \times \frac{1}{0.669}$	- x 1.087 =	1.384 pci/g
#	Sample ID	Analyte	Reported Concentration $(P^{Ct}/q)$	Calculated Concentration $(P^{C_1}/q)$	Acceptable (Y/N)
		Ra - 228	1.38	1.38	✓
		' Ra-226	.1.26	1.26	j
		1			
		F			
				1	
		· ·			
		· · · · · · · · · · · · · · · · · · ·			
┝──┟					·····
		L			

٠

VALIDATION FINDINGS WORKSHEET

Note:\_\_\_\_

LDC #: 19125 A 29

SDG #: 210150

Page: \_\_\_\_of\_\_

### LDC Report# 19125B29

## Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:	BRC Tronox Parcel C/D/F/G/H
Collection Date:	June 11, 2008
LDC Report Date:	July 29, 2008
Matrix:	Soil/Water
Parameters:	Radium-226 & Radium-228
Validation Level:	EPA Level III
Laboratory:	GEL Laboratories, LLC.

Sample Delivery Group (SDG): 210228

### Sample Identification

TSB-GJ-08-10 TSB-GJ-08-20 TSB-GJ-08-30 TSB-GJ-08-40 TSB-GJ-09-10 TSB-GJ-09-20 TSB-GJ-09-30 TSB-GJ-09-40 Rinsate 1 TSB-GJ-08-10MS TSB-GJ-08-10DUP

### Introduction

This data review covers 11 soil samples and one water sample 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.

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) with the following exceptions:

Method Blank ID	Isotope	Activity (pCi/L)	Associated Samples
PBW Radium-228		0.753	All water samples in SDG 210228

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

Sample "Rinsate 1" was identified as a rinsate. No radium-226 or radium-228 was found in this blank with the following exceptions:

Rinsate ID	Sampling Date	Isotope	Concentration	Associated Samples
Rinsate 1	6/11/08	Radium-226	0.505 pCi/L	All soil samples in SDG 210228

Sample concentrations were compared to concentrations detected in the field blanks as required by the QAPP. No sample data was qualified with the following exceptions:

Sample	Isotope	Reported Concentration	Modified Final Concentration
TSB-GJ-08-10	Radium-226	0.949 pCi/g	1.00U pCi/g
TSB-GJ-09-30	Radium-226	0.327 pCi/g	1.00U pCi/g

### **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 with the following exceptions:

DUP ID (Associated Samples)	Analyte	Difference (Limits)	Flag	A or P
TSB-GJ-08-10DUP (All soil samples in SDG 210228)	Radium-228	1.44 pCi/g (≤1.00)	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.

### V. Minimum Detectable Activity

All minimum detectable activities met required detection limits.

The QAPP reporting limits were met with the following exceptions:

Sample	Analyte	Sample MDA	Required Detection Limit (RDL)	Flag	A or P
TSB-GJ-08-10	Radium-228	1.15 pCi/g	1.0 pCi/g	None	P
TSB-GJ-08-20	Radium-228	1.29 pCi/g	1.0 pCi/g	None	Р

Sample	Analyte	Sample MDA	Required Detection Limit (RDL)	Flag	A or P
TSB-GJ-08-30 TSB-GJ-09-20	Radium-228	1.02 pCi/g	1.0 pCi/g	None	Р
TSB-GJ-08-40	Radium-228	1.13 pCi/g	1.0 pCi/g	None	Р
TSB-GJ-09-10	Radium-228	1.45 pCi/g	1.0 pCi/g	None	Р
TSB-GJ-09-30 TSB-GJ-09-40	Radium-228	1.01 pCi/g	1.0 pCi/g	None	Ρ

### **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

No field duplicates were identified in this SDG.

### BRC Tronox Parcel C/D/F/G/H Radium-226 & Radium-228 - Data Qualification Summary - SDG 210228

SDG	Sample	Isotope	Flag	A or P	Reason
210228	TSB-GJ-08-10 TSB-GJ-08-20 TSB-GJ-08-30 TSB-GJ-08-40 TSB-GJ-09-10 TSB-GJ-09-20 TSB-GJ-09-30 TSB-GJ-09-40	Radium-228	J (all detects) UJ (all non-detects)	A	Duplicate analysis (Difference)
210228	TSB-GJ-08-10 TSB-GJ-08-20 TSB-GJ-08-30 TSB-GJ-09-20 TSB-GJ-09-20 TSB-GJ-09-10 TSB-GJ-09-10 TSB-GJ-09-30 TSB-GJ-09-40	Radium-228	None	Ρ	Minimum detectable activity

### BRC Tronox Parcel C/D/F/G/H Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG 210228

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 210228

SDG	Sample	lsotope	Modified Final Concentration	A or P
210228	TSB-GJ-08-10	Radium-226	1.00U pCi/g	A
210228	TSB-GJ-09-30	Radium-226	1.00U pCi/g	A

### VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 7-22-08

SDG #: 210228 Laboratory: GEL Laboratories LLC

LDC #: 19125B29

mx

Page: <u>l</u> of <u>l</u> Reviewer: <u>MG</u> 2nd Reviewer: <del>MG</del>

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
Ι.	Technical holding times	A	Sampling dates: 6-11-08
lla.	Initial calibration	A	
lib.	Calibration verification	A	
- 111.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	Sw	MS/MSD/DUP (SDG: 209606, 210334)
IVb.	Laboratory control samples	Á	LCS
IVc.	Chemical recovery	A	
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	SW	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	N	
XIV	Field blanks	SW	R = 9

Note:

e: 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-GJ-08-10 S	11	<del>۶۶۵، ۶۶۶</del> TSB-GJ-08-10MSD S	21		31	
2	TSB-GJ-08-20	12	796, 238	22		32	
3	TSB-GJ-08-30	13		23		33	
4	TSB-GJ-08-40	14		24		34	
5	TSB-GJ-09-10	15		25		35	
6	TSB-GJ-09-20	16		26		36	
7	TSB-GJ-09-30	17		27	• • • • • • • • • • • • • • • • • • •	37	
8	TSB-GJ-09-40 ✔	18		28		38	
9	Rinsate 1			29		39	
10	TSB-GJ-08-10MS 336, 229 S	20		30		40	

Notes:

	LDC #: 1910 SDG #: 910	10038 80010		VALIDATION FINDINGS WORKSHEET Blanks 2nd Rev	Page: Lot Reviewer: MG
	METHOD: Radiochemistry (Method: <u>(V) N N/A</u> Were blank analyses <u>(Y) N N/A</u> Were any activities d	diochemistry Were blank Were any a	(Method: 5 analyses per ctivities dete	ochemistry (Method: <u>Sピe CつVer</u> ) Were blank analyses performed as required? If no, please see qualifications below. Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.	cations below.
	Units: PC	-'/ L		Associated Samples: <i>α</i> <sup>1</sup>   water	
	Isotope	Blank ID	Blank Action	Sample Identification	
		PBW	Level	No sample was qualified	
ר א גר	Ra-238	0.753			
	Units:			Associated Samples:	
	lsotope	Blank ID	Blank Action	Sample Identification	
			Level		
	CIRCLED RESULTS	S WERE NOT QU	IALIFIED. ALL F	CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE OUALIFIED BY THE FOUL OWING STATEMENT.	

608 50161

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 #: 49 SDG #: 3	802016		VALIDATION FINDINGS WORKSHEET <u>Field Blanks</u>	S WORKSHEET Jks	- of -
	METHOD: Radiochemistry (Method: See	adiochemisti	ry (Method:_	see cover	2nd Reviewer:	24
—	<u>() N N/A</u> W <u>() N N/A</u> W Blank units: PC Sampling date:	Were field Were targent PC: /L	d blanks ide get isotopes <b>Associated</b> O <i>8</i>	Were field blanks identified in this SDG? Were target isotopes detected in the field blanks? PC: /L Associated sample units: PCi / a le: 6-11-08		
	Field blank t	type: (circle	one) Field B		Associated Samples: $a_{11} s_{01}$	
	Analyte	Blank ID	Blank		Samula Idantita.	
		6	- Action Limit			
< 81	Ra-226	0.505		00'1/28:0 00'1/646'0		
						T
	Blank units: Sampling date:	te:	Associated	Associated sample units:		
	Field blank ty	ype: (circle c	one) Field Bl	Field blank type: (circle one) Field Blank / Rinsate / Other: Assoc	Associated Samples:	
<u></u>	Analyte	Blank ID	Blank		Sample Identification	
يا تشنيد			Limit			
K			-			
י ₌י	oamples with I U".	Isotope conc	entrations w	ithin five times the associated field blank concent	amples with isotope concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not deterted "U".	atactad

Version 1.0 (3/2/2000)

FBLKASC4.35

19125 829	800010
LDC #:	SDG #:

## VALIDATION FINDINGS WORKSHEET **Duplicate Analysis**

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

> see cover METHOD: Radiochemistry (Method:\_

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

 $\delta = 1$  sigma error Act = sample activity Was a duplicate sample analyzed the required frequency of 5% in this SDG? Were all duplicate sample duplicate error ratio (DER)  $\leq 1.42$ ? DER =  $\frac{|Act_{1} - Act_{2}|}{2 + \delta_{2}^{2}|^{1/2}}$ Y NNIA

LEVEL IV ONLY:

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

	-						
*		- 		by difference			
*	Duplicate ID	Matrix	Isotope	-DER (Limits)	Associated Samples		
	1 12	Soil	Ra-238	1.44 PC: ( ( 21.00)			-
						4/07/A	
							_
							_
							_
Com	Comments:						

9125 829	Beeole
LDC #:	SDG #:

# VALIDATION FINDINGS WORKSHEET Minimum Detectable Activities

METHOD: Radiochemistry (Method: See cover

Page: of / Reviewer: MG 2nd Reviewer:

÷
RDI
the
above
are a
MDAs
sample
following
The

*	Cl olume?		QAPD	LAR			ſ
-		S∥ S	<u>DL (units)</u>	MDA (units)	Finding	Qualifications	
		Ka - 200	1.0 (PCi/g)	1.15 (PCi/q)	Lab MD	Nova /P	
C	¢		0	0			T
~	+	Ra-228		() 60.)			T
~	ſ						Т
	5	Ra-239		1.02 ( )			T
							Т
3	ъ	Ra-228		1.13 ( )			T
		·					-1
Ś	5	Ra-238		1.45 / 1			
9	6	Ra- 239					
				1.04			
-	L						Γ
		Na- 118		()			Ť
9	¢						T
0	Ø	Ra-228	^	1.01 ( 4 )	,		T
						•	T
							T
							T
							1
							T
							T
							T
							T
							T
							-
							-
							T
Comments:				•			ī

### LDC Report# 19125C29

## Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:	BRC Tronox Parcel C/D/F/G/H
r roject/one Name.	

Collection Date:	June 12, 2008
------------------	---------------

LDC Report Date: July 29, 2008

Matrix: Soil/Water

Parameters: Radium-226 & Radium-228

Validation Level: EPA Level III

Laboratory: GEL Laboratories, LLC.

Sample Delivery Group (SDG): 210334

### Sample Identification

TSB-CJ-09-0 TSB-CJ-09-10 Rinsate 2 TSB-CJ-09-0MS TSB-CJ-09-0MSD TSB-CJ-09-0DUP Rinsate 2MS Rinsate 2MSD Rinsate 2DUP

V:\LOGIN\ERM\BRC\TRONOX~1\19125C29.ER3

### Introduction

This data review covers 4 soil samples and 4 water 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.

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) with the following exceptions:

Method Blank ID	Isotope	Activity (pCi/L)	Associated Samples
PBW	Radium-228	0.753	All water samples in SDG 210334

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

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) 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.

The QAPP reporting limits were met with the following exceptions:

Samplə	Analyte	Sample MDA	Required Detection Limit (RDL)	Flag	A or P
TSB-CJ-09-0	Radium-228	2.34 pCi/g	1.0 pCi/g	None	Ρ
TSB-CJ-09-10	Radium-228	1.02 pCi/g	1.0 pCi/g	None	Р

### 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

No field duplicates were identified in this SDG.

### BRC Tronox Parcel C/D/F/G/H Radium-226 & Radium-228 - Data Qualification Summary - SDG 210334

SDG	Sample	Isotope	Flag	A or P	Reason
210334	TSB-CJ-09-0 TSB-CJ-09-10	Radium-228	None	Ρ	Minimum detectable activity

BRC Tronox Parcel C/D/F/G/H

Radium-226 & Radium-228 - Laboratory Blank Data Qualification Summary - SDG 210334

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 210334

No Sample Data Qualified in this SDG

Date: 7-22-08

LDC #: 19125C29 SDG #: 210334 Laboratory: GEL Laboratories LLC

Level III

Page:\_\_\_of\_\_( Reviewer: MG 2nd Reviewer: 5

my

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
<u> </u>	Technical holding times	A	Sampling dates: 6 - 12 - 09
lla.	Initial calibration	A	
llb.	Calibration verification	A	
111.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD/DUP (SDG: 209606)
IVb.	Laboratory control samples	A	LCS
IVc.	Chemical recovery	A	
V.	Sample result verification	N	
VI.	Minimum dectectable activity (MDA)	SW	
VII.	Overall assessment of data	A	
VIII.	Field duplicates	N	
XIV	Field blanks	ND	R=3

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	тѕв-сј-09-0 5	11 2	PBW	21	31	
2	TSB-CJ-09-10	12		22	32	
32	Rinsate 2 W	13		23	33	
4	<del>۵۵, ۵۵</del> ۲SB-CJ-09-0MS	14		24	34	
5	<i>ും</i> , റാർ TSB-CJ-09-0MSD	15	· · ·	25	35	
6	376, 339 TSB-CJ-09-0DUP	16		26	36	
7 2	KINSATE & MS W	17		27	37	
8 7	KINDUTE & MSD	18		28	38	
9	Rinsate 2 DUP 228	19		29	39	
10	PB 5	20		30	40	

Notes:

	LDC #: 14 SDG #: 21	11105204 210334		VALIDATION FINDINGS WORKSHEET Blanks 2nd	Page: ــــ of ـــ Reviewer: ــــــــــــــــــــــــــــــــــــ
	METHOD: Ra ( <u>v)</u> N N/A ( <u>v)</u> N N/A	METHOD: Radiochemistry (Method: <u>(V) N/A</u> Were blank analyses <u>(Y) N N/A</u> Were any activities d	(Method:	ochemistry (Method: <u>See Cover</u> ) Were blank analyses performed as required? If no, please see qualifications below. Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.	fications below.
	Units:	۲ ~ ' / L		Associated Samples: all water	
	lsotope	Blank ID	Blank Action	Sample Identification	
< 8L	L Ra-233	PBW 0.753	Level	No sample was qualified	
	Units:			Associated Samples:	
	Isotope	Blank ID	Blank Action	Sample Identification	
			Level		

LDC #: 19125029

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".

BLANKS.35.DOC

19125639	210334
; #	#
ГРС	SDG

# VALIDATION FINDINGS WORKSHEET Minimum Detectable Activities

METHOD: Radiochemistry (Method: See cover

Page: 1 of 1 Reviewer: MG 2nd Reviewer: \_\_\_\_\_

The following sample MDAs are above the RDL:

			NA PD			
* -	Sample ID	Isotope	RDL (units)	MDA (units)	Finding	
-		Ru-200	1.0 (pci/4)	17:20 HZ C		dualitications
					LES TUR T WAPP RL	Nove / P
б	8	80-228				
		~ 67	>		->	<b>→</b>
Comments:						

DETLIMIT.35

Version 1.0 (3/2/2000)

## Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:	BRC Tronox Parcel C/D/F/G/H
Collection Date:	June 10, 2008
LDC Report Date:	July 30, 2008
Matrix:	Soil
Parameters:	Isotopic Uranium & Isotopic Thorium
Validation Level:	EPA Level III & IV
Laboratory:	GEL Laboratories, LLC.

Sample Delivery Group (SDG): 210150

### Sample Identification

TSB-FJ-06-02-10\*\* TSB-FJ-06-02-20 TSB-FJ-06-02-30\*\* TSB-FR-02-02-10 TSB-FR-02-02-10-FD TSB-FR-02-02-20\*\* TSB-FR-02-02-20 TSB-FJ-02-02-20 TSB-FJ-02-02-20 TSB-FJ-02-02-30

\*\*Indicates sample underwent EPA Level IV review

### Introduction

This data review covers 10 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	Uranium-233/234	0.461	All samples in SDG 210150

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

Sample	Isotope	Reported Concentration	Modified Final Concentration
TSB-FJ-06-02-10**	Uranium-233/234	0.829 pCi/g	100U pCi/g
TSB-FJ-02-02-10**	Uranium-233/234	0.987 pCi/g	100U pCi/g

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.

The QAPP reporting limits were met with the following exceptions:

Sample	Analyte	Sample MDA	Required Detection Limit (RDL)	Flag	A or P
TSB-FJ-06-02-30**	Uranium-233/234 Uranium-238	1.42 pCi/g 1.18 pCi/g	1.0 pCi/g 1.0 pCi/g	None None	Р

### **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-FR-02-02-10 and TSB-FR-02-02-10-FD were identified as field duplicates. No isotopic uranium or isotopic thorium was detected in any of the samples with the following exceptions:

	Concentration (pCi/g)					
Isotope	TSB-FR-02-02-10	TSB-FR-02-02-10-FD	RPD (Limits)	Difference (Limits)	Flags	A or P
Thorium-228	1.46	1.67	-	0.21 (≤1.00)	-	-
Thorium-230	1.01	0.847	-	0.163 (≤1.00)	-	-
Thorium-232	1.25	1.12	*	0.13 (≤1.00)	-	-
Uranium-233/234	1.26	1.76	-	0.50 (≤1.00)	-	-
Uranium-238	0.696	1.73	-	1.034 (≤1.00)	J (all detects)	A

### BRC Tronox Parcel C/D/F/G/H Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG 210150

SDG	Sample	Isotope	Flag	A or P	Reason
210150	TSB-FJ-06-02-30**	Uranium-233/234 Uranium-238	None None	Р	Minimum detectable activity
210150	TSB-FR-02-02-10 TSB-FR-02-02-10-FD	Uranium-238	J (all detects)	A	Field duplicates (Difference)

### BRC Tronox Parcel C/D/F/G/H Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG 210150

SDG	Sample	Isotope	Modified Final Concentration	A or P
210150	TSB-FJ-06-02-10**	Uranium-233/234	100U pCi/g	A
210150	TSB-FJ-02-02-10**	Uranium-233/234	100U pCi/g	А

### BRC Tronox Parcel C/D/F/G/H

Isotopic Uranium & Isotopic Thorium - Field Blank Data Qualification Summary - SDG 210150

## No Sample Data Qualified in this SDG

LDC #:	19125A59	VALIDATION COMPLETENESS WORKSHEET
SDG #:	210150	Level III/IV
Laborator	y: GEL Laboratories L	<u>_C</u>

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 - 10 - 08
lla.	Initial calibration	Α	
IIb.	Calibration verification	A	
111.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	MS/MSD/DUP (SDG: 210223)
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	SW	
VII.	Sample result verification	A	Not reviewed for Level III validation.
VIII.	Overall assessment of data	A	
IX.	Field duplicates	รพ	D=4+5
Lx	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

	<u>un 5011</u>				
1	TSB-FJ-06-02-10**	11	PBS	21	31
2	TSB-FJ-06-02-20	12		22	32
3	TSB-FJ-06-02-30**	13		23	33
4	TSB-FR-02-02-10	14		24	34
5	TSB-FR-02-02-10-FD	15		25	35
6	TSB-FR-02-02-20**	16		26	36
7	TSB-FR-02-02-30	17		27	37
8	TSB-FJ-02-02-10**	18		28	38
9	TSB-FJ-02-02-20	19		29	39
10	TSB-FJ-02-02-30	20		30	40

Notes:

.

1.1

,

## Method:Radiochemistry(EPA Method See cover)

1

Validation Area	Ye	s N	o   I	A	Findings/Comments
1. Technical holding times					
All technical holding times were met.					
IE. Calibration					
Were all instruments and detectors calibration as required?	V V	1			
Were NIST traceable standards used for all calibrations?	• ✓	1			
Was the check source identified by activity and radionuclide?	/	1			······································
Were check sources including background counts analyzed at the requiried frequency and within laboratory control limits?	/ /				
III. Blanks					
Were blank analyses performed as required?				$\square$	
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?	<i>✓</i>			Τ	
Were all duplicate sample duplicate error rations (DER) $\leq$ 1.42?.	. /				
V. Laboratory control samples					
Was an LCS analyzed per analytical batch?	$\checkmark$				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 75-125%	$\checkmark$				
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?			<u> </u>		
VIII. Sample Result Verification	<u> </u>		<u>,                                     </u>		
Were activities adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	$\checkmark$				
Were the Minimum Detectable Activities (MDA) < RL?		$\checkmark$			

### VALIDATION FINDINGS CHECKLIST

Page: 2 of 2 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.	$\checkmark$		Ī	
X. Field duplicates				
Field duplicate pairs were identified in this SDG.				ı
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.			$\checkmark$	

 $\mathbf{I} = \mathbf{r}$ 

I.

	LDC #: <u>1913</u> SDG #: <u>216</u>	210150		VALIDATION FINDINGS WORKSHEET <u>Blanks</u>	Page: 1 of 1 Reviewer: MG
	METHOD: Radiochemistry (Method:	diochemistry Were blank Were any a	(Method: 5 analyses pe ictivities dete	ochemistry (Method: <u>See Cove</u> ) Were blank analyses performed as required? If no, please see qualifications below. Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.	e qualifications below.
	Units:	. III-		Associated Samples: a I	
	Isotope	Blank ID	Blank Action	Sample Identification	
		PBS	Level		
ר אר	U-333/234	0.461		0.827/1.00 0.987/1.00	
	Units:			Associated Samples:	
	lsotope	Blank ID	Blank Action	Sample Identification	
			Level		
	CIRCLED RESULTS	WERE NOT QU	JALIFIED. ALL I	CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOULOWING STATEMENT.	

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".

19135259	210150
LDC #:	SDG #:

# VALIDATION FINDINGS WORKSHEET Minimum Detectable Activities

METHOD: Radiochemistry (Method: See cover

Page: 1 of 1 Reviewer: べら

The following sample MDAs are above the RDL:

			00 00/			
#	Sample ID	Isotope	RDL (units)	LA IS MDA (units)	Finding	
	~	U - 333/224	1 1 (pci/)	1/100/ 67/1		ΞII
		1 1	18/11	1.18 1.16	Lab MDA > QAPP RL	None P
			*	1.18 ( * )	->	4
T						
Comments:						

# VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:	<u> </u> of
Reviewer:	MG
2nd reviewer:	$+ \sim$

METHOD: Radiochemistry (Method: See Cover

<u>(Y)n n/a</u> ON N/A

Were field duplicate pairs identified in this SDG? Were target isotopes detected in the field duplicate pairs?

	Activity (	pcila,	by difference
Isotopes	4	5	Qual parent only
Th-228	1.46	1.67	0.21 (\$1.00)
Th-230	1.01	0.847	0.163 ( )
Th- 232	1.25	1.12	0.13 ( )
U-233/234	1.26	1.76	0.50 ( )
U-238	0.696	1.73	1.034 ( ) Jdets/A

	Activity ()	
Isotopes		RPD

	Activity ( )	
Isotopes		RPD

	Activity (	)	
lsotopes			RPD

19135459	210150
;#	- #
БС	SDG

# VALIDATION FINDINGS WORKSHEET Level IV Recalculation Worksheet

Page: 1 of 1 ちれ Reviewer: 2nd Reviewer:

i.

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 = <u>Found</u> x 100 True

Where, Found = activity of each analyte <u>measured</u> 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 recaiculated using the following formula:

S = Original sample activity D = Duplicate sample activity Where, RPD = <u>!S-D!</u> × 100 (S+D)/2

		_			Recalculated	Reported	
Sample (D	Type of Analysis	Analyte	Found/S (units)	True/D (units)	%R or RPD	20 2. DDD	Acceptable
	Laboratory control sample						(N/X)
L C S		U-733	34.3 (PCi/1)	(3 (pci/4) 33.8 (pci/6)	20)	201	~
	Matrix snika samula						-
TSB- 6J-08-10 MS		Th-332	10.19 (pc:/)	19 (PCi/) 10.1 (PCi/)	101	107	
	Duplicate RPD		>	0			
T58-GJ-08-10 DUF		U-233/234	-	1.52 (pci/) 1.68 (pci/)	0	0	
	Chemical recovery		8				
		T4-239	2.21153 (dpm)	1153 (dpm) 2.27964 (dpm)	47	47	
							>

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

LDC #: 19125A59 SDG #: 210150 VALIDATION FINDINGS WORKSHEET Page: of Sample Calculation Verification Reviewer: 2nd reviewer: METHOD: Radiochemistry (Method: See cover Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". <u>(Y)</u>N N/A Have results been reported and calculated correctly? Are results within the calibrated range of the instruments?  $\overline{Y}$  N N/A Analyte results for <u>#1</u> <u>Th-230</u> reported with a positive detect were recalculated and verified using the following equation: Activity = **Recalculation:** \* net area corrected due to tracer impurity (cpm - bckgrd cpm)  $\frac{(47.489_{505})}{(2.22)(0.142092)(0.212)(0.212)} = 1.449 \text{ pci/g}$ (2.22)(E)(Vol)(CF) E = Efficiency Vol = Volume CF = %R, Self-absorbance, abundance, ect Reported Calculated Concentration Concentration Acceptable # Analyte (PCi/g) Sample ID (pci/a) (Y/N)1.85 1.83 Th - 223 Y Th-230 1.45 1.45 1.66 1.66 Th - 232 41 1 U-233/234 0.829 0.829 1. . U-233 1.42 1.42'

Note:\_\_\_\_

# LDC Report# 19125B59

# Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:	BRC Tronox Parcel C/D/F/G/H
Collection Date:	June 11, 2008
LDC Report Date:	July 30, 2008
Matrix:	Soil/Water
Parameters:	Isotopic Uranium & Isotopic Thorium
Validation Level:	EPA Level III
Laboratory:	GEL Laboratories, LLC.

# Sample Delivery Group (SDG): 210228

### Sample Identification

TSB-GJ-08-10 TSB-GJ-08-20 TSB-GJ-08-30 TSB-GJ-08-40 TSB-GJ-09-10 TSB-GJ-09-20 TSB-GJ-09-30 TSB-GJ-09-40 Rinsate 1 TSB-GJ-08-10MS TSB-GJ-08-10MSD TSB-GJ-08-10DUP TSB-GJ-08-10DUPRE

#### Introduction

This data review covers 13 soil samples and one water sample 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.

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.
- 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
PBS1	Uranium-233/234	0.212	TSB-GJ-08-20 TSB-GJ-08-30 TSB-GJ-08-40 TSB-GJ-09-10 TSB-GJ-09-20 TSB-GJ-09-30 TSB-GJ-09-40
PBS2	Uranium-233/234	0.416	TSB-GJ-08-10

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

Sample "Rinsate 1" was identified as a rinsate. No isotopic uranium or isotopic thorium were found in this blank.

# **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**

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

No field duplicates were identified in this SDG.

BRC Tronox Parcel C/D/F/G/H Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG 210228

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 210228

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 210228

No Sample Data Qualified in this SDG

#### VALIDATION COMPLETENESS WORKSHEET LDC #: 19125B59 SDG #: 210228 Level III Laboratory: GEL Laboratories LLC

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
Ι.	Technical holding times	A	Sampling dates: 6 - 11 - 08
lla.	Initial calibration	A	
llb.	Calibration verification	A	
III.	Blanks	SW	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	A	M5/MSD/DUP (SDG: 210334)
IVa.	Laboratory control samples	Α	LCS
V.	Tracer Recovery	A	
<u>VI.</u>	Minimum Detectable Activity (MDA)	A	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	2	
L x	Field blanks	ND	R = 9

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:

1.3	TSB-GJ-08-10 S	11	TSB-GJ-08-10MSD Th. U S	21	31
2 1	TSB-GJ-08-20	12	TSB-GJ-08-10DUP	22	32
3	TSB-GJ-08-30	13 (	PBSI	23	33
4	TSB-GJ-08-40	14 8	PBW	24	34
5	TSB-GJ-09-10	15	PBS2	25	35
6	TSB-GJ-09-20	16	TSB-GJ-08-10 MSRE U	26	36
7 1	TSB-GJ-09-30	17 3	TSB-GJ-08-10 DUP RE	27	37
8 <sup>1</sup>	TSB-GJ-09-40	18		28	38
9 2	Rinsate 1 W	19		29	39
10 <sup>t</sup>	TSB-GJ-08-10MS S	20		30	40

Notes:

Page:	2nd Reviewer:										
VALIDATION FINDINGS WORKSHEET <u>Blanks</u>	2nd Reviewer: $$ d? If no, please see qualifications below. greater than the minimum detectable activity (MDA)? If yes, please see qualifications below.	Sample Identification	samples were qualified				Sample Identification				WERE QUALIFIED BY THE FOLLOWING STATEMENT: the blank activity will be qualified as not detected "U"
	See כסעפע performed as require etected in the blanks Associated Sample		SI Lavel No			Associated Samples:	Blank Action Level				If there is activity in the blank above the MDA, sample results within 10x the bla
LDC #: 19125359 SDG #: 210228	METHOD: Radiochemistry (Method: <u>V N N/A</u> Were blank analyses <u>V N N/A</u> Were any activities d Units: P Ci / d	Isotope Blar	3/234 0.			Units:	Isotope Blank ID			CIBCLED REGULTS WITH	If there is activity in the bla

BLANKS.35.DOC

SD(	SDG #: 910	Beecie		VALIDATION FINDINGS WORKSHEET Blanks Revi	Page: 1 of 1 Reviewer: 20
ME				2nd Revi	2nd Reviewer:
₹¢(		MELHUU: Hadlochemistry (Method: <u>N N/A</u> Were blank analyses	(Method: < analyses pe	ochemistry (Method:) Were blank analyses performed as required? If no. please see qualifications halow	
Units:	N/A	Were any a P C ز /م	activities dete	Were any activities detected in the blanks greater than the minimum detectable activity (MDA)? If yes, please see qualifications below. $\frac{1}{\sqrt{2}}$	ations below.
		+		Associated Samples:	i
	lsotope	Blank ID	Blank	Sample Identification	
_		PBS2	Level		
- 2 2 V	U-233/234	0.461		1 aarit	
Units:	s:		1	Associated Samples:	
	Isotope	Blank ID			
			Action	Sample Identification	
<u> </u>					
CIRCLI		CIRCLED RESULTS WERE NOT OTTOT			

LDC #: 19125 359

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".

BLANKS.35.DOC

# LDC Report# 19125C59

# Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:	BRC Tronox Parcel C/D/F/G/H
Collection Date:	June 12, 2008
LDC Report Date:	July 30, 2008
Matrix:	Soil/Water
Parameters:	Isotopic Uranium & Isotopic Thorium
Validation Level:	EPA Level III
Laboratory:	GEL Laboratories, LLC.

# Sample Delivery Group (SDG): 210334

# Sample Identification

TSB-CJ-09-0 TSB-CJ-09-10 Rinsate 2 TSB-CJ-09-0MSD TSB-CJ-09-0DUP Rinsate 2MS Rinsate 2MSD Rinsate 2DUP

#### Introduction

This data review covers 5 soil samples and 4 water 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.

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.
- 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).

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

# 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 with the following exceptions:

DUP ID (Associated Samples)	Analyte	Difference (Limits)	Flag	A or P
TSB-CJ-09-0DUP (All soil samples in	Thorium-228	1.52 pCi/g (≤1.00)	J (all detects)	Α
SDG 210334)	Thorium-230	1.88 pCi/g (≤1.00)	UJ (all non-detects) J (all detects) UJ (all non-detects)	

# 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.

The QAPP reporting limits were met with the following exceptions:

Sample	Analyte	Sample MDA	Required Detection Limit (RDL)	Flag	A or P
TSB-CJ-09-0	Thorium-228 Thorium-232	1.26 pCi/g 1.05 pCi/g	1.0 pCi/g 1.0 pCi/g	None None	Ρ
TSB-CJ-09-10	Thorium-228 Thorium-230 Thorium-232	1.31 pCi/g 1.09 pCi/g 1.09 pCi/g	1.0 pCi/g 1.0 pCi/g 1.0 pCi/g	None None None	P

# **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**

No field duplicates were identified in this SDG.

# BRC Tronox Parcel C/D/F/G/H Isotopic Uranium & Isotopic Thorium - Data Qualification Summary - SDG 210334

SDG	Sample	lsotope	Flag	A or P	Reason
210334	TSB-CJ-09-0 TSB-CJ-09-10	Thorium-228 Thorium-230	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Duplicate analysis (Difference)
210334	TSB-CJ-09-0	Thorium-228 Thorium-232	None None	Ρ	Minimum detectable activity
210334	TSB-CJ-09-10	Thorium-228 Thorium-230 Thorium-232	None None None	Ρ	Minimum detectable activity

#### BRC Tronox Parcel C/D/F/G/H

Isotopic Uranium & Isotopic Thorium - Laboratory Blank Data Qualification Summary - SDG 210334

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 210334

No Sample Data Qualified in this SDG

LDC #:	19125C59	VALIDATION COMPLETENESS WORKSHEET
SDG #:		Level III
Laboratory	: GEL Laboratories L	LC

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
<u> </u>	Technical holding times	A	Sampling dates: 6 - 12 - 03
lla.	Initial calibration	A	
IIb.	Calibration verification	Ą	
<u>III.</u>	Blanks	A	
IVa.	Matrix Spike/(Matrix Spike) Duplicates	SW	MS/MSD/DUP
IVa.	Laboratory control samples	A	LCS
V.	Tracer Recovery	A	
VI.	Minimum Detectable Activity (MDA)	SW	
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
x	Field blanks	ND	R=3

Note:

A = Acceptable

ND = No compounds detected

N = Not provided/applicable SW = See worksheet

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

Validated Samples:

1	тѕв-сј-09-0 S	112	PBW	21	31
2	TSB-CJ-09-10	12		22	32
32	Rinsate 2 W	13		23	33
4	TSB-CJ-09-0MS TH, U S	14		24	34
5	TSB-CJ-09-0MSD	15		25	35
6	TSB-CJ-09-0DUP	16		26	36
<sub>7</sub> 2	Th, U Rinsate 2MS W	17		27	37
8 <sup>2</sup>	Rinsate 2MSD	18		28	38
92	Th, u Rinsate 2DUP	19		29	39
10 <sup>l</sup>	PBS	20		30	40

Notes:

LDC #: 19135659 210334 SDG #:

# VALIDATION FINDINGS WORKSHEET **Duplicate Analysis**

Reviewer: MG \_ of | 3 Page:\_\_\_ 2nd Reviewer:\_\_\_

METHOD: Radiochemistry (Method: SCC Covev

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".  $\underbrace{O \ N \ N/A}$  Was a duplicate sample analyzed the required frequency of 5% in this SDG?  $\underbrace{Y \ (N) \ N/A}$  Were all duplicate sample duplicate error ratio (DER)  $\leq$  1.42? DER =  $\underbrace{|Act_{1} - Act_{2}|}$  Act = sar

Was a duplicate sample analyzed the required frequency of 5% in this SDG? Were all duplicate sample duplicate error ratio (DER)  $\leq$  1.42? DER =  $\frac{|\text{Act}_{1^2} - \text{Act}_2|}{2 |\delta_1^2 + \delta_2^2|^{1/2}}$ 

 $\delta = 1$  sigma error Act = sample activity

> LEVEL IV ONLY: <u>Υ Ν Ν/Α</u>

Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

	es Qualifications	J/ UJ/A	~										
by difference According C	Ĩ	all Soil											
Matrix Isotope		Th - 220											
# Duplicate ID	9	~											Commente.

19105059	010334
 #	#:
БС	SDG

# VALIDATION FINDINGS WORKSHEET Minimum Detectable Activities

METHOD: Radiochemistry (Method: See cover

Page: Lof I Reviewer: 거도 2nd Reviewer: L

The following sample MDAs are above the RDL:

,						
#  ·	Sample ID	Isotope		LAB		
		Th. 220		MUA (UNITS)	Finding	Qualifications
		0 0 0 0	1.0 (121/3)	1.26 (PCi/4)	Lah MDA > QAPP DI	
	*	14 -232		1.05 ( , ')		NOVE / P
Ч	C					
	8	Th-228		1.31 ( )		
		Th-230		. 09		
	*	T4-232				
					<b>→</b>	
İ						
- -						

DETLIMIT.35