

LABORATORY DATA CONSULTANTS, INC.

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Northgate Environmental Management, Inc.

June 22, 2010

1100 Quail Street Ste. 102 Newport Beach, CA 92660 ATTN: Ms. Cindy Arnold

SUBJECT: Tronox LLC Facility, PCS, Henderson, Nevada,

Data Validation

Dear Ms. Arnold,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on June 3, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 23307:

SDG#

Fraction

G0D200500, G0D220587, G0D230609 G0D280587, G0D300598, G0E010426 G0E010431, G0E030471, G0E030477 G0E030478, G0E040578, G0E040582 G0E050582, G0E050610, G0E060621 Dioxins/Dibenzofurans

G0E050582, G0E050610, G0E060621 G0E100428, G0E140423

The data validation was performed under Stage 2B/4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Standard Operating Procedures (SOP) 40, Data Review/Validation, BRC 2009
- Quality Assurance Project Plan Tronox LLC Facility, Henderson Nevada, June 2009
- NDEP Guidance, May 2006
- USEPA, Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Diobenzofurans Data Review, September 2005

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

Sincerely,

Rei Fag (W Erlinda T. Rauto

Operations Manager/Senior Chemist

Attachment 1

	Stage 2B/4				日	ဗ္	‡ 23	307		LDC #23307 (Tronox	170 4 5 1	ا ا	LLC-Northgate, Henderson NV /	Ĕ	gate	Ĭ	end	ers	<u>.</u>	2		Tronox PCS	ŏ	ర్ణ	\mathcal{F}										
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Page: 1 of 1 Reviewer: JE 2nd Reviewer: BC

LDC #: 23307

SDG #: G0D200500, G0D220587, G0D230609, G0D280587,G0D300598 G0E010426, G0E010431, G0E030471, G0E030477, G0E030478 G0E040578, G0E040582, G0E050582, G0E050610, G0E060621 G0E100428, G0E140423

Tronox Northgate Henderson Worksheet

EDD Area	Yes	No	NA	Findings/Comments
I. Completeness			,	
Is there an EDD for the associated Tronox validation report?	X			
II. EDD Qualifier Population				
Were all qualifiers from the validation report populated into the EDD?	Х			
III. EDD Lab Anomalies				
Were EDD anomalies identified?	Х			
If yes, were they corrected or documented for the client?	Х			See EDD_discrepancy_ form_LDC23307_062210.doc
IV, EDD Delivery				
Was the final EDD sent to the client?	Х	·		

Tronox LLC Facility, PCS, Henderson, Nevada Data Validation Reports LDC #23307

Dioxins/Dibenzofurans



Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 16, 2010

LDC Report Date:

June 17, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D200500

Sample Identification

RSAK5-9BPC SSAJ6-01-7BPC SSAJ6-01-10BPC** SA127-6BPC SA127-6BPCMS SA127-6BPCMSD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 6 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B 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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0113286MB	4/23/10	OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.75 pg/g 0.22 pg/g 0.25 pg/g 0.35 pg/g 0.50 pg/g 0.16 pg/g 0.75 pg/g	SA127-6BPC
0116296MB	4/26/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.20 pg/g 0.17 pg/g 1.2 pg/g 0.33 pg/g 0.45 pg/g 1.5 pg/g 1.6 pg/g	RSAK5-9BPC
0118247MB	4/28/10	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 0CDF	0.038 pg/g 0.026 pg/g 0.10 pg/g 0.28 pg/g 0.17 pg/g 0.24 pg/g 0.18 pg/g 0.31 pg/g 0.13 pg/g 0.15 pg/g 0.064 pg/g 0.19 pg/g 0.15 pg/g 0.19 pg/g 0.23 pg/g	SSAJ6-01-7BPC SSAJ6-01-10BPC**

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

Samples EB-04152010-1-RZD (from SDG G0D170492) and EB-04152010-2-RZD (from SDG G0D200558) were identified as equipment blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB04152010-1-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.34 pg/L 0.41 pg/L 0.41 pg/L 7.3 pg/L 60 pg/L 0.19 pg/L 0.39 pg/L 1.3 pg/L 0.63 pg/L 2.2 pg/L 0.62 pg/L 6.8 pg/L	All samples in SDG G0D200500

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB04152010-2-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 0CDF	1.6 pg/L 2.9 pg/L 1.4 pg/L 2.6 pg/L 2.3 pg/L 9.8 pg/L 11 pg/L 45 pg/L 48 pg/L 29 pg/L 70 pg/L 13 pg/L 13 pg/L 7.6 pg/L 180 pg/L 58 pg/L 450 pg/L	All samples in SDG G0D200500

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D200500

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

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MS/MSD percent recoveries (%R) and relative percent differences (RPD) were not within QC limits for several compounds, the LCS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAJ6-01-7BPC	¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDF ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	38 (40-135) 30 (40-135) 27 (40-135) 29 (40-135) 32 (40-135) 22 (40-135) 21 (40-135) 18 (40-135)	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD 0CDD 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	J (all detects) UJ (all non-detects)	Р
SSAJ6-01-10BPC**	¹³ C-1,2,3,7,8-PeCDF ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	37 (40-135) 33 (40-135) 39 (40-135) 34 (40-135) 24 (40-135)	1,2,3,7,8-PeCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAJ6-01-7BPC	1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	Р
SSAJ6-01-10BPC**	1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	P
SA127-6BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D200500	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D200500	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D200500

SDG	Sample	Compound	Flag	A or P	Reason (Code)
GOD200500	SSAJ6-01-7BPC	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D200500	SSAJ6-01-10BPC**	1,2,3,7,8-PeCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р	internal standards (%R) (i)
G0D200500	SSAJ6-01-7BPC	1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D200500	SSAJ6-01-10BPC**	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D200500	SA127-6BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D200500	RSAK5-9BPC SSAJ6-01-7BPC SSAJ6-01-10BPC** SA127-6BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D200500	RSAK5-9BPC SSAJ6-01-7BPC SSAJ6-01-10BPC** SA127-6BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D200500

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D200500

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D200500

No Sample Data Qualified in this SDG

Tronox Northgate Henderson ET

LDC #: 23307A21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D200500	Stage 2B
Laboratory: Test America	
METHOD: HRGC/HRMS Diox	ins/Dibenzofurans (EPA SW 846 Method 8290)

	Date: 6/16/10
	Page: /of/_
	Reviewer: Q
2nd	Reviewer:
	/

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
l.	Technical holding times	A	Sampling dates: 4/16/10
11.	HRGC/HRMS Instrument performance check	\blacksquare	/ /
111.	Initial calibration	#	
IV.	Routine calibration/i	A	
V.	Blanks	m	
VI.	Matrix spike/Matrix spike duplicates	W.	
VII.	Laboratory control samples	\triangleleft	409
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	W	
Χ.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	3N	
XII.	System performance	A	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	W	B-04072010-72D(400090441), 2B-04152010-1-72D B-04152010-2-72D(40000058) (400170492)
			28-04152010-2-RZD(40000558) (40D)T0492

Note:

A = Acceptable N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

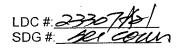
D = Duplicate TB = Trip blank

EB = Equipment blank

Validated Samples:

M	50:19			,		
1	RSAK5-9BPC	11	0116296MB	21	31	
2	SSAJ6-01-7BPC	12	0118247M13	22	32	
3 P	SSAJ6-01-10BPC **	13	0113286MB	23	33	
43	SA127-6BPC	14		24	34	
5	SA127-6BPCMS	15		25	35	
6	SA127-6BPCMSD	16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20		30	40	

Notes:	



VALIDATION FINDINGS CHECKLIST

Page: _____of___ Reviewer: _______ 2nd Reviewer: _______

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

model Disking Disking Control			_	
Validation Area	Yes	No	NA	Findings/Comments ´
I. Technical holding times		1	,	
All technical holding times were met.				·
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?				
Were the retention time windows established for all homologues?				
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers \leq 25% ?				
Is the static resolving power at least 10,000 (10% valley definition)?				
Was the mass resolution adequately check with PFK?				
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?				
III. Initial calibration		,		
Was the initial calibration performed at 5 concentration levels?		-		
Were all percent relative standard deviations (%RSD) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?				
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 30% for labeled standards?	/			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	/			
V. Blanks				
Was a method blank associated with every sample in this SDG?				
Was a method blank performed for each matrix and concentration?				
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?				
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		\	,	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per extraction batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				



VALIDATION FINDINGS CHECKLIST

				•
VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		/		
Were the performance evaluation (PE) samples within the acceptance limits?				1
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?		/		
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	$\perp \angle$	<u> </u>	<u> </u>	
X. Target compound identification	т	1	T	_
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?				
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	/			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?				
Did compound spectra contain all characteristic ions listed in the table attached?	(ļ	
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	/		ļ	
Was the signal to noise ratio for each target compound and labeled standard ≥ 2.5?	/			
Does the maximum intensity of each specified characteristic ion coincide within \pm 2 seconds (includes labeled standards)?	/			
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?				
Was an acceptable lock mass recorded and monitored?				
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?				
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XII. System performance				
System performance was found to be acceptable.				
XIII. Overall assessment of data			latin da.	
Overall assessment of data was found to be acceptable.				
KIV. Field duplicates				
Field duplicate pairs were identified in this SDG.				
Farget compounds were detected in the field duplicates.				
(V. Field blanks				
Field blanks were identified in this SDG.				
Target compounds were detected in the field blanks.				

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	g. ocpp	L. 1,2,3,6,7,8-HxCDF	a. ocdf	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X, Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:

SDG # 2000 LDC #: 2330/1/3

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank analyzed for each matrix? Y N/A

Was the blank contaminated? If yes, please see qualification below. In date 1910 Blank analysis date: Y/N N/A

Blank extraction date:

Conc. units:

Associated Samples:

Compound	Blank ID	Sample Identification
011.3	011328MI	
4	0.75	
14	25.0	
	0.25	
7	0.35	
0	0.50	
9	0.16	
$ \langle \rangle $	0.75	
17//		

Blank extraction date: 4/24/0 Blank analysis date: 4/4/10 Conc. units: 1999

Associated Samples:

	_	_				_		
ıtion								
Sample Identification								
S								
	•6							
Blank ID	011 659614	0.20	0.17	7:	0.33	54.0	7.5	9/
nd	011.							
Compound		U	7	4	\mathcal{H}	/	0	*

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307A21

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of 1 Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Was a method blank performed for each matrix and whenever a sample extraction was performed? Were all samples associated with a method blank?

Was the method blank contaminated? If yes, please see qualification below.

n date: 4/28/10 Blank analysis date: 5/15/10

Blank extraction date: 4/28/10 N N∕V

Conc. units: pg/g

2-3 (>5X) Associated samples:

Compound	Blank ID			Sample	Sample Identification			
	0118247MB	5X						
D	0.038	0.19						
ш	0.026	0.13						
u.	0.10	0.5						
O	0.28	1.4						
Ŧ	0.17	0.85						
	0.24	1.2						
ſ	0.18	6:0						
×	0.31	1.55						
Ţ	0.13	0.65						
M	0.15	0.75						
Z	0.064	0.32				The state of the s		
0	0.19	0.95						
a .	0.15	0.75						
Ö	0.23	1.15						
				-				

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23307A21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

Page:

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Associated sample units: (Y N/A Were field blanks identified in this SDG? Blank units: pg/L

b/bd Sampling date: 4/16/10

All (>5X) Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Compound	Blank ID			Sample Identification	cation		
	EB-04152010-1-RZD	5X					
A	0.34	0.0017					
D	0.41	0.00205					
Ш	0.41	0.00205					
Щ	7.3	0.0365					
9	09	0.3					
工	0.19	0.00095					
	0.39	0.00195					
*	1.3	0.0065					
	0.33	0.00165					
Z	0.63	0.00315					
0	2.2	0.011					
Ф	0.62	0.0031					
Ø	6.8	0.034					
CRQL							

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 23307A21 SDG #:See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Associated sample units: N N/A Were field blanks identified in this SDG? Blank units: pg/L

Sampling date: 4/16/10

b/bd

All (>5X) Associated Samples: P Field blank type: (circle one) Field Blank / Rinsate / Other:

	, , , , , , , , , , , , , , , , , , , ,		500000000000000000000000000000000000000					
Compound	Blank ID			Sai	Sample Identification	tion		
	EB-04152010-2-RZD	5X						
∢	1.6	0.008						
В	2.9	0.0145						
O	1.4	0.007						
٥	2.6	0.013						
Ш	2.3	0.0115						
红	9.8	0.049						
	11	0.055						
工	45	0.225						
	48	0.24						
ſ	29	0.145						
¥	70	0.35						
-	56	0.28						
M	13	0.065						
Z	7.6	0.038						
0	180	6.0						
۵	58	0.29						
g	450	2.25						
CRal								

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U" CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

SDG #: See Cover LDC #: 23307A21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

| Y N N/A Were field blanks identified in this SDG?
| Blank units: pg/L Associated sample units | Sampling date: 4/7/10

b/bd Associated sample units:_

All (>5X) Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Compound	Blank ID			San	Sample Identification	ion		
	FB-04072010-RZD	5X						
U	0.89	0.00445						
Ш	1.5	0.0075						
Ш	2.2	0.011						
9	8.3	0.0415						
¥	1.4	0.007						
	1.6	0.008						
M	1.5	0.0075						
Z	1.6	0.008						
0	1.3	0.0065						
a.	1.4	0.007						
Ø	4.1	0.0205						
			:					
CRQL								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 23307/44 SDG #: Les CON

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

N/A

Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an

associated MS/MSD. Soil / Water. Y AN NIA

Was a MS/MSD analyzed every 20 samples of each matrix? Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

:	- 11	NO GERER	(40507)																			
Section of the sectio	Associated Samples	5.2																				
RPD (Limits)	044 (- () 2	The Carlo		())	()	()	()						(())	()				
MSD %R (Limits)	1 m + m	[]	907181	`)	()	()	()	(()				()	())	()		())		
MS %R (Limits)	1 A 800 m		not to)	()	()	()	()	())	,	, (_	()	()	()	()	()	()		
Compound	18 B		22 Cento																			
MS/MSD ID	2/5	'	(4)																			
# Date																						

LDC#: 232078-7 SDG #:222 @wed

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: __of __ Reviewer: ______ 2nd Reviewer: _______

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Are all internal standard recoveries were within the 40-135% criteria?

Was the S/N ratio all internal standard peaks > 10?

Y)N N/A

*	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	5%)		Qualifications ()	ons ()
		4	B	E	8	135)	7	う女で	X-4 1-8
			7	W					
			Ø	Q)				
			¥	a	0				
			\pm	N) \				
			y	22	7				
			H	4)				
			/	8/	8	^			
)	(
		3	Ó	37)	((B	5. F-4 I-J
			B	W.	<u> </u>				
			4	39	<i>A</i>				
			\mathcal{H}	24	7				
			/	48)				
				/	_				
		S(WS)	4	S. C.)		NOON	Mak	
			<i>H</i>	38			1		
			/	3/)				
		6 (MSD)	N	24)				
		6 (NSD)	b	34)	, ,		->	
П		Internal Standards	Check Standard Used		Internal (Internal Standards		Check St	Check Standard Used
Æ	¹³ C-2,3,7,8-TCDF	DF		<u>-</u>	13C-OCDD				
B.	13C-2,3,7,8-TCDD	00		Α.	¹³ C-1,2,3,4-TCDD				
ن	¹³ C-1,2,3,7,8-PeCDF	eCDF		ز	¹³ C-1,2,3,7,8,9-HxCDD				
i	¹³ C-1,2,3,7,8-PeCDD	eCDD		Σ					
шi	¹³ C-1,2,3,4,7,8-HxCDF	-HxCDF		z					
u:	¹³ C-1,2,3,6,7,8-HxCDD	-нхсор		Ö.					
ပ	¹³ C-1,2,3,4,6,7,8-HpCDF	,8-HpCDF		o.			7		
r	¹³ C-1,2,3,4,6,7,8-HpCDD	,8-HpCDD							

LDC #: <u>23367</u>/2/ SDG #: 2ec G)Wer

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Y N N/A

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	Jets 4(e)		7		747					
Associated Samples	Q	W	7		W					
306 > calib lange	K.O. &	80	H.K.L.0.0.8	,	EMP @ 11511/th	1				
Sample ID	X	8	*		THY THE					
Date							0			
*										

See sample calculation verification worksheet for recalculations Comments:

LDC #: 2330742/ SDG # 361 @716

Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page: 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the

RRF = $(A_u)(C_u)/(A_u)(C_v)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

A_x = Area of compound, C_x = Concentration of compound, S = Standard deviation of the RRFs,

A_s = Area of associated internal standard C_k = Concentration of internal standard X = Mean of the RRFs

L									
				Reported	Recalculated	Reported	Recalculated	Reported	Receipted
*	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (Initial)	Average RRF	RRF 0	RRF		
-	lote	1 1	2,3,7,8-TCDF (10-2,3,7,8-TCDF)	062/20	00.00		() sta	%RSD	%RSD
	(202)	9/1/10	23.7 8.TODD (190.23.7 8.TOD)	2011	4.101.2	094963	0.94463	6.1085	6.109
		\ \ -		1.0382	1.03870	1.047×	104720	489709	A 2001
L		·	1,2,3,6,7,8-HXCDD ("C·1,2,3,6,7,8-HXCDD)	1.09904	1.09904	1.11730	1.11430	10501	10501
\perp			1,2,3,4,8,7,8-HpCDD (13C-1,2,4,8,7,8,-HpCDD)	09982	18/2000	10501	11,000	4.1204	1.720
			OCDF (1ºC-OCDD)	123	パークイン	10000	1102001	55/53	5.315
c	, , ,	,			1.0/1	001-51	1.2-788	9.34898	0.42
·	Carr	4/21/10	2,3,7,8-TCDF (19C-2,3,7,8-TCDF)	8801	1.088	1.10	0//	67'	50,
		_	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						1:1
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
I			1,2,3,4,6,7,8-HpCDD (19C-1,2,4,8,7,8,-HpCDD)						
			OCDF ("C-OCDD)						
6	1040	1,"7	2,3,7,8-TCDF (*6-2,3,7,8-TCDF)	0 43/	1260	0000	9		
T	(305)	01/4/2	2,3,7,8-TCDD (19C-2,3,7,8-TCDD)	Jan J	1. 00 h		0.93	15:04	5:16
			1,2,3,8,7,8-HxCDD ("C-1,2,3,8,7,8-HxCDD)		101	- Signal	1.05	7.72	7.82
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1000		91.1	116	4.30	4.38
		•	OCDE (%c-Ocna)	1	0.95/	1.07	(CO. /	20.6	\$0.0
			(0000)	1. thi./	ノカイリー	- 1	1		

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

LDC #: 281 COME.

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

Page: Reviewer:

2nd Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF RRF = (A,)(C,)/(A,)(C,)

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_x = Area of compound,$ $C_x = Concentration of compound,$

 $A_{\rm k} \approx$ Area of associated internal standard $C_{\rm k} =$ Concentration of internal standard

<u>L</u>					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	Q%
	14N/W/315	F-17-	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	0.25/35	567660	56466.0	8.0	Q; Q0
		0/6/6	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.03870	716811	1.18974	571	5.41
		`	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	passo1	as1/1.1	08/1/11	6.6	66
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	78966:0	15-60.1	1.0923/	96	19.6
			OCDF (3C-OCDD)	455ge-1	1-46157	1.46157	15.8	15.8
2	Sapplynes	chelin	2,3,7,8-TCDF ('°C-2,3,7,8-TCDF)	0.936	0.83	0.82	12.9	6.0
	/ /	11/4/2	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.033	88.0	XXX	15.0	15.0
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	611.1	1.17	1.17	5.7	5.7
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	7560	20:1	20.1	4.4	4.5
			OCDF (3c-OCDD)	1.347	1.46	1.46	800	86
က	MYloLetz	1/2/1	2,3,7,8-TCDF (³ C-2,3,7,8-TCDF)	1.088	2.95	26.0	13.3	13.1
		a/ /// /5	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)			,		
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (3C-OCDD)					

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

LDC #. 2330# 24 SDG #. 201 CONON

Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer.

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below

using the following calculation:

% Recovery = 100 * (SSR - SR)/SA

SSR = Spiked sample result, SR = Sample result SA = Spike added Where:

MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples:

RPD = I MSR - MSDR I * 2/(MSR + MSDR)

		o Ai	Samule	Spiked Sample	amnle	Matrix Snike	Snike	Matrix Spike Duplicate	a Duplicate	Reported	Recalculated
Compound	<u> </u>	Added Og/A)	Concentration (DS)	Concentration	tration	Percent F	Percent Recovery	Percent Recovery	Recovery	RPD	RPD
	MS	Men		SW	MSD	Reported	Recalc	Reported	Recalc		1000
2.3.7.8-TCDD	20.0	187	X/	4.9%	38.2	100	92	8//	801	4.7	4.8
1,2,3,7,8-PeCDD	100	ME TO	756	651	191	601	603	118	1/28	0.8	4
1.2.3.4.7.8-HxCDD	1		38	166	25/	132	c//	Se/	120	10	(0)
	260	18/	3300	1820	3160	0.0	00	596	005	0.0	558
	200	(83)	12000	8630	11/0	0.0	0.0	0.0	0.0	0.0	120
		\									

Comments: Refer to Matrix Spike/Matrix Spike Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results. LDC #: 2023 SDC # WOLD

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:_ Reviewer:

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration SA = Spike added

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 01/8247

RPD = I LCS - LCSD I * 2/(LCS + LCSD)

	Spi	<u>.</u>	Spiked S	ample	SUL		ICSD	d.	I CS/I CSD	CSD
Compound	A Q	Added (25/2)	Concentration (P9/q)	tration (g)	Percent Recovery	ecovery	Percent Recovery	ecovery	RPD	٥
	1.08	I CSD) JUS	l csp	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	0.00	NX	7,55	}	5	13				
QC	20		711		114	14				
1,2,3,4,7,8-HxCDD	- _				111	111				
1,2,3,4,7,8,9-HpCDF			116		911	116				
	300	~	255		128	128				
				-						
	-									

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

ions Monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

Descriptor	Accurate mass ^(a)	Ol nol	Elemental Composition	Analyte	Descriptor	Accurate Mass ^(a)	Ol nol	Elemental Composition	Analyte
_	303.9016	Σ	O.H.	TCDF	4	407.7818	M+2	C.H ³⁵ Cl. ³⁷ ClO	HpCDF
	305.8987	M+2	C,H,*CI,*C10	TCDF		409.7788	M+4	C,H**Cl,*7Cl,O	HPCDF
	315.9419	Σ	0,0,4,30,0	TCDF (S)		417.8250	Σ	13C,2H3CI,O	HpCDF (S)
	317.9389	M+2	13C12H433CIO	TCDF (S)		419.8220	M+2	13C12H35C1837C1O	HpcDF
	319.8965	Σ	C ₁₂ H ₄ *C1 ₄ O ₂	TCDD		423.7767	M+2	C ₁₂ H ²⁶ Cl ₆ 37ClO ₂	HpCDD
	321.8936	M+2	C12H,**C1],**C102	TCDD		425.7737	M+4	C ₁₂ H ²⁶ CI ₅ 37CI ₂ O ₂	Нрсор
	331.9368	Σ	13C1, H, 35C1, O.	TCDD (S)		435,8169	M+2	13C ₁₂ H ³⁵ Cl ₃ 37ClO ₂	HpCDD (S)
	333,9338	M+2	13C; H, 35Cl, 37ClO,	TCDD (S)		437.8140	M+4	13C12H35C1537C12O2	HpCDD (S)
	375.8364	M+2	C, H, *CI, **CIO	HXCDPE		479.7165	M+4	C,,H**CI,**CI,O	NCDPE
	[354.9792]	Lock	G.F.1	PFK		[430.9728]	LOCK	C,F1,	PFK
7	339.8597	M+2	C.,H,36CI,37CIO	PeCDF	2	441,7428	M+2	C,35CI,37CIO	OCDF
	341.8567	M+4	O.17* 13°C1,O	PeCDF		443.7399	M+4	C,35C,37Cl,O	OCDF
	351.9000	M+2	13C, H, 35C, 10	PeCDF (S)		457.7377	M+2	C, scl, vclo,	OCDD
-4	353.8970	M+4	13C, H, **Cl, 3*Cl, O	PecDF (S)		459.7348	A+A	C,35Cl,37Cl,O,	OCDD
	355.8546	M+2	C, H, "CI, "CIO,	PeCDD		469.7780	M+2	13Č;38ČI;37ČIO,	OCDD (S)
	357.8516	M+4	C;H,**Cl,*7Cl,O,	PeCDD		471.7750	M+4	13C12*C1,3*C1,O2	(s) agoo
	367.8949	M+2	13C1, H, 4C1, 37C1O,	PeCDD (S)		513.6775	M+4	C,2**CI_3*7CI_2O	DCDPE
	369.8919	M+4	13C1_H3*C1_37C1_O_	PeCDD (S)		[422.9278]	LOCK	C ₁₀ F ₁₇	PFK
	409.7974	M+2	C ₁₂ H ₃ ³ Cl ₂ ³ ClO	HPCDPE				:	
	[354.9792]	LOCK	្ច ភ	PFK					
က	373.8208	M+2	C, H, 35CI, 37CIO	HXCDF					
	375.8178	4	C12H2**C1*3*C12O	HXCDF					
	383.8639	Σ	13C, H, 3CI, O	HXCDF (S)					
	385.8610		13C12H233CIG	HXCDF (S)				-	
	389.8156		C ₁₂ H ₂ **Cl ₅ **ClO ₂	HXCDD					
	391.8127		C ₁₂ H ₂ **Cl ₄ **Cl ₂ O ₂	HXCDD					
	401.8559		13C ₁₂ H ₂ 3CI ₅ 3'CIO ₂	HXCDD (S)					
	403.8529		13C12H23C137C12O2	HXCDD (S)					
	445.7555		C ₁₂ H ₂ ³² Cl ₂ O	OCDPE					
	[430.9728]	COCK	C,F ₁ ,	PFK					

The following nuclidic masses were used:

®

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}Cl = 34.968853$ $^{37}Cl = 36.965903$

S = internal/recovery standard

LDC #: 23307A2/ SDG #: 2000

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	<u>/</u> of_/_
Reviewer:	<u>a</u>
2nd reviewer:	- l
_	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

1	<u> </u>	Ŋ	N/A
[Υ/	N	N/A
C	_		

Were all reported results recalculated and verified for all level IV samples?
Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concent	ation	$= (A_{\lambda})(I_{\lambda})(DF) (A_{\lambda})(RRF)(V_{\lambda})(\%S)$
A _x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
l _s	=	Amount of internal standard added in nanograms (ng)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
RRF	=	Relative Response Factor (average) from the initial calibration
Df	==	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.

Example:
Sample I.D:
Conc. = (564/60) (2000) (1/60/92) (1.033) (10.18) (938
= 99.7 pg/g

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
"					
	-				
 					
 					
ļ					
<u> </u>				 	
 					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 21, 2010

LDC Report Date:

June 14, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D220587

Sample Identification

SSAL7-02-1BPC

SSAK8-03-1BPC

SSAL5-03-1BPC

SSAK8-03-1BPCMS

SSAK8-03-1BPCMSD

Introduction

This data review covers 5 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
5/16/10	¹³ C-1,2,3,4,6,7,8-HpCDD	38.9	SSAL5-03-1BPC	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	Р

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples	
0116296MB	4/26/10 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF OCDF		0.20 pg/g 0.17 pg/g 1.2 pg/g 0.33 pg/g 0.45 pg/g 1.5 pg/g 1.6 pg/g	SSAL7-02-1 BPC SSAL5-03-1 BPC	
0138437MB	5/18/10 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF OCDF		0.046 pg/g 0.25 pg/g 0.044 pg/g 0.066 pg/g	SSAK8-03-1BPC	

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	Compound	Reported Concentration	Modified Final Concentration
SSAL7-02-1BPC	2,3,7,8-TCDF	0.22 pg/g	0.22U pg/g

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D220587

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

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MS/MSD percent recoveries (%R) were not within QC limits for some compounds, the LCS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK8-03-1BPC	¹³ C-OCDD	32 (40-135)	OCDD	J (all detects) UJ (all non-detects)	Р
			OCDF	J (all detects) UJ (all non-detects)	

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAL5-03-1BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D220587	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D220587	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D220587

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D220587	SSAL5-03-1BPC	1,2,3,4,6,7,8-HpCDD J+ (all detects)		Р	Routine calibration (%D) (c)
G0D220587	SSAK8-03-1BPC	OCDD J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)		Р	Internal standards (%R) (i)
G0D220587	SSAL5-03-1BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	,4,7,8-HxCDF J (all detects) ,6,7,8-HxCDF J (all detects) ,4,6,7,8-HpCDF J (all detects) ,4,7,8,9-HpCDF J (all detects)		Project Quantitation Limit (e)
G0D220587	SSAL7-02-1BPC SSAK8-03-1BPC SSAL5-03-1BPC	All compounds reported below the PQL.			Project Quantitation Limit (sp)
G0D220587	SSAL7-02-1BPC SSAK8-03-1BPC SSAL5-03-1BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D220587

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D220587	SSAL7-02-1BPC	2,3,7,8-TCDF	0.22U pg/g	Α	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D220587

No Sample Data Qualified in this SDG

Tronox Northgate Henderson ET

LDC #: 23307B21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D220587	Stage 2B
Laboratory: Test America	
	: (D)

	Date:	6/19/10
	Page: <u>/</u>	<u> </u>
	Reviewer:	7
2nd	Reviewer:	9

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	A	Sampling dates: 4/1/10
II.	HRGC/HRMS Instrument performance check	4	/ /
111.	Initial calibration	A	
IV.	Routine calibration/IX	M	
V.	Blanks	M	
VI.	Matrix spike/Matrix spike duplicates	au	No spassid - No Cenal
VII.	Laboratory control samples	A	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	M	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	-5W	
XII.	System performance	N	
XIII.	Overall assessment of data	1	
XIV.	Field duplicates	N,	
XV.	Field blanks	√W	TB-04072010-RZD (GDD090441)

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)	SSAL7-02-1BPC	11' 0116296MB	21	31
2 2	SSAK8-03-1BPC	122 0138427 NAB	22	32
3 3	SSAL5-03-1BPC	13	23	33
4 8	SSAK8-03-1BPCMS	14	24	34
5	SSAK8-03-1BPCMSD	15	25	35
6		16	26	36
7		17	27	37
8		18	28	38
9		19	29	39
10		20	30	40

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1.2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HoCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF		V. Total TCDE
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	
				VV. I OTAL PECOF
U. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDE
E. 1,2,3,7,8,9-HXCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total Hoode

Notes:

LDC #: 2330 B2/ SDG #: 120 Cloud

VALIDATION FINDINGS WORKSHEET Routine Calibration

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Was a routine calibration was performed at the beginning and end of each 12 hour period? Were all percent differences (%D) of RRFs \leq 20% for unlabeled compounds and \leq 30% for labeled?

N/N/A

Did all routine calibration standards meet the Ion Abundance Ratio criteria?

SDG#: 20 COND LDC #:33307 B2

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer.

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

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

Were all samples associated with a method blank?

∀N Z Y/N N/A

Was the blank contaminated? If yes, please see gualification below. Was a method blank analyzed for each matrix?

🖉 Blank analysis date: 🚿 Blank extraction date: 469 Conc. units: N N/A

Sample Identification Associated Samples: M 23/4 120 M 0.33 4 30 Blank ID 4 Compound N #

Blank extraction date: 5/8/0 Blank analysis date: 5/2/

N

_							_	
	tion							
4 (20%	Sample Identification				,			
	S							
Associated Samples:								
, ,		(3						
	Blank ID	N. 8437W	0 046	2	0.044	0 066		
Conc. units: 199	Compound			1				
Conc. unit			7	4	0	×))	

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23307B21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Reviewer:_ Page:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

b/bd Associated sample units:

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank / Rinsate / Other:	Field Blank / Rinsate	/ Other:	Associated Samples:	oles:	All (>5X)	5X)		
Compound	Blank ID			Sarr	Sample Identification	on		
	FR-04072010-RZD	2X						
	0.89	0.00445						
	1.5	0.0075						
	2.2	0.011						
	8.3	0.0415						
	1.4	0.007						
	1.6	0.008						
	1.5	0.0075						
	1.6	0.008						
	1.3	0.0065						
	1.4	0.007						
	4.1	0.0205						
CROL								

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 23307 [B2] SDG #: 282 COM

Matrix Spike/Matrix Spike Duplicates VALIDATION FINDINGS WORKSHEET

Reviewer:

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

| N/A | Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Was a MS/MSD analyzed every 20 samples of each matrix? Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits? MAN NA N NA

Qualifications	No and	1	(W SD7)	,																			
Associated Samples	ح ا																						
RPD (Limits)	()	()	()	()	()	()	()	())	((()	()	()	()	()	()	()	()	()	()	())
MSD %R (Limits)	H9 (T9-139)	17 (25-14)	()	()	()	()	()		()		(()	()	()	()	()	()	()	()	()	(()	()
	146(79-139)		()	()	()	()	()	(()	()	()	()	()	()	()	()	()	()	()	()	()	()	(
Compound	4	Ø																					
MS/MSD ID	4/5																						
Date																							
#																							

LDC #:233078=/ SDG #:200 CONCO

VALIDATION FINDINGS WORKSHEET Internal Standards

Reviewer: 2

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

| MAN | Are all internal standard recoveries were within the 40-135% criteria? METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Was the S/N ratio all internal standard peaks > 10? A/N N

#	Date	Lab ID/Reference	Internal Standard	-	% Recovery (Limit: 40-135%)	40-135%)	Qualifications ()
		ለ	4	``	3	140-135	1/W + (4.8)
)		
)		
)		
)		
)		
)	(
)	
						(
						()	
						()	
						()	
						()	
						()	
						()	
		Internal Standards	Check Standard Used		. ul	Internal Standards	Check Standard Used
∢	13C-2.3.7.8-TCDF	OF		:	13C-OCDD		
ď	13C-2 3 7 8-TCDD	CC		Υ.	¹³ C-1,2,3,4-TCDD		
i c	 	PeCDF		l.	¹³ C-1,2,3,7,8,9-HxCDD	CDD	
٥	 	PeCDD		Σ			
шi	¹³ C-1,2,3,4,7,8-HxCDF	-HxCDF		z			
u.	_	-HxCDD		o			J
ιö	<u> </u>	,8-HpCDF		a:			
<u> </u>	<u> </u>	,8-HpCDD					

LDC #: 23307B>/

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of Reviewer:

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

X N N X

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	1 det 4			V + (+)						
Associated Samples	m			114						
Finding	H. K. L.O.P. &	>calsbranse		zupe Msults						
Sample ID				\mathcal{M}						
Date							0			
*										

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 21, 2010

LDC Report Date:

June 17, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D230609

Sample Identification

SSAK7-01-10BPC** SSAK7-01-9BPC RSAJ5-8BPC RSAJ5-7BPC

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 4 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B 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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination.

 This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0118247MB	4/28/10	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.038 pg/g 0.026 pg/g 0.10 pg/g 0.28 pg/g 0.17 pg/g 0.24 pg/g 0.18 pg/g 0.31 pg/g 0.13 pg/g 0.15 pg/g 0.064 pg/g 0.19 pg/g 0.15 pg/g 0.19 pg/g 0.23 pg/g	SSAK7-01-10BPC** SSAK7-01-9BPC
0130380MB	5/10/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.41 pg/g 1.6 pg/g 0.65 pg/g 1.3 pg/g 0.67 pg/g 0.28 pg/g 2.0 pg/g 0.82 pg/g 4.0 pg/g	RSAJ5-8BPC RSAJ5-7BPC

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 0CDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D230609

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK7-01-10BPC**	¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	31 (40-135) 26 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	P
SSAK7-01-9BPC	¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	36 (40-135) 32 (40-135) 36 (40-135) 21 (40-135) 18 (40-135) 13 (40-135)	1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	Р
RSAJ5-8BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	27 (40-135) 30 (40-135) 21 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
RSAJ5-7BPC	¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	35 (40-135) 37 (40-135) 15 (40-135) 16 (40-135) 11 (40-135)	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK7-01-10BPC**	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P
SSAK7-01-9BPC RSAJ5-8BPC	1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р
RSAJ5-7BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D230609	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D230609	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D230609

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D230609	SSAK7-01-10BPC**	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R)
G0D230609	SSAK7-01-9BPC	1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HxCDD 1,2,3,4,6,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	J (all detects) (UJ (all non-detects)	P	Internal standards (%R) (i)
G0D230609	RSAJ5-8BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D230609	RSAJ5-7BPC	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P	internal standards (%R) (i)
G0D230609	SSAK7-01-10BPC**	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D230609	SSAK7-01-9BPC RSAJ5-8BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D230609	RSAJ5-7BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D230609	SSAK7-01-10BPC** SSAK7-01-9BPC RSAJ5-8BPC RSAJ5-7BPC	All compounds reported below the PQL.	J (all detects)	Α	Project Quantitation Limit (sp)
G0D230609	SSAK7-01-10BPC** SSAK7-01-9BPC RSAJ5-8BPC RSAJ5-7BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D230609

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D230609

No Sample Data Qualified in this SDG

Tronox Northgate Henderson ET

LDC #: 23307C21	_ VALIDATION COMPLETENESS WORKSHE
SDG #: G0D230609	Stage 2B/ 4 -
Laboratory: Test America	
	(FDA OM 040 M-H 1 0000)

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	A	Sampling dates: 4/31/10
11.	HRGC/HRMS Instrument performance check	4	
111.	Initial calibration	A	
IV.	Routine calibration/I	A	
V.	Blanks	w	
VI.	Matrix spike/Matrix spike duplicates	W	No assid spl - No Cenal.
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	W	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	₹N	
XII.	System performance	A	
XIII.	Overall assessment of data	#	
XIV.	Field duplicates	N,	
XV.	Field blanks	W	PB-04072010-PZD(400090441)

Note: A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

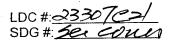
TB = Trip blank

EB = Equipment blank

Validated Samples:

1	SSAK7-01-10BPC **	5 11	01/8247MB 0130380MB	21	31	
2	SSAK7-01-9BPC	12	6130380MB	22	32	
3 >	RSAJ5-8BPC	13		23	33	
4	RSAJ5-7BPC	/ 14		24	34	
5		15		25	35	
6		16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20		30	40	

Notes:	

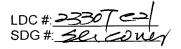


VALIDATION FINDINGS CHECKLIST

Page: /of / Reviewer: / 2nd Reviewer: /

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Validation Area	Yes	No	NA	Findings/Comments '
I. Technical holding times				
All technical holding times were met.				-
Cooler temperature criteria was met.	/		'	
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?			<u> </u>	
Were the retention time windows established for all homologues?		-	'	!
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?			<u> '</u>	!
Is the static resolving power at least 10,000 (10% valley definition)?		 '	<u> '</u>	
Was the mass resolution adequately check with PFK?	1/		<u> </u>	
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	1	<u> </u>	<u>'</u>	
III. Initial calibration				<u> </u>
Was the initial calibration performed at 5 concentration levels?		<u>'</u>	'	
Were all percent relative standard deviations (%RSD) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?		<u> </u>		
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?				
IV. Continuing calibration	, , , , , , , , , , , , , , , , , , ,		<u> </u>	
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	/	<u> </u>	<u> </u>	
V. Blanks				
Was a method blank associated with every sample in this SDG?			Ш	
Was a method blank performed for each matrix and concentration?	/		Ш	
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?		- 3.00		
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VII. Laboratory control samples	· 7			
Was an LCS analyzed for this SDG?	4			
Was an LCS analyzed per extraction batch?	/		,	
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within				



VALIDATION FINDINGS CHECKLIST

Page: → of →
Reviewer: →
2nd Reviewer: →

VIII. Regional Quality Assurance and Quality Control			,	Г
Were performance evaluation (PE) samples performed?		/	<u> </u>	2
Were the performance evaluation (PE) samples within the acceptance limits?			L	
IX. Internal standards	· · · · ·			
Were internal standard recoveries within the 40-135% criteria?				
Was the minimum S/N ratio of all internal standard peaks ≥ 10?				
X. Target compound identification		T	1	·
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?				
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?				
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	/			
Did compound spectra contain all characteristic ions listed in the table attached?				
Was the Ion Abundance Ratio for the two quantitation ions within criteria?				
Was the signal to noise ratio for each target compound and labeled standard ≥ 2.5?	/			
Does the maximum intensity of each specified characteristic ion coincide within ± 2 seconds (includes labeled standards)?	_	,		
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?				
Was an acceptable lock mass recorded and monitored?				
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?				
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XII. System performance				
System performance was found to be acceptable.				
XIII. Overall assessment of data	(Y) ()			
Overall assessment of data was found to be acceptable.				
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.				
Target compounds were detected in the field duplicates.				
XV: Field blanks				
Field blanks were identified in this SDG.	Δ			
Target compounds were detected in the field blanks.				

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

		- K 109478-H-COFF	P 1234789-HoCDF	U. Total HpCDD
A. 2,3,7,8-1 CDD	F. 1,2,3,4,0,7,000	100X1-0,1,1,0,3,1 X		
700000000000000000000000000000000000000	9,000	L. 1,2,3,6,7,8-HxCDF	Q. 0CDF	V. Total TCDF
0. 1,2,2,7,0,1	((((((((((((((((((((
	H 0378-TODE	M. 2.3,4,6,7,8-HXCDF	R. Total TCDD	W. Total PeCDF
COCKE 1, 4, 6, 3, 1				
	1 4 2 3 7 8. DACDE	N. 1.2.3.7.8.9-HXCDF	S. Total PeCDD	X. Total HxCDF
OOKL!0,1,0,0,1,1				
122789-HYCOD	1 2 3 4 7 8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF
II. 1,4,5,1,0,1,0,0				

Notes:

VALIDATION FINDINGS WORKSHEET

2nd Reviewer:_ Reviewer:_

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

SDG #: See Cover

LDC #: 23307C21

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below.

Conc. units: pg/g

Associated samples: Blank analysis date: 5/15/10 Blank extraction date: 4/28/10

1-2 (>5X)

Sample Identification 0.19 0.65 0.75 0.32 0.95 0.75 1.15 0.13 0.85 1.55 6.0 0.5 1.2 젉 0118247MB Blank ID 0.038 0.026 0.15 0.064 0.19 0.18 0.13 0.15 0.23 0.10 0.28 0.24 0.17 0.31 Compound ≥ 0 G Ш

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307C21

VALIDATION FINDINGS WORKSHEET

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. Y N N/A

Blank extraction date: 5/10/10

Conc. units: pg/g

Associated samples: Blank analysis date: 5/21/10

3-4 (>5X)

Sample Identification 2.05 3.25 3.35 6.5 4. 4.1 9 20 걺 œ 0130380MB Blank ID 0.65 0.28 0.41 0.67 2.0 0.82 4.0 .. Compound 0

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307C21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:__ Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

b/bd Associated sample units:_ N/A Were field blanks identified in this SDG? Blank units: pg/L

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank Rinsate / Other.

Associated Samples:

All (>5X) Sample Identification 0.00445 0.0415 0.0205 0.0075 0.0075 0.0065 0.008 0.008 0.011 0.007 0.007 걺 EB-04072010-RZD Blank ID 0.89 1.5 1.6 1.5 1.6 8.3 1.4 1.3 4. 2.2 4.1 Compound တ Σ Z

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

VALIDATION FINDINGS WORKSHEET Internal Standards

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

YANNA Are all internal standard recoveries were within the 40-135% criteria?

Y N N/A Was the S/N ratio all internal standard peaks > 10?

			13C-1234678-HpCDD	_
		ď.	¹³ C-1,2,3,4,6,7,8-HpCDF	3 يۇد
\$		Ö	¹³ C-1,2,3,6,7,8-HxCDD	
		ż	¹³ C-1,2,3,4,7,8-HxCDF	E C
		Σ	¹³ C-1,2,3,7,8-PeCDD	_
	¹³ C-1,2,3,7,8,9-HxCDD	j	¹³ C-1,2,3,7,8-PeCDF	╄
	¹³ C-1,2,3,4-TCDD	ᅶ	13C-2,3,7,8-TCDD	<u> </u>
	13C-OCDD	:	13C-2,3,7,8-TCDF	A. 13C-2
	Internal Standards	Check Standard Used	Internal Standards	
Check Standard Used	Internal Standards			
	()			
	,)	//		
	()	91		
		51		
	()	78 37		
(c+.K-K)		35	7	
-)			
) /			
	30 (+		
(F-4.0-R)	() 75	2 3 2	W	
	()			
	()	(8)		
		X / / X		
	() /	A		
	()			
(B-F.K-R)	()	3		
		9E A	Ч	
-	(4) 98	8		
(MA (FG A)	51 (40-135)		,	-
Qualifications (/)	% Recovery (Limit: 40-135%)	Internal Standard	Lab ID/Reference	# Date

50G #: 23307C3/ 50G #: 261 Conel

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: ____of Reviewer:

Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Were the correct in V/A Were the correct in V/A Compound quantit

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

			cook Vealib land	ما	
*	Date	Sample ID	Finding	Associated Samples	Qualifications
			H. K. O. P. B		whether (C)
			,		-
		W V	Ø.	5-5	
			/		,
		4	4.1. K. L.O. P. B.	7	/
		\(\text{\text{\$\psi}}\)	All ZNDC MSW AS		(F)
				,	
	,				

Comments: See sample calculation verification worksheet for recalculations

LDC #: -3307C2 SDG # Ser and

Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

 $A_x = Area of compound,$ $C_x = Concentration of compound,$ S = Standard deviation of the RRFs,

 $A_{\bf k}$ = Area of associated internal standard $G_{\bf k}$ = Concentration of internal standard X = Mean of the RRFs

RRF = $(A_{\omega}/(C_{\omega})/(A_{\omega})(C_{\omega})$ everage RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Average RRF (initial)	RRF (C 3 std)	RRF (S std)	%RSD	%BSD
-	10/2	1/1/2	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	28/200	0.933		5	10011	0011
	(305)	10///0	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.03870	1.8801			489709	A xan
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09904	1.09904	1)	17	103817	4038
			1,2,3,4,6,7,8-HpCDD (19C-1,2,4,6,7,8,-HpCDD)	789660	10.9988	175501	105041	52/52	5 3/5
			OCDF (1°C-OCDD)	1.562	1.25.24	1.32988	1.32988	939998	9 400
2	10th	01/11/4	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	8801	8801	1.10	0//	651	22/
			2,3,7,8-TCDD (19C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF (1ºC-OCDD)						
8			2,3,7,8-TCDF (13C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (18C-2,3,7,8-TCDD)						
I			1,2,3,6,7,8-HxCDD (130-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			ocpf (4c_ocpb)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results. SDG #: 36 COUR LDC #: 2332/23

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF RRF = (A_)(C_s)/(A_)(C_s)

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_{\rm k}$ = Area of associated internal standard $C_{\rm k}$ = Concentration of internal standard $A_x = Area \ of compound,$ $C_x = Concentration \ of compound,$

L					Reported	Recalculated	Reported	Recalculated
		Calibration		Average DDE	200	u		
*	Standard ID	Date	Compound (Reference Internal Standard)	(initial)	(00)	(OO)	%۵	0%
-	12M1/0305	1/20 50 Eall	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	28/26.0	0.99473	674660	N,	o x
			2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	078801	746811	718811	145	SKI
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09404	1.17180	1.17/80	66	9.0
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	78960	1.04331	1.09231	9.6	9.6
			OCDF ("C-OCDD)	1.26224	1.46/57	1.46157	15.8	15.8
2	174/10/30S	1-1-	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	25/560	0.96173	671290	4.4	7.4
	, ,	2/////5	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.03870	1.15010	0/05/1	107	101
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09904	1.17867	1.17867	1.7	7.7
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	789660	1.04098	104098	4.4	PY
			OCDF (1°C-OCDD)	1.26224	1.47489	1.47589	16.9	6,91
က	PH/10502	(-/21.)	2,3,7,8-TCDF (¹³C-2,3,7,8-TCDF)	8801	1.13/	1/8/:1	40	17
	\ \ \ \	2/12/1/	2,3,7,8-TCDD (*3C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (3°C-OCDD)					

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

SDG # 28 CONON

VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration SA = Spike added

RPD = ILCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 01/8247

			7	3	82	u	l CSD	0	I CS/I	CS/LCSD
Fill Comp	S S O	Spirke Added	Concentration	ration (2)	Percent Recovery	ecovery	Percent Recovery	scovery	RPD	Qc
purpoduoo	301	ıcsn	1 CS	l CSD	Reported	Recalc	Reported	Recaic	Reported	Recalculated
2.3.7.8-TCDD	20.0	NX	7,55	XM	5	[13				
1,2,3,7,8-PeCDD	201		14	-	4	14				
1.2.3.4.7.8-HxCDD	٠				111	11/				
1.2.3.4.7.8.9-HpCDF	<u></u>		116		16	116				
OCDF	200	~	255		82	28				
				_						
								-		
	-			-						

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

lons Monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

Descriptor	Accurate mass ^(s)	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass ^(a)	Ol nol	Elemental Composition	Analyte	
	303.9016	:	o¹1ɔۥۥ*H²¹ɔ	TCDF	4	407.7818	M+2	C ₁₂ H**Cl ₈ **ClO	HpCDF	
	305.8987	~	G;2H435Cl37C10	TCDF		409.7788	M+4	C ₁₂ H ³⁵ Cl ₅ 37Cl ₂ O	HpCDF	
	315.9419		12C12H, 25C1,O	TCDF (S)		417.8250	Σ	13C12H36CI,O	HpCDF (S)	
	317.9389	۸.	12C12H425C132CIO	TCDF (S)		419.8220	M+2	13C12H30Cl637ClO	HpcDF	
	319.8965		C ₁₂ H ₄ *C ₁ O ₂	TCDD		423.7767	M+2	C ₁₂ H ²⁵ CI ₆ ²⁷ CIO ₂	Нрсор	
	321.8936	٥.	C ₁₂ H ₄ **Cl ₃ **C10 ₂	TCDD		425.7737	M+4	C,H ³⁵ Cl, ³⁷ Cl,O,	НрСББ	
	331.9368	Σ	13C, H, 2CI,O,	TCDD (S)		435.8169	M+2	13C, H*Ci, 37ClO,	HpCDD (S)	
	333,9338	M+2	13C, H, 35Cl, 37ClO,	TCDD (S)		437.8140	₩ +	13C, H ²³ Cl, 37Cl, O,	HeCDD (S)	
	375.8364	M+2	C,H,*CI,*CIO	HXCDPE		479.7165	A+ ₩	C.H.**CI,**CI,O	NCDPE	
	[354.9792]	LOCK	ر آئی	PFK		[430.9728]	LOCK	C, 17	PFK	
	339.8597	M+2	C,H,**Cl_**ClO	PecDF	2	441,7428	M+2	012,401,37010	OCDF	
	341.8567	M+4	O,17, "CI, 37CI, O	PeCDF		443.7399	M+4	0,0%,0%,0	OCDF	
	351,9000		(3C, H, 3CI, 37C10	PeCDF (S)		457.7377	× +2	C, 3CI, 37CIO,	ocop	
	353,8970		13C. H. 3CI.O.	PeCDF (S)		459.7348	∑ - +	C :3CI: 37CI: O		
	355,8546		C.H.*CI.	PeCDD		469.7780	V + V	13C, 36C 37C O.	OCDD (S)	
	357.8516		C.H. 3CI. 3CI.O.	Pecpo		471,7750	. + 1 +	130 %01 3701.0	0000 (8)	
	367 8040		12' '3' ('3' ('2')2' '3' ('3') '3' ((0)		E12 677E		(12 (16 (12 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	(2)	_
	360 8010	7+M		recut (s)		5/50/075	+ N + C		מיניים ו	
	808.08		2020 " L D T T T T T T T T T T T T T T T T T T	recup (a)		[472.92/6]	500	C ₁₀ -17	<u>-</u>	
	409.7974		C ₁₂ H ₃ *Cl ₈ 3/ClO	HPCDPE						_
	[354.9792]	LOCK	C,F ₁	PFK		,				
	373.8208	M+2	C.H.36CI.37CIO	HXCDF						
	375,8178		C.17. 201.0	HXCDF						·
	383 8639			HYCDE (S)						
	385.8610		13. 2. 3. 15th	HYCDE (S)						
	200 0456		(12.12 (13.12) (13.12 (13.12)		_					
	301.8127	7 + W	127 0 22 20 0 22 20 0							
	401 8550		12 12 12 12 12 12 12 12 12 12 12 12 12 1	(0)						_
	403 8530		12 12 0.5 0.02 13 1 3 1 3 1 0	(6) 20 (7)						_
	445 7555		C T 3C 3C C	(א) אריירי						
	[430 9728]		(12) (2) (2) (1) (1) (1) (1) (1)	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2						
	[420:3750]		6 9 ¹ 17	۷.						
										_

The following nuclidic masses were used:

®

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}CI = 34.968853$ $^{37}CI = 36.965903$

S = internal/recovery standard

LDC #: 33367C31 SDG # 501 CONLY

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Were all reported results recalculated and verified for all level IV samples?

Page:_	/_of_ <i>/</i>
Reviewer:	9-
2nd reviewer:	9

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

YNN	V/A V/A	Were all recalculated results for detected to	arget compounds agree within 10.0% of the reported results?
Concer	ntration	= (A,)(I,)(DF) (A _b)(RRF)(V _o)(%S)	Example:
A_{x}	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D;:
A_{is}	-	Area of the characteristic ion (EICP) for the specific internal standard	7 /707
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (3/8/57.0) (2000) (1.0) (1/6977/13) (1.03870) (10.15) (1.915)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	
DDE	_	Relative Response Factor (average) from the initial	=493.5 PG/A

Percent solids, applicable to soil and solid matrices

calibration Dilution Factor.

Df

%S

Example:	
Sample I.D,	:
7 /-07	
Conc. = $(\frac{278457.0}{1.000})$ ($\frac{2000}{1.000}$) ($\frac{1}{1.000}$))6 G1C

416971.5 (1.03870) (10.15 18.915) = 493.5 pg/g

					
			Reported Concentration	Calculated Concentration	
#	Sample ID	Compound	()	()	Qualification
	-				
-					
				<u> </u>	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 27, 2010

LDC Report Date:

June 17, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D280587

Sample Identification

SSAK8-04-4BPC SSAK8-04-5BPC**

SSAK8-04-5BPC_FD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 3 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B 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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0126326MB	5/6/10	2,3,7,8-TCDD 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.030 pg/g 0.021 pg/g 0.030 pg/g 0.043 pg/g 0.28 pg/g 0.061 pg/g 0.032 pg/g 0.046 pg/g 0.063 pg/g 0.081 pg/g 0.085 pg/g 0.046 pg/g 0.046 pg/g 0.046 pg/g 0.046 pg/g 0.049 pg/g 0.11 pg/g 0.079 pg/g 0.21 pg/g	All samples in SDG G0D280587

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.6 pg/L 1.4 pg/L 4.1 pg/L 4.1 pg/L	All samples in SDG G0D280587

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK8-04-4BPC	¹³ C-OCDD	33 (40-135)	OCDD	J (all detects)	Р
			OCDF	UJ (all non-detects) J (all detects) UJ (all non-detects)	

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK8-04-4BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D280587	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D280587	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

Samples SSAK8-04-5BPC** and SSAK8-04-5BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentra	tion (pg/g)	RPD	Difference		
Compound	SSAK8-04-5BPC**	SSAK8-04-5BPC_FD	(Limits)	(Limits)	Flags	A or P
2,3,7,8-TCDD	1.3	1.5	-	0.2 (≤0.52)	-	-
1,2,3,7,8-PeCDD	3.5	4.3	-	0.8 (≤2.6)	-	-
1,2,3,4,7,8-HxCDD	2.0	2.3	-	0.3 (≤2.6)	-	-
1,2,3,6,7,8-HxCDD	4.1	4.9	-	0.8 (≤2.6)	-	-
1,2,3,7,8,9-HxCDD	3.3	4.3	-	1 (≤2.6)	-	•
1,2,3,4,6,7,8-HpCDD	11	13	-	2 (≤2.6)	-	-
OCDD	8.9	14	-	5.1 (≤5.2)	-	-
2,3,7,8-TCDF	33	41	22 (≤50)	-	-	-
1,2,3,7,8-PeCDF	53	64	19 (≤50)	•	-	-
2,3,4,7,8-PeCDF	30	35	15 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	80	100	22 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	60	71	17 (≤50)	-	-	-

	Concentra	ation (pg/g)	DDD	Difference		A or P
Compound	SSAK8-04-5BPC**	SSAK8-04-5BPC_FD	RPD (Limits)	Difference (Limits)	Flags	
2,3,4,6,7,8-HxCDF	14	18	25 (≤50)	-	•	-
1,2,3,7,8,9-HxCDF	11	15	31 (≤50)	•	-	•
1,2,3,4,6,7,8-HpCDF	140	200	35 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	86	120	33 (≤50)	-	-	-
OCDF	340	570	51 (≤50)	-	J (all detects)	Α

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D280587

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D280587	SSAK8-04-4BPC	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D280587	SSAK8-04-4BPC	OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D280587	SSAK8-04-4BPC SSAK8-04-5BPC** SSAK8-04-5BPC_FD	All compounds reported below the PQL.	J (all detects)	Α	Project Quantitation Limit (sp)
G0D280587	SSAK8-04-4BPC SSAK8-04-5BPC** SSAK8-04-5BPC_FD	All compounds reported as EMPC	JK (all detects)	Α	Project Quantitation Limit (k)
G0D280587	SSAK8-04-5BPC** SSAK8-04-5BPC_FD	OCDF	J (all detects)	Α	Field duplicates (RPD) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D280587

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D280587

No Sample Data Qualified in this SDG

Tronox Northgate Henderson ET

LDC #: 23307D21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D280587	Stage 2B/
Laboratory: Test America	-
	(EDA OM 040 Matter of 0000)

2nd Reviewer

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	A	Sampling dates: 4/37/10
11.	HRGC/HRMS Instrument performance check	4	
III	Initial calibration	A	
IV.	Routine calibration/I	4	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	W	No assid spl- No aval
VII.	Laboratory control samples	\triangleleft	109
VIII.	Regional quality assurance and quality control	N ,	
lX.	Internal standards	W	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	A	
XIII.	Overall assessment of data	#	
XIV.	Field duplicates	W	D=2+3
XV.	Field blanks	W	TB-04072010-RZD(G00090441)

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

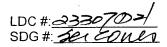
TB = Trip blank

EB = Equipment blank

Validated Samples:

		·				
1	SSAK8-04-4BPC	11	0/26326NB	21	31	
2	SSAK8-04-5BPC ★★	12		22	32	
3	SSAK8-04-5BPC_FD	13		23	 33	
4		14		24	34	
5		15		25	35	
6		16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20		30	40	

Notes:	



VALIDATION FINDINGS CHECKLIST

Page: of Page: 2 Page:

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

				T
Validation Area	Yes	No	NA	Findings/Comments ´
I. Technical holding times				
All technical holding times were met.				
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?				
Were the retention time windows established for all homologues?				
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers \leq 25% ?				
Is the static resolving power at least 10,000 (10% valley definition)?				
Was the mass resolution adequately check with PFK?				
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?				
III. Initial calibration	· · · · · ·			
Was the initial calibration performed at 5 concentration levels?				
Were all percent relative standard deviations (%RSD) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?	/			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?				
V. Blanks				
Was a method blank associated with every sample in this SDG?				
Was a method blank performed for each matrix and concentration?				
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?				
VI. Matrix spike/Matrix spike duplicates	· · ·			
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VII. Laboratory control samples			(ASC 100A (ASC 100A (ASC 10)	
Was an LCS analyzed for this SDG?		.		
Was an LCS analyzed per extraction batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				



VALIDATION FINDINGS CHECKLIST

Page: of of Page: Of Page: Pag

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		/	1_	
Were the performance evaluation (PE) samples within the acceptance limits?			\perp	
IX. Internal standards	,	Т		
Were internal standard recoveries within the 40-135% criteria?	ļ.,	/		
Was the minimum S/N ratio of all internal standard peaks ≥ 10?				
X. Target compound identification				
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?	(
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	/			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	/	-		
Did compound spectra contain all characteristic ions listed in the table attached?			-	
Was the Ion Abundance Ratio for the two quantitation ions within criteria?			<u> </u>	
Was the signal to noise ratio for each target compound and labeled standard ≥ 2.5?			ļ	
Does the maximum intensity of each specified characteristic ion coincide within ± 2 seconds (includes labeled standards)?				
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?				
Was an acceptable lock mass recorded and monitored?			<u></u>	
XI. Compound quantitation/CRQLs		17- 17-		
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?				
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	/			
XII. System performance				
System performance was found to be acceptable.				
XIII: Overall assessment of data			5(/ · · · · · · · · · · · · · · · · · ·	
Overall assessment of data was found to be acceptable.				
XIV. Field duplicates	v is			
Field duplicate pairs were identified in this SDG.				
Target compounds were detected in the field duplicates.				
XV: Field blanks				
Field blanks were identified in this SDG.		<u> </u>		
Target compounds were detected in the field blanks.	/			

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. 0CDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HXCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:

W. 17

SDG #: See Cover LDC #: 23307D21

VALIDATION FINDINGS WORKSHEET

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? Was the method blank contaminated? If yes, please see qualification below. Y N/A Y/N N/A

Blank extraction date: 5/6/10

Blank analysis date: 5/18/10 Conc. units: pg/g

All (>5X)

Sample Identification Associated samples: 0.105 0.215 0.305 0.315 0.405 0.175 0.395 0.15 0.15 0.16 0.23 0.23 0.55 1.05 4. 0126326MB Blank ID 0.030 0.030 0.046 0.035 0.046 0.021 0.043 0.061 0.032 0.063 0.079 0.28 0.081 0.11 0.21 Compound တ

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were quaified as not detected, "U".

SDG #: See Cover LDC #: 23307D21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: 9 Reviewer:__ Page:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

White Manual Manuscript SDG?

Blank units: pg/L Associated sample units Sampling date: 4/7/10

b/bd Associated sample units:_

Field blank type: (circle and Field blank Rinsate / Other:

All (>5X) Sample Identification Associated Samples: 0.00445 0.0415 0.0075 0.0075 0.0065 0.0205 0.011 0.007 0.008 0.008 0.007 X EB-04072010-RZD Blank ID 0.89 1.5 1.6 1.5 2.2 8.3 1.6 53 4. 4. 7. Compound CRaL တ

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

VALIDATION FINDINGS WORKSHEET Internal Standards

Reviewer: 2

Page: Z

SDG #261 CON LDC #: 3330/D

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Are all internal standard recoveries were within the 40-135% criteria?

Was the S/N ratio all internal standard peaks > 10?

N/A

*	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)		Qualifications
			-#	33)	40-1301	VAN 4 (A. &)
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))	
		Internal Standards	Check Standard Used		Internal Standards	ndards	Check Standard Used
Ą	13C-2,3,7,8-TCDF)DF			್ತಿರ-೦೦D		
B)	13C-2,3,7,8-TCDD	סמג		ᅶ	¹³ C-1,2,3,4-TCDD		
ن	¹³ C-1,2,3,7,8-PeCDF	PeCDF		اند	¹³ C-1,2,3,7,8,9-HxCDD		
۵	¹³ C-1,2,3,7,8-PeCDD	PeCDD		Σ			
ш	¹³ C-1,2,3,4,7,8-HxCDF	8-HxCDF		z			
ñ.	¹³ C-1,2,3,6,7,8-HxCDD	8-HxCDD		Ö			
ى ى	¹³ C-1,2,3,4,6,7,8-HpCDF	7,8-HpCDF		a.			
Τ̈́	1 1	7,8-HpCDD					

SDG # See Com 100 #:0330/05

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

A N N N

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	Motor (e)		JK(K)						
Associated Samples	/		w						
Gods > call b 100 3	×		ZNDC MENTS						
Sample ID	/		W ZHADE						
# Date						0			

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23307D21</u> SDG#: <u>See Cover</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N NA Y N NA

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

	Concentrat	ion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	2	3	RPD	Difference	Limits	(Parent Only)
A	1.3	1.5		0.2	(≤0.52)	
В	3.5	4.3		0.8	(<u><</u> 2.6)	
С	2.0	2.3		0.3	(<u><</u> 2.6)	
D	4.1	4.9		0.8	(≤2.6)	
E	3.3	4.3		1	(≤2.6)	
F	11	13		2	(<u><</u> 2.6)	
G	8.9	14		5.1	(<u><</u> 5.2)	
Н	33	41	22			
	53	64	19			
J	30	35	15			
к	80	100	22			
L	60	71	17			
М	14	18	25			
N	11	15	31			
О	140	200	35			
Р	86	120	33			
Q	340	570	51			Jdots/A

V:\FIELD DUPLICATES\23307D21.wpd

(+d)



Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_{\nu})(C_{\mu})/(A_{\mu})(C_{\nu})$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

 $A_x = Area of compound, \\ C_x = Concentration of compound, \\ S = Standard deviation of the RRFs, \\$

 $A_{\rm k} = {\rm Area~of~associated~internal~standard~} C_{\rm k} = {\rm Concentration~of~internal~standard~} X = {\rm Mean~of~the~RRFs}$

L									
				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (C 3 std)	RRF (CS std)	%RSD	%RSD
-	10/2	11	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	28/66.0	0.93135	0.93135 0.9/26 × 0.94963	0.94963	28017	6017
	(305)	2/1/10	2,3,7,8-TCDD (*3C-2,3,7,8-TCDD)	1.03870	1.0387	x140.1	104720	489709	4 201
		,	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09904	1.09904	1 .	111130	195827	4938
			1,2,3,4,6,7,8-HpCDD (19C-1,2,4,6,7,8,-HpCDD)		0.99834	1.05541	1.05541	53/53	5.3/5
			OCDF (4c-OCDD)	pc=2-1	1.25.24	1.32988	1.32988	8,39998	207 6
7	10/1	01/11/4	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	1.088	1.10	011	651	02.1
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)						
			OCDF (*c-OCDD)						
3			2,3,7,8-TCDF (¹⁸ C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)						
			OCDF (1°C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results. LDC #: 2330702

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

Reviewer:

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF RRF = $(A_u)(C_u)/(A_u)(C_v)$

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_x = Area of compound,$ $C_x = Concentration of compound,$

 $A_{\rm k}=$ Area of associated internal standard $C_{\rm k}=$ Concentration of internal standard

L					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	%۵
	1744/0/3R	10/1	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	0.92135	0.96862	S 3886 2	5./	6.5
		0//0//0	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	018801	1.07593	1.07593	<i>1</i> 80	ŠŽ
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	706601	1.24646	Theta!	12.9	6.5
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	78966.0	82601.1	5/60/1	K //	//.3
			OCDF (3c-OCDD)	PCC9C1	711051	1.50116	18.9	18.9
2	1847/1005D	6/8/2	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	2801	1.17	/ / /	7.8	1.0
			2,3,7,8-TCDD (¹³C-2,3,7,8-TCDD)			/		
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (3c-OCDD)					
ო			2,3,7,8-TCDF (°C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (%C-OCDD)					

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

LDC #: 2330(D2 SDG# NGC 1/4

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:_ Reviewer:

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

RPD = I LCS - LCSD I * 2/(LCS + LCSD)

LCS ID: 0/26326

Where: SSC = Spiked sample concentration SA = Spike added

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

	S	ike	Spiked	Sample	ICS	S	1 CSD	g,	I CS/I CSD	csn
Compound	Ď Å	Addeg Page 9	Concentration (PS)	tration	Percent Recovery	ecovery	Percent Recovery	tecovery	RPD	0
是一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个	, , ,	I CSD	108	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	0.00	N.A.	22.8	NH	7/1	711				
1,2,3,7,8-PeCDD	00/	•	///		///	///				
1,2,3,4,7,8-HxCDD	/		T01		102	201				
1,2,3,4,7,8,9-HpCDF	À		~//		7 7	e//				
OCDF	700	<i>\rightarrow</i>	755	1	114	#11				
				-						

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

lons Monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

Descriptor	Accurate mass(a)	Ol noi	Flamental Composition	Analyte	Docorintor	Acceptate Magazia	Ol not	noisionamo Clotacamolia	
loud Hoose	Accelate IIIdo			Allaiyte	Descriptor	Accurate Mass	Ul not	Eremental Composition	Analyte
_	303,9016	Σ	0,0,4,50,0	TCDF	4	407.7818	M+2	C. H*Cl. 37CIO	HDCDF
	305.8987	M+2	C;H,*Cl,*7C10	TCDF		409.7788	M+4	0,075,020	HDCDF
	315,9419	Σ	13C,H, 3CI,O	TCDF (S)		417.8250	Σ	0-10-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	HDCDF (S)
	317.9389	M+2	13C12H_36C1_37C1O	TCDF (S)		419.8220	M+2	13C, H. Cl. 37ClO	HoCDF
	319.8965	Σ	C ₁ ,H ₂ *C ₁ O ₃	TCDD		423.7767	M+2	C.H. Claro	Hocod
	321.8936	M+2	C,H,*Cl,**C10,	TCDD		425.7737	M+4	C.H*CI,37CI,O	Hecop
	331.9368	2	13C; H, 3CI,O,	TCDD (S)		435.8169	M+2	13C. H ³⁵ Cl. 37ClO	HPCDD (S)
	333,9338	M+2	13C;H,35Cj,37ČlO,	TCDD (S)		437.8140	. . +	13C H ³² Cl 37Cl O	
	375.8364	M+2	CI,H, aCI, a'CIO	HXCDPE		479.7165	. ₩ +	C.F. (13 (12 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	NOOPE NOOPE
	[354.9792]	LOCK	, F. P.	PFK		[430.9728]	LOCK	C.F. (7 (2)	PFK I
						•		<u>.</u>	
2	339.8597	M+2	C, H, 35C , 37C O	PecDF	2	441.7428	V+V	C.:35CI.37CIO	CODE
	341.8567	M+4	O,T, C, L, SCI, O	PecDF	,	443.7399	- -	C12 C17 C1C	000 F
	351.9000	M+2	13C, H, 3C, 17C10	PeCDF (S)		457.7377	\ + \ \	C12 C16 C12 C. 35CL37CIO	
	353.8970		13C, H, *Cl, 37Cl, O	PeCDF (S)		459,7348	A+ M	C. 3CI.37CI.O.	0000
	355.8546		C,H,*CI,*OO,	PecDD		469.7780	M+2	13C, 38C 37C O,	OCDD (S)
	357.8516		Cj.H.ªCij.³Oi,Ō,	PeCDD		471.7750	Α + 4	130,301,301,00	0000 (8)
	367.8949	M+2	19C, H, 35C, 77ClO,	PeCDD (S)		513.6775	M+4	C, 32C , 37C , O	DCDPE
	369.8919	M+4	13C1,H,38C1,37C1,O,	PecDD (S)		[422.9278]	LOCK	,	PFK
	409.7974	M+2	C, H, 35Cl, 7ClO	HDCDPE		•		71.01	
	[354.9792]	LOCK	ر ئى ئى	PFK					
က	373.8208	M+2	C.H.**CI.3*CIO	HXCDF					
	375.8178		C ₁₂ H ₂ *Cl ₄ *Cl ₂ O	HXCDF					
	383.8639	₹	O"D" H"C"	HXCDF (S)					
	385.8610	M+2	13C12H235CIS	HxCDF (S)					
	389.8156		C ₁₂ H ₂ 35Cl ₅ 37ClO ₂	НХСББ					
	391.8127		C ₁₂ H ₂ ³² Cl ₂ ¹ 3Cl ₂ O ₂						
	401.8559		13C12H23C162	HXCDD (S)					
	403,8529	¥ +	1.50.47.50.70.00 1.50.47.50.00	HXCDD (S)		7.			
	[430 9728]			מינים אינים					
	[92/6:904]		Cg_17	<u>-</u>					

(a) The following nuclidic masses were used:

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}Cl = 34.968853$ $^{37}Cl = 36.965903$

S = internal/recovery standard

LDC #: 2330702/ SDG #: 261 CONN

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	<u>/</u> of <u>_/</u>
Reviewer:	9
2nd reviewer:	Ψ-

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

/	N	<u>M</u>	N/A
l	Y/	N	N/A

Were all reported results recalculated and verified for all level IV samples?
Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concent	ration	$= \frac{(A_{\bullet})(I_{\bullet})(DF)}{(A_{\pm})(RRF)(V_{\circ})(\%S)}$
A_{x}	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
Is	=	Amount of internal standard added in nanograms (ng)
V _o	==	Volume or weight of sample extract in milliliters (ml) or grams (g).
RRF		Relative Response Factor (average) from the initial calibration
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.

Example.	
Sample I.D:	
Conc. = (105/03.70) (2000) (206/140) (0.99684) (10.49) (0.94	1 ()
=10.7P9/g	

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
		And the second s			
			·		

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 28, 2010

LDC Report Date:

June 14, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D300598

Sample Identification

EB04282010-RZB

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks.

Sample EB04282010-RZB was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB04282010-RZB	4/28/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	3.8 pg/L 5.2 pg/L 5.2 pg/L 7.5 pg/L 3.7 pg/L 16 pg/L 12 pg/L 2.7 pg/L 2.0 pg/L 43 pg/L 9.9 pg/L 76 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D300598	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D300598	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D300598

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D300598	EB04282010-RZB	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D300598	EB04282010-RZB	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D300598

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D300598

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307E21	_ VALIDATION COMPLETENESS WORKSHEET
SDG #: G0D300598	Stage 2B
Laboratory: Test America	
	: (D)



METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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	Φ	Sampling dates: 4/3/10
11.	HRGC/HRMS Instrument performance check	4	
III.	Initial calibration	A	
IV.	Routine calibration/IX	A	
V.	Blanks	A-	
VI.	Matrix spike/Matrix spike duplicates	N	client spirited.
VII.	Laboratory control samples	A	10= '
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	4	
X.	Target compound identifications	N	1
XI.	Compound quantitation and CRQLs	SN	Allempe ventes - VE(E)
XII.	System performance	N	
XIII.	Overall assessment of data	1	
XIV.	Field duplicates	17	
XV.	Field blanks	w	2B=/,

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	EB04282010-RZB W	11	0/244/218	21	31	
2		12		22	32	
3		13		23	33	
4		14		24	34	
5		15		25	35	
6		16		26	36	
7		17	·	27	37	
8		18		28	38	·
9		19		29	39	
10		20		30	40	

Notes:		

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P 1234789-H-CDE	- 1-1-1-1
10000				o. Iolai npcDD
0. 1,2,3,7,0-FBCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	0.000	/ Total +00r
				v. 10tal 1001
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
				V. LOTAL TROUT
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S Total Decrip	
				A. Lotal HXCCF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	> Total - 100 - 10

Notes:

SDG #:See Cover LDC #: 23307E21

VALIDATION FINDINGS WORKSHEET Field Blanks

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N N/A Were field blanks identified in this SDG?
Blank units: pg/L Associated sample units

b/bd Associated sample units:_

Sampling date: 4/28/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Sample Identification None Associated Samples: 0.0375 0.0185 0.0135 0.0495 0.215 0.019 0.026 0.026 0.08 0.38 90.0 0.01 ă EB04282010-RZB Blank ID 5.2 7.5 2.0 5.2 3.7 2.7 43 92 16 5 Compound G ≥ 0 Z

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 28, 2010

LDC Report Date:

June 14, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E010426

Sample Identification

SSAQ4-04-1BPC SSAO4-03-3BPC

Introduction

This data review covers 2 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0126326MB	5/6/10	2,3,7,8-TCDD 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.030 pg/g 0.021 pg/g 0.030 pg/g 0.043 pg/g 0.043 pg/g 0.061 pg/g 0.032 pg/g 0.046 pg/g 0.063 pg/g 0.081 pg/g 0.035 pg/g 0.046 pg/g 0.046 pg/g 0.011 pg/g 0.079 pg/g 0.21 pg/g	All samples in SDG G0E010426

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

Samples FB-04072010-RZC (from SDG G0D130519) and FB-04062010-RZB (from SDG G0D120488) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZC	4/8/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.77 pg/L 0.74 pg/L 0.82 pg/L 4.2 pg/L 37 pg/L 0.57 pg/L 0.96 pg/L 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	SSAO4-03-3BPC
FB-04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SSAQ4-04-1BPC

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAQ4-04-1BPC	1,2,3,4,6,7,8-HpCDF OCDF 2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	Р
SSAO4-03-3BPC	1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E010426	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E010426	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E010426

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E010426	SSAQ4-04-1BPC	1,2,3,4,6,7,8-HpCDF OCDF 2,3,7,8-TCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E010426	SSAO4-03-3BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E010426	SSAQ4-04-1BPC SSAO4-03-3BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E010426	SSAQ4-04-1BPC SSAO4-03-3BPC	All compounds reported as EMPC	JK (all detects)	Α	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E010426

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E010426

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

DC #: 23307F21	VALIDATION CONFELTENESS
SDG #: G0E010426	Stage 2B
_aboratory: <u>Test America</u>	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	A	Sampling dates: 4/28/10
II.	HRGC/HRMS Instrument performance check	A	, ,
III.	Initial calibration	A	
IV.	Routine calibration/i	A	
V.	Blanks	M	
VI.	Matrix spike/Matrix spike duplicates	m	No assid St - No and.
VII.	Laboratory control samples	A	No assid sp - No and.
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	W	1B-040[2010-R2C(GOD 130519), 1B04062010-R2B(GOD)

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

TB = Trip blank EB = Equipment blank

Validated Samples:

	T	T	1 (1)			
1	SSAQ4-04-1BPC	11	0/26326MB	21	31	
2	SSAO4-03-3BPC	. 12		22	32	
3		13		23	33	
4		14		24	34	
5		15		25	35	
6		16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20		30	40	

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

A 2 3 7 8-TCDD				
	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HXCDF	P 1234780 UPCDE	
B. 12.3 7 8-Pechh				U. Total HpCDD
0000	6. OCDD	L. 1,2,3,6,7,8-HxCDF	11000	
000000000000000000000000000000000000000				V. lotal TCDF
C. 1,4,3,4,7,8-MXCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	0001001	
				W. Total PeCDF
U. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	100718 0 T C C T N		
		JOXU-6,0,1,0,2,1	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	1 2 2 4 7 8 DeCDE			
		O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	100 - 100 F >

Notes:

SDG #: See Cover LDC #: 23307F21

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

∀ Z

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. A N/A

Blank analysis date: 5/18/10 Blank extraction date: 5/6/10 Conc. units: pg/g

Associated samples:

All (>5X)

Compound	Blank ID			Sample I	Sample Identification		
	0126326MB	2X					
A	0:030	0.15					
O	0.021	0.105					
Ш	0:030	0.15					
u.	0.043	0.215					
9	0.28	1.4					
I	0.061	0.305					
	0.032	0.16					
ſ	0.046	0.23					
¥	0.063	0.315					
	0.081	0.405					
M	0.035	0.175					
Z	0.046	0.23					
0	0.11	0.55					
Ь	0.079	0.395					
Ø	0.21	1.05					

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #:23307F21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:__ Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

b/bd Associated sample units: Blank units: pg/L Associated sample units Sampling date: 4/8/10

Field blank type: (circle one) Field Blank / Binsate / Other:

Sample Identification 2 (>5X) Associated Samples: 0.00385 0.00285 0.00335 0.0048 0.0037 0.0041 0.0055 0.0048 0.0105 0.0075 0.0335 0.185 0.005 0.005 0.021 EB-04072010-RZC Blank ID 0.74 0.77 0.82 96.0 0.96 0.57 0.67 4.2 1.0 1.0 1.1 2.1 6.7 37 Compound Ö Σ

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

SDG #: See Cover LDC #: 23307F21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N N/A Were field blanks identified in this SDG?

Brank units: pg/L Associated sample units: Sampling date: 4/6/10

Field blank type: (circle one) Field Blank / Rinsate / Other.

Associated Samples:

_													 	 _	 	
	Sample Identification							-								
	Sample														 	
		5X	0.0034	0.0125	0.031	0.0135	0.007	0.0041	0.0047	0.009	0.006	0.022				
		10-RZB	8	· c	~1			2	4	3	7	-				
	DIAIN ID	FB04062010-RZB	0.68	2.5	6.2	2.7	1.4	0.82	0.94	1.8	1.2	4.4				
	0															
	Compound															
			Ш	ட	ပ	I	ᅩ		z	0	۵	Ø				CRQL

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 2330/F>/ SDG #: 561 COND

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

2	ul ts		JAME (2)
	utte	4	→
APC USI	,	M	(E)

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 29, 2010

LDC Report Date:

June 18, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E010431

Sample Identification

SSAO4-05-1BPC**

SSAQ3-01-1BPC**

SSAQ3-01-2BPC

SSAO4-05-1BPC FD

SSAO4-05-1BPCMS

SSAO4-05-1BPCMSD

SSAQ3-01-1BPCMS

SSAQ3-01-1BPCMSD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 8 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B 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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0134189MB	5/14/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.14 pg/g 0.41 pg/g 0.12 pg/g 0.11 pg/g 0.15 pg/g 0.14 pg/g 0.35 pg/g	SSAQ3-01-1BPC**
0126326MB	5/6/10	2,3,7,8-TCDD 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.030 pg/g 0.021 pg/g 0.030 pg/g 0.043 pg/g 0.28 pg/g 0.061 pg/g 0.032 pg/g 0.046 pg/g 0.063 pg/g 0.081 pg/g 0.035 pg/g 0.046 pg/g 0.046 pg/g 0.046 pg/g 0.079 pg/g 0.079 pg/g 0.21 pg/g	SSAO4-05-1BPC** SSAQ3-01-2BPC SSAO4-05-1BPC_FD

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

Samples FB-04072010-RZC (from SDG G0D130519) and FB-04062010-RZB (from SDG G0D120488) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZC	4/8/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD 0CDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.77 pg/L 0.74 pg/L 0.82 pg/L 4.2 pg/L 37 pg/L 0.57 pg/L 0.96 pg/L 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	SSAO4-05-1BPC** SSAO4-05-1BPC_FD

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SSAQ3-01-1BPC** SSAQ3-01-2BPC

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

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MS/MSD percent recoveries (%R) and relative percent differences (RPD) were not within QC limits for several compounds, the LCS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAO4-05-1BPC** SSAO4-05-1BPC_FD	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAQ3-01-1BPC**	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAQ3-01-2BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E010431	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E010431	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

Samples SSAO4-05-1BPC** and SSAO4-05-1BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentra	ation (pg/g)				
Compound	SSAO4-05-1BPC**	SSAO4-05-1BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	4.1	4.9	18 (≤50)	-	-	-
1,2,3,7,8-PeCDD	11	13	-	2 (≤2.6)	•	-
1,2,3,4,7,8-HxCDD	6.4	7.0	-	0.6 (≤2.6)	-	-
1,2,3,6,7,8-HxCDD	13	14	7 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	13	15	14 (≤50)	-	-	_
1,2,3,4,6,7,8-HpCDD	56	50	11 (≤50)	-	-	-
OCDD	82	61	29 (≤50)	-	-	<u>-</u>
2,3,7,8-TCDF	100	130	26 (≤50)	-	-	•
1,2,3,7,8-PeCDF	160	180	12 (≤50)	•	-	-
2,3,4,7,8-PeCDF	82	95	15 (≤50)	•	-	-
1,2,3,4,7,8-HxCDF	290	310	7 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	220	210	5 (≤50)	-	-	-
2,3,4,6,7,8-HxCDF	52	49	6 (≤50)	•	-	-
1,2,3,7,8,9-HxCDF	36	39	8 (≤50)	-	~	-
1,2,3,4,6,7,8-HpCDF	810	650	22 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	310	330	6 (≤50)	-	-	-
OCDF	3100	2600	18 (≤50)	-	-	-

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E010431

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E010431	SSAO4-05-1BPC** SSAO4-05-1BPC_FD	OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E010431	SSAQ3-01-1BPC**	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E010431	SSAQ3-01-2BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E010431	SSAO4-05-1BPC** SSAQ3-01-1BPC** SSAQ3-01-2BPC SSAO4-05-1BPC_FD	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E010431	SSAO4-05-1BPC** SSAQ3-01-1BPC** SSAQ3-01-2BPC SSAO4-05-1BPC_FD	All compounds reported as EMPC	JK (all detects)	Α	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E010431

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E010431

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307G21	_ VALIDATION COMPLETENESS WORKSHEET
SDG #: G0E010431	Stage 2B∕- ∤
Laboratory: Test America	

	Date:	6/5/10
	Page:_	_/of/
	Reviewer:	R
2nd	Reviewer:	9
		/

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	1	Sampling dates: 4/59/10
11.	HRGC/HRMS Instrument performance check	4	, ,
III.	Initial calibration	\bot	
IV.	Routine calibration/I	A.	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	w	
VII.	Laboratory control samples	A	105
/III.	Regional quality assurance and quality control	N	
IX.	Internal standards	WH	
Χ.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	15/N	
XII.	System performance	A	
XIII.	Overall assessment of data		
XIV.	Field duplicates	W/	D=1+4
XV.	Field blanks		FBO406=010-RZB(FODIZO498), FB-040[2010-RZC(FODI30

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

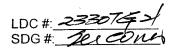
TB = Trip blank

EB = Equipment blank

Validated Samples:

10	SSAO4-05-1BPC **	11	0/26326MB	21	31	
2 7	SSAQ3-01-1BPC ***	12	0/26326MB 0/34189MB	22	32	
3 🕏	SSAQ3-01-2BPC	13	<u> </u>	23	33	
4 C	SSA 6 4-05-1BPC_FD	14		24	34	
5	SSAO4-05-1BPCMS	15		25	35	
6	SSAO4-05-1BPCMSD	16		26	36	
7	SSAQ3-01-1BPCMS	17		27	37	
8	SSAQ3-01-1BPCMSD	18		28	38	
9		19		29	39	
10		20		30	40	

Notes:			

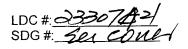


VALIDATION FINDINGS CHECKLIST

Page: / of / Reviewer: ______ 2nd Reviewer: ______

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Validation Area	Yes	No	NA	Findings/Comments ´
I. Technical holding times				
All technical holding times were met.				•
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?				
Were the retention time windows established for all homologues?				
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?				
Is the static resolving power at least 10,000 (10% valley definition)?		****		
Was the mass resolution adequately check with PFK?				
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?				
III. Initial calibration				·
Was the initial calibration performed at 5 concentration levels?				
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?				
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?				
V. Blanks				
Was a method blank associated with every sample in this SDG?	\			
Was a method blank performed for each matrix and concentration?	\			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?				
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VII: Laboratory control samples				
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per extraction batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				



VALIDATION FINDINGS CHECKLIST

Page: of A Reviewer: 2nd Reviewer:

		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
VIII. Regional Quality Assurance and Quality Control	Т		F	
Were performance evaluation (PE) samples performed?		/		
Were the performance evaluation (PE) samples within the acceptance limits?	<u> </u>			
IX. Internal standards	T			
Were internal standard recoveries within the 40-135% criteria?				
Was the minimum S/N ratio of all internal standard peaks ≥ 10?				
X. Target compound identification	·	1	r	
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?				
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	/			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?				
Did compound spectra contain all characteristic ions listed in the table attached?	1			
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	/			
Was the signal to noise ratio for each target compound and labeled standard ≥ 2.5?	/			
Does the maximum intensity of each specified characteristic ion coincide within \pm 2 seconds (includes labeled standards)?	/			
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?		(
Was an acceptable lock mass recorded and monitored?	/	<u> </u>		
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?				
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XII. System performance				
System performance was found to be acceptable.				
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.				·
XIV: Field duplicates				
Field duplicate pairs were identified in this SDG.	/			
Target compounds were detected in the field duplicates.				
XV: Field blanks				
Field blanks were identified in this SDG.				
Target compounds were detected in the field blanks.	1			

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	a.ocdf	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:

5

SDG #: See Cover LDC #: 23307G21

VALIDATION FINDINGS WORKSHEET **Blanks**

Page: Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Y N/A

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below.

Y/N N/A Was the method Blank extraction date: 5/14/10

Blank analysis date: 5/21/10 Conc. units: pg/g

Associated samples:

Compound	Blank ID			Sample	Sample Identification		
	0134189MB	5X					
L.	0.14	0.7					
9	0.41	2.05					
¥	0.12	9.0					
	0.11	0.55					
0	0.15	0.75					
a .	0.14	0.7					
Ö	0.35	1.75					

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307G21

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below.

Blank analysis date: 5/18/10 Blank extraction date: 5/6/10

Conc. units: pg/g

1, 3-4 (>5X) Associated samples:

Compound	Blank ID			Samule S	Sample Identification		
	0126326MB	5X					
А	0:030	0.15					
S	0.021	0.105					
Ш	0:030	0.15					
LL.	0.043	0.215					
9	0.28	1.4					
I	0.061	0.305					
	0.032	0.16					
7	0.046	0.23					
メ	0.063	0.315					
-	0.081	0.405					
Σ	0.035	0.175					
Z	0.046	0.23					
0	0.11	0.55					
Д	0.079	0.395					
Ø	0.21	1.05					

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were quaified as not detected, "U".

SDG #: See Cover LDC #:23307G21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

b/bd Associated sample units: | N/A Were field blanks identified in this SDG? | Blank units: __pg/L___ Associated sample units

Sampling date: 4/8/10

Field blank type: (circle ong Field Blank / Rinsate / Other:

Associated Samples:

Sample Identification 1,4 (>5X) 0.00385 0.00285 0.00335 0.0048 0.0055 0.0048 0.0105 0.0075 0.0335 0.0037 0.0041 0.185 0.005 0.005 0.021 섫 EB-04072010-RZC Blank ID 0.74 0.77 0.82 0.57 0.96 0.67 96.0 4.2 1.0 0. 2.1 1.5 7. 37 6.7 Compound ш O Ω

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 23307G21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

|Y|N N/A Were field blanks identified in this SDG? | Blank units: pg/L Associated sample units

b/bd Associated sample units: Sampling date: 4/6/10

Field blank type: (circle orle) Field Blank / Rinsate / Other:

Field blank type: (circle one) Field Blank / Rinsate / Other:	Field Blank/Rinsate	/ Other:	Associated Samples:	nples:	2-3 (>5X)	(>2X)		
Compound	Blank ID				Sample Identification	ation		
	FR04062010-R7B	5X						
Ш	0.68	0.0034						
ш	2.5	0.0125						
9	6.2	0.031						
I	2.7	0.0135						
×	1.4	0.007						
-1	0.82	0.0041						
Z	0.94	0.0047						
0	1.8	600.0						
L	1.2	900'0						
ø	4.4	0.022						
C								

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 233074

Matrix Spike/Matrix Spike Duplicates VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

| N/A N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits? Was a MS/MSD analyzed every 20 samples of each matrix?

Qualifications	1 9 91	3 1	(M < 0 >)																					
Associated Samples																								
RPD (Limits)	9			()	()	()	()	(()	()))	()	()		())	()	()	()	()	()	
MSD %R (Limits)	1 / Lu Sa	cacke	< - 6.W	7	(()		()	(())		()	()	()	()	()	()	()	()	()	()	()
MS %R (Limits)	3	7			()	()	()	()	()	()	()	()	()	()	()	(()	()	()	()	(())	(
Compound	20 R													-										
MS/MSD ID	5/2 7/8	Lin /																						
Date																								
*							l			- 1														

SDG #: 201 C LDC #:2330

VALIDATION FINDINGS WORKSHEET

Internal Standards

2nd Reviewer:__ Reviewer: Page:__

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290) N/A

Are all internal standard recoveries were within the 40-135% criteria? Was the S/N ratio all internal standard peaks > 10?

Y/N N/A

Check Standard Used Qualifications pra Internal Standards ì % Recovery (Limit: 40-135%) ¹³C-1,2,3,7,8,9-HxCDD ¹³C-1,2,3,4-TCDD 13C-OCDD 0 W 199 400 M N 1 8 39 7 ż ö Σ Check Standard Used Internal Standard p MU 1914 4 1 アノア Lab ID/Reference Internal Standards SIMSD XX ¹³C-1,2,3,6,7,8-HxCDD ¹³C-1,2,3,4,7,8-HxCDF ¹³C-1,2,3,7,8-PeCDD ¹³C-1,2,3,7,8-PeCDF 13C-2,3,7,8-TCDD ¹³C-2,3,7,8-TCDF Date Ö ш œ *

¹³C-1,2,3,4,6,7,8-HpCDD ¹³C-1,2,3,4,6,7,8-HpCDF

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SDG #: 20 COM PLOCE # . SOBOLE

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

A A

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	J678/P(C)	1		A		LK(K)				
Associated Samples	1,4		4	V		\mathcal{M}				
code > call nunge	2 x sel to reason		F, H.J.J. K. L. OP &	H. O. &		ZNDO MSWAS				
Sample ID	4 1		7	3		N				
# Date							0			

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23307G21</u> SDG#: <u>See Cover</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: /of / Reviewer: 2nd Reviewer: 4

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

YN NA YN NA Were field duplicate pairs identified in this SDG? Were target analytes detected in the field duplicate pairs?

	Concentrati	on (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	1	4	RPD	Difference	Limits	(Parent Only)
Α	4.1	4.9	18			
В	11	13		2	(≤2.6)	
С	6.4	7.0		0.6	(≤2.6)	
D	13	14	7			
E	13	15	14			
F	56	50	11			
G	82	61	29			
Н	100	130	26			
ı	160	180	12			
J	82	95	15			
к	290	310	7			
L :	220	210	5			
М	52	49	6			
N	36	39	8			
О	810	650	22			
Р	310	330	6			
Q	3100	2600	18			

V:\FIELD DUPLICATES\23307G21.wpd

SDG #: 28-3019-21

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

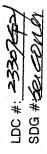
METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_{\nu})(C_{k})/(C_{\nu})$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

 $A_x = Area$ of compound, $A_k = Area$ of associated internal standard $C_x = Concentration$ of compound, $C_k = Concentration$ of internal standard S = Standard deviation of the RRFs, X = Mean of the RRFs

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (Initial)	RRF (253 std)	RRF (CS Atd)	%RSD	%RSD
-	1451	PF	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.004	400.1	35:1	90.1	01.8	128
	(402)	01/21/5	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.049	6701	901	1.06	2/5	8,00
		\ \ _	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.163	1.163	05./	1.50	X.X.	81.13
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.073	1.073	11.1	111	79.6	7.86
			OCDF (%C-OCDD)	1.523	1.522	1.58	1.58	8.42	225
2			2,3,7,8-TCDF (13C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)						
			ocpf ("c-ocpp)						
3			2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (¹⁵ C-1,2,3,6,7,8-HxCDD)						
		·	1,2,3,4,6,7,8-HpCDD (¹³C-1,2,4,6,7,8,-HpCDD)						
			OCDF (13C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10,0% of the recalculated results. 

Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

 $\label{eq:RF} $$RF = (A_{\lambda})(C_{\alpha})/(A_{\alpha})(C_{\lambda})$$ average RRF = sum of the RRFs/number of standards $$RSD = 100 * (S/X)$$$

 A_x = Area of compound, C_x = Concentration of compound, S = Standard deviation of the RRFs,

 $A_{\rm ls}$ = Area of associated internal standard $C_{\rm ls}$ = Concentration of internal standard X = Mean of the RRFs

L	,			1					
				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF	Average RRF	RRF	RRF		
Ŀ					(minima)	1 CS S Sta)		%RSD	%RSD
	1940	\ \ \	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0.90/35	0.9/35	0.92/35 0.94963	091012	7/080	0 9/1
	(305)	13/1/10	3//// 2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1,03876	1.03870	1.04720	001001	1/807.00	1000
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.00001	1.09Pod	۲,	11.730	193017	4.0
			. 1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	704660	1998	10000	102/11	1,0/104	4.200
			OCDF (4c-ocdd)	1.26234	page!	XX655/	12.000	77778	0.1/1/2
01	181		03.7 8.TCDE (180.22.7 8.TCDE)	180 1	7 10	¶.	97//	06417	1.te0
	100	1 2/1/2		۸	0.936	0.93	0.00	5:24	8 19
	(705)	11/4/6	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.033	1.033	1.05	1001	777	000
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.112	1117	1./1		130	001
	-		1,2,3,4,6,7,8-HpCDD ("C-1,2,4,6,7,8,-HpCDD)	0.957	0 957	100	100	10	1:00
			OCDF (1ºc-OCDD)	1.347	1.44	147	1001	2000	1.00
ო	10A2	./. //.	2,3,7,8-TCDF (¹3C-2,3,7,8-TCDF)	9801	10 86	011		ax,	7.61
		0//10/4	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	3	00	2/:/	1:12	1	/. Y V
		,	1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF (19c-Ochn)						

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

· SDG #: 26, 501 LDC #: 2330743

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

Page:

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF · RRF)/ave. RRF = (A_)(C_s)/(A_s)(C_s)

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF

Where:

 A_x = Area of compound, C_x = Concentration of compound,

 $A_{\mathbf{k}} = \text{Area of associated internal standard } C_{\mathbf{k}} = \text{Concentration of internal standard}$

<u></u>					Potronog			
					перопед	Hecalculated	Reported	Recalculated
*	# Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	0%
	2 THYIOLOGS	di812	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	25/KG'0	0,96862	0.98862	1 4	1
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1,03870	107593	1.075.93	36	N . N
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09904	1.24h	134046	150	1000
			1,2,3,4,6,7,8-HpCDD (19C-1,2,4,6,7,8,-HpCDD)	78966.0	110973	1.10973	11.3	1.1
			OCDF (°C-OCDD)	prest./	1.62.1	1.50/16	S S S	8 81
"	2 (FAN/10/3DE	1305 -1,01.0	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	28135	13766.0	751560	× 0%	W X
		1/61/	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.63870	Skgc/·/	1.12695	l ox	j Ox
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.09904	1.18764	1.18764	1	100
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	78960	1.0 4/34	1.05734	4.5	20
			OCDF (*c-OCDD)	1.36224	1.50957	1.50957	19.6	193
က	<050/twee	1/22/2	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	8801	1.7	1.34	671	P. 4
	\		2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
\perp			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (13C-OCDD)					

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

LUC #:2330

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

ave. RRF ≈ initial calibration average RRF RRF ≈ continuing calibration RRF Where:

 $A_{\rm b}$ = Area of associated internal standard $C_{\rm b}$ = Concentration of internal standard

% Difference = 100 * (ave. RRF - RRF)/ave. RRF RRF = $(A_a)(C_a)/(A_a)(C_a)$

 $A_x = Area of compound,$ $C_x = Concentration of compound,$

L								
					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	%	0%
-	194/1000	1.000	2,3,7,8-TCDF (*C-2,3,7,8-TCDF)	1.088	1.13	6/1	40	1 7
	, / /	0///	2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)				3	
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (1c-OCDD)					
2	Shalfate	01/12/3	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	0.936	760	760	N	No
		<u>'</u>	2,3,7,8-TCDD (40-2,3,7,8-TCDD)	1.033	78.0	28.0	18.2	181
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.112	6/1	6/:/	8.8	8.8
			1,2,3,4,6,7,8-HpCDD (°C-1,2,4,6,7,8,-HpCDD)	1957	86.0	0.98	2.6	8.8
			OCDF (1°C-OCDD)	1.347	25.1	1.55	14.9	14.9
၈	2014/2010 5/2410	6/24/10	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	4.004	1.03	60:1	D. A.	7.00
			2,3,7,8-TCDD (*C-2,3,7,8-TCDD)	1.049	1.07	1.07	1.7	1.7
$oldsymbol{ol}}}}}}}}}}}}}}}}}}}}$			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.163	8/1	8/-/	8:1	1.7
			1,2,3,4,6,7,8-HpCDD (*C-1,2,4,6,7,8,-HpCDD)	1.073	8/:/	6/:/	5.5	5.5
			ocpf (4c-ocpp)	4251	79.1	1.64	1.9	2.9

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

LDC#333674F3 SDG #561 COMP

Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSR - SR)/SA

SSR = Spiked sample result, SR = Sample result SA = Spike added Where:

RPD = I MSR - MSDR I * 2/(MSR + MSDR)

MS/MSD samples:

MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

	Spi	ke	Sample	Spiked Sample	ample	Matrix	Matrix Spike	Matrix Spike Duplicate	- Duplicate	Reported	Recalculated
Compound	Added (+)	(gg)	Concentration (+)	Concentration	rration 3/9)	Percent Recovery	Recovery	Percent Recovery	Recovery	RPD	RPD
	WS	MSD		NS	MSD	Reported	Recaic	Renorted	Recalc		3 9
2,3,7,8-TCDD	<u>د</u> ا	20.5	7	585	920	4	4=	115	165	9ic	NU
1,2,3,7,8-PeCDD	106	(0 >		136	(23	108	(108	109	011	j	4.0
1,2,3,4,7,8-HxCDD			6.4	4	(>>	~ a)	(02	7	4	イト	76
1,2,3,4,7,8,9-HpCDF	\	<i>></i>	30	286	9=9	0.0	0.0	305	30 C	0.0	75
OCDF	<u>2</u>	200	3100	02=1	4.90	0.0	0.0	465	285	00	60
)							

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

SDG # Sec Clara LDC #: 2330/

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

Page: Reviewer:_

2nd Reviewer:

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery ≈ 100 * SSC/SA

Where: SSC = Spiked sample concentration SA = Spike added

RPD = ILCS - LCSD I * 2/(LCS + LCSD)

LCS ID: 0/2532

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

	S	ike	Spiked S	ample	801	S	ICSD	g	1 CS/I CSD	csp
Compound	PA (Addeg Addeg	Concentration (PS)	retion (9)	Percent Recovery	lecovery	Percent Recovery	lecovery	RPD	٥
	, 331	ıcsn	108	I CSD	Reported	Recalc	Reported	Recalc	Raported	Recalculated
2,3,7,8-TCDD	0.00	N.X	22.8	XX	114	71.17				
1,2,3,7,8-PeCDD	100	1	111		///	///				
1,2,3,4,7,8-HxCDD	/		201		201	102				
1,2,3,4,7,8,9-HpCDF			7/3	/	7/1	6//				
OCDF	300	/	755	7	114	7/1/				

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

lons Monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

Analyte	HPCDF HPCDF HPCDF HPCDD HPCDD HPCDD HPCDD (3) NCDPE PFK	ocder ocde ocde (s) ocde (s) ocde (s) bcde PFK	
Elemental Composition	C, H & Cl, TClO C, 2 H & Cl, TClO C, 2 H & Cl, TCl, O C, 2 H & Cl, TCl, O C, 2 H & Cl, TClO C, 2 H & Cl, TCl, O C, 2 H &	C1.201,37ClO C1.201,37ClO C1.201,37ClO ₂ C1.201,37ClO ₂ C1.201,37ClO ₂ 13C1,201,37ClO ₂ 13C1,201,37ClO ₂ 13C1,201,37Cl ₂ C1.201,37Cl ₂ O	
Ion ID	M M M H + 2 C C C K M M H + 2 C C K M M H + 4 C C C K M H + 4 C C C K M H + 4 C C C K M H + 4 C C C C C C C C C C C C C C C C C C	M + 2 M + 4 M + 2 M + 4 M + 4 LOCK	
Accurate Mass ^(s)	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775	
Descriptor	4	ഗ	
Analyte	TCDF TCDF (8) TCDP (8) TCDD TCDD (8) TCDD (8) HXCDPE	Pecde Pecde Pecde (S) Pecde Pecde Pecde (S) Pecde (S) Pecde (S) Pecde (S) Pecde (S)	HXCDF HXCDF (S) HXCDF (S) HXCDD (S) HXCDD (S) HXCDD (S) HXCDD (S) OCDPE
Elemental Composition	C ₁₂ H, 201,0 C ₁₂ H, 201,0 (10,2), 37C10 (10,2), 42C1,37C10 C ₁₂ H, 20C1,37C10, (10,2), 42C1,37C10, (10,2), 42C1,37C10, (11,2), 42C1,37C10, (12,2), 42C10, (12,2), 42C10,	C ₁₂ H ₃ ³ C ₁ O ¹ O C ₁₂ H ₃ ³ C ₁ O ¹ O (1 ₂ H ₃ ³ C ₁ O ¹ O ²	C.2.P. 301,37010 C.2.P. 301,37010
Ol nol	M M M M M M M M M M M M M M M M M M M	M+2 M+4 M+2 M+4 M+4 M+2 M+4 M+2	M M M H + 2 C C C C C C C C C C C C C C C C C C
Accurate mass ^(a)	303.9016 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9338 375.8364	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555
Descriptor	-	a	თ

(a) The following nuclidic masses were used:

H = 1.007825 C = 12.00000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}CI = 34.968853$ $^{37}CI = 36.965903$

S = internal/recovery standard

LDC #: 23307421 SDG #: <u>jer cone</u>

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	<u>/</u> of_/
Reviewer:	9
2nd reviewer:	9
_	

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

y N	V/A	Were all recalculated results for detected ta	arget compounds agree within 10.0% of the reported results?
Conce	ntration	$n = \frac{(A_{\bullet})(I_{\bullet})(DF)}{(A_{\bullet})(RRF)(V_{\bullet})(\%S)}$	Example:
A_{x}	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D,:
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	20.00/18
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (7859548) (2000) ((37059288 (1.03870) (10.57) (0.94)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	
RRF	=	Relative Response Factor (average) from the initial calibration	= 4. 11 P5/8
Df	==	Dilution Factor.	,
%S	=	Percent solids, applicable to soil and solid matrices only.	

Were all reported results recalculated and verified for all level IV samples?

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
			· · · · · · · · · · · · · · · · · · ·		
<u> </u>					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 30, 2010

LDC Report Date:

June 17, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E030471

Sample Identification

SSAK7-05-1BPC** SSAK7-05-1BPC_FD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 2 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B 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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The jon abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0127206MB	5/7/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.053 pg/g 0.35 pg/g 0.13 pg/g 0.095 pg/g 0.24 pg/g	SSAK7-05-1BPC**
0126326MB	5/6/10	2,3,7,8-TCDD 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.030 pg/g 0.021 pg/g 0.030 pg/g 0.043 pg/g 0.28 pg/g 0.061 pg/g 0.032 pg/g 0.046 pg/g 0.063 pg/g 0.061 pg/g 0.063 pg/g 0.064 pg/g 0.065 pg/g 0.079 pg/g 0.079 pg/g 0.21 pg/g	SSAK7-05-1BPC_FD

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

Sample EB-04302010-RZD (from SDG G0E030473) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB04302010-RZD	4/30/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	1.7 pg/L 1.4 pg/L 1.5 pg/L 2.8 pg/L 7.2 pg/L 1.5 pg/L 1.2 pg/L 1.2 pg/L 1.9 pg/L 1.6 pg/L 2.4 pg/L 1.4 pg/L 5.0 pg/L	All samples in SDG G0E030471

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E030471

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK7-05-1BPC**	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E030471	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E030471	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

Samples SSAK7-05-1BPC** and SSAK7-05-1BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentration (pg/g)			Difference			
Compound	SSAK7-05-1BPC**	AK7-05-1BPC** SSAK7-05-1BPC_FD		(Limits)	Flags	A or P	
2,3,7,8-TCDD	7.6	4.9	43 (≤50)	-	-	•	
1,2,3,7,8-PeCDD	26	16	48 (≤50)	-	-	-	

	Concentra	tion (pg/g)	RPD	Difference		
Compound	SSAK7-05-1BPC** SSAK7-05-1BPC_FD		(Limits)	(Limits)	Flags	A or P
1,2,3,4,7,8-HxCDD	17	9.7	-	7.3 (≤2.6)	J (all detects)	А
1,2,3,6,7,8-HxCDD	39	23	52 (≤50)	_	J (all detects)	А
1,2,3,7,8,9-HxCDD	37	19	64 (≤50)	-	J (all detects)	А
1,2,3,4,6,7,8-HpCDD	160	72	76 (≤50)	-	J (all detects)	А
OCDD	150	58	88 (≤50)	-	J (all detects)	А
2,3,7,8-TCDF	210	140	40 (≤50)	-	-	-
1,2,3,7,8-PeCDF	410	260	45 (≤50)	-	-	-
2,3,4,7,8-PeCDF	230	140	49 (≤50)	•	-	-
1,2,3,4,7,8-HxCDF	800	440	58 (≤50)	-	J (all detects)	А
1,2,3,6,7,8-HxCDF	580	310	61 (≤50)		J (all detects)	А
2,3,4,6,7,8-HxCDF	150	84	56 (≤50)	-	J (all detects)	А
1,2,3,7,8,9-HxCDF	84	45	60 (≤50)	-	J (all detects)	А
1,2,3,4,6,7,8-HpCDF	1900	840	77 (≤50)	-	J (all detects)	А
1,2,3,4,7,8,9-HpCDF	880	400	75 (≤50)	-	J (all detects)	А
OCDF	7000	2000	111 (≤50)	-	J (all detects)	А

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E030471

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E030471	SSAK7-05-1BPC**	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E030471	SSAK7-05-1BPC** SSAK7-05-1BPC_FD	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E030471	SSAK7-05-1BPC** SSAK7-05-1BPC_FD	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)
G0E030471	SSAK7-05-1BPC** SSAK7-05-1BPC_FD	1,2,3,4,7,8-HxCDD	J (all detects)	А	Field duplicates (Difference) (fd)
G0E030471	SSAK7-05-1BPC** SSAK7-05-1BPC_FD	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	А	Field duplicates (RPD) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E030471

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E030471

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E030471

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307H21	VALIDATION COMPLETENESS WORKSHEET
SDG #: <u>G0E030471</u>	Stage 2B/
Laboratory: Test America	
METHOD, UDCC/UDMC Dia	sing/Dihangaturana (EDA CIM 846 Mathad 8200)

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	4	Sampling dates: 4/30/10
11.	HRGC/HRMS Instrument performance check	4	, ,
III.	Initial calibration	1	
IV.	Routine calibration/I	A	
V.	Blanks	av	
VI.	Matrix spike/Matrix spike duplicates	m	No ascid spl - No Caral
VII.	Laboratory control samples	A	No asid spl- No anal
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	1	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SIN	
XII.	System performance	A	
XIII.	Overall assessment of data	Á	
XIV.	Field duplicates	W	D=1+2
XV.	Field blanks	w	TB-04072010-\$21(40D090441), EB-04302010-\$2D(408

Note: A = Acceptable

N = Not provided/applicable

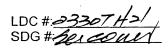
R = Rinsate SW = See worksheet FB = Field blank D = Duplicate TB = Trip blank EB = Equipment blank

Validated Samples:

r		· · · · · · · · · · · · · · · · · · ·			 	
1 /	SSAK7-05-1BPC ** 5	11	0127206N/3	21	31	
2	SSAK7-05-1BPC_FD	ح 12	0/27206N/3 0/26326MB	22	32	
3		13		23	33_	
4		14		24	34	
5		15		25	35	
6		16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20		30	40	

Notes:			

ND = No compounds detected

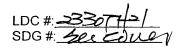


VALIDATION FINDINGS CHECKLIST

Page: _____of____ Reviewer: _______ 2nd Reviewer: _______

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Validation Area	Yes	No	NA	Findings/Comments '
I. Technical holding times				
All technical holding times were met.				·
Cooler temperature criteria was met.				
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?				
Were the retention time windows established for all homologues?	1			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	/			
Is the static resolving power at least 10,000 (10% valley definition)?	/			
Was the mass resolution adequately check with PFK?	/			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?				
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?				
Were all percent relative standard deviations (%RSD) \leq 20% for unlabeled standards and \leq 30% for labeled standards?	(
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?				
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?				
V. Blanks				
Was a method blank associated with every sample in this SDG?				
Was a method blank performed for each matrix and concentration?				
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?				
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.		-		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per extraction batch?	1			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within he QC limits?	1			



VALIDATION FINDINGS CHECKLIST

Page: 2 of 2 Page: 2 of 2 Page: 2 of 2 Page: 2

				/
VIII. Regional Quality Assurance and Quality Control			,	_
Were performance evaluation (PE) samples performed?		/	_	
Were the performance evaluation (PE) samples within the acceptance limits?			L.,	
IX. Internal standards		·		
Were internal standard recoveries within the 40-135% criteria?	/			
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	//		<u></u>	
X. Target compound identification		.		T
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?				
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?				
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	/			
Did compound spectra contain all characteristic ions listed in the table attached?				
Was the Ion Abundance Ratio for the two quantitation ions within criteria?				
Was the signal to noise ratio for each target compound and labeled standard > 2.5?				
Does the maximum intensity of each specified characteristic ion coincide within \pm 2 seconds (includes labeled standards)?				
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?		_		
Was an acceptable lock mass recorded and monitored?				
XI. Compound quantitation/CRQLs				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?				
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XII. System performance				
System performance was found to be acceptable.				
XIII. Overall assessment of data		4 2 1 2 2 3 4 3 3		
Overall assessment of data was found to be acceptable.				·
XIV: Field duplicates	- E		77	
Field duplicate pairs were identified in this SDG.				
Target compounds were detected in the field duplicates.				
KV: Field blanks				
Field blanks were identified in this SDG.				
Target compounds were detected in the field blanks.				

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

A, 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HXCDF	a. ocdf	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:

SDG #: 201 CON LDC #: 2332/7

VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

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

Were all samples associated with a method blank?

Was the blank contaminated? If yes, please see qualification below. Was a method blank analyzed for each matrix?

Blank extraction date: S

Associated Samples: 7/10 Blank analysis date: Conc. units: 2999

Conc. units: 699	Blank ID Sample Identification	<u> </u>	0.053	35	. 73	26.0	75.	
	Blank	operation of	0.05	6.4	01:	0.00	0.5.	
Conc. units:	Compound	Ole	\pm	4	9	A	\forall	

Blank analysis date: Blank extraction date:

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307H21

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of 1 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? N/A

Was the method blank contaminated? If yes, please see qualification below. In date: 5/6/10 Blank analysis date: 5/18/10 Blank extraction date: 5/6/10 N N/A

Conc. units: pg/g

2 (>5X) Associated samples:

			225	Associated samples.		(VCZ) 7		
Compound	Blank ID				Sample	Sample Identification		
	0126326MB	5X						
4	0:030	0.15						
ပ	0.021	0.105		- Indiana				
Ш	0:030	0.15						
Ľ.	0.043	0.215						
ပ	0.28	1.4						
Ŧ	0.061	0.305						
	0.032	0.16						
ſ	0.046	0.23						
×	0.063	0.315						
-	0.081	0.405						
×	0.035	0.175						
Z	0.046	0.23						
0	0.11	0.55						
Д	0.079	0.395						
Ö	0.21	1.05						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #:See Cover LDC #:23307H21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Reviewer

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

N N/A Were field blanks identified in this SDG?

b/bd Associated sample units: Blank units: pg/L Sampling date: 4/30/10

EB Field blank type: (circle one) Field Blank / Rinsate / Other:

Field blank type: (circle one) Field Blank / Rinsate / Other:	e) Field Blank / Rinsate	/ Other: $/=\mathcal{O}$	Associated Samples:	All (All (>Sx)		
Compound	Blank ID			Sample Identification	ation	:	
	EB-04302010-RZD	5X					
ပ	1.7	0.0085					
D	1.4	0:00					
Ш	1.5	0.0075					
Щ	2.8	0.014					
ග	7.2	0.036					
	1.5	0.0075					
×	2.2	0.011					
-	1.2	0.006					
W	1.9	0.0095					
Z	1.6	0.008					
0	2.4	0.012					
۵	1.4	0.007					
Ø	5.0	0.025					
CROL							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307H21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N N/A Were field blanks identified in this SDG?

Blank units: __pg/L____ Associated sample units

b/bd Associated sample units:_

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank NRinsate / Other.

Associated Samples:

All (>5X)

Sample Identification 0.00445 0.0075 0.0415 0.0075 0.0205 0.008 0.008 0.0065 0.011 0.007 0.007 섫 FB-04072010-RZD Blank ID 0.89 1.5 2.2 8.3 1.4 1.6 7. 1.6 1.3 4. 4. Compound CRQL 0

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #:23307.

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

N N/A

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

)								
Qualifications	16/2/P(e		<u> </u>						
Associated Samples	mge		ar						
Finding	H.O. & > call blange		ZUPC REWAS						
Sample ID			au						
Date						0			
*									

Comments: See sample calculation verification worksheet for recalculations

LDC#:23307H21 SDG#: See Cover

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: __lof/ Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N NA

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

	Concentrat	ion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications	
Compound	1	2	RPD	Difference	Limits	(Parent Only)	
A	7.6	4.9	43				
В	26	16	48				
С	17	9.7		7.3	(<u><</u> 2.6)	Vdets/A	(fd)
D	39	23	52				
E	37	19	64				
F	160	72	76				
G	150	58	88				
Н	210	140	40			,	
1	410	260	45				
J	230	140	49				. , ,
K	800	440	58			Idets/A	Ifd.
L	580	310	61				
М	150	84	56				
N	84	45	60				
0	1900	840	77				
Р	880	400	75				
Q	7000	2000	111			7	

V:\FIELD DUPLICATES\23307H21.wpd

5 x ed se

LDC #: 2320742

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page: /of / Reviewer: 9

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_u)(C_w)/(A_w)(C_v)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

 $A_x = Area$ of compound, $A_s = C_x = Concentration of compound, <math>C_s = S = Standard deviation of the RRFs, <math>X = I$

A_k = Area of associated internal standard C_k = Concentration of internal standard s, X = Mean of the RRFs

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (C 3 std)	RRF (CS std)	%RSD	%RSD
-	lota	11/2	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	28/280	0.93/35	10.9/126×	E96750	78017	6017
	(305)	1/1/0	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.03870	-	x140.1	104720	489709	A XON
			1,2,3,6,7,8-HxCDD (19C-1,2,3,6,7,8-HxCDD)	1.09904	1.09904	1 ,	11/1/30	493817	4938
		1	1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)		0.8988	1.05541	105541	42/02	1 3/C
			OCDF (4c-OCDD)	1.2524	12554	1.32988	1.32988	868680	9 400
7	1942	01/11/4	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	1.088	1.10	011	651	1.20
		,	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			ocpr ("c-ocpp)						
၈		`	2.3,7,8-TCDF (19C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (19C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (1°C-1,2,4,8,7,8,-HpCDD)						
			OCDF ("C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results. LDC #:2320742/

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF RRF = $(A_a)(C_a)/(A_a)(C_a)$

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_x = Area of compound,$ $C_x = Concentration of compound,$

 $A_{\rm s} =$ Area of associated internal standard $C_{\rm k} =$ Concentration of internal standard

<u> </u>					Reported	Recalculated	Reported	Recalculated	
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	0%	
٢	STEHOLIFI		2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	25/260	951660	75/66.0	8.3	8.3	
		01/8/15	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.03870	56921.1	569011	5.80	2.5	
		_	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09404	1.18764	7.18764	8./	8.1	
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	728966.0	105134	781501	5.5	5.5	
Ш			OCDF ("C-OCDD)	45624	1.50957	1.50957	19.6	19.6	П
74	1/1/6/	1/2 H 4/2	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	1.088	(./3	1.13	43	4.1	
	a / /		2,3,7,8-TCDD (13C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF (13C-OCDD)						
က			2,3,7,8-TCDF (°C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			ocdf (3c-ocdd)						

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results. LDC #: 3330TH 2/ SDG #: BC CONEY

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:	/of/_
Reviewer:	9
2nd reviewer:_	10
-	T

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

/		N	N/A N/A
	V	Ν	N/A
	•		

Were all reported results recalculated and verified for all level IV samples?
Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concent	ation	$= (A_{\bullet})(I_{\bullet})(DF) (A_{is})(RRF)(V_{o})(%S)$
A _×	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
l _s	=	Amount of internal standard added in nanograms (ng)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
RRF	=	Relative Response Factor (average) from the initial calibration
Df	===	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.

Example:			
Sample I.D	/	. D	:
Conc. = (48)	; 299886 ? 14.17.31X	(2000)(1.09904)(10.4	13 16941
= 38.	,5 p.	9/9	

			Reported Concentration	Calculated Concentration	Qualification
#	Sample ID	Compound	()	()	Qualification
 					
 					
\vdash					
<u></u>					
					•
					
			1		

SDG #: 511CONN LDC #: 2230/

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

Reviewer:

2nd Reviewer:_

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

SSC = Spiked sample concentration SA = Spike added Where:

RPD = I LCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

105 ID: 0/276306

	. C		Spiked S	ample	108	8	ICSD	J.	USD I/SD I	CSD
panoamog	¥ §	Added	Concentration	ration	Percent Recovery	ecovery	Percent Recovery	ecovery	RPD	Q
	100	uso i	/ SO	I CSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2.3.7.8-TCDD	000	KY	22.6		113	113				
G	00/		801	_	801	108				
			105		501	501 6 81	50,			
1 2 3 4 7 8 9-HnCDF	1		6/		611	611				
	200	1	345	1	123	50/				
						·				

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

Ions Monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

Analyte	HPCDF HPCDF HPCDF (S) HPCDD HPCDD (S) HPCDD (S) NCDPE (S)	000F 000D 000D 000D (S) 000D (S) 000PE PFK	
Elemental Composition	C ₁ H ³ C ₁ ,7ClO C ₁ H ³ C ₁ ,7ClO C ₁ H ³ C ₁ ,7ClO 1 ³ C ₁ H ³ C ₁ ,7ClO C ₁ H ³ C ₁ ,7ClO C ₁ H ³ C ₁ ,7ClO ₂ C ₁ C ₂ H ³ C ₁ ,7Cl ₂ O C ₁ H ³ C ₁ ,7Cl ₂ O C ₁ H ³ C ₁ ,7Cl ₂ O C ₁ H ³ C ₁ ,7Cl ₂ O	C ₁₂ 25C ₁ 37ClO C ₁₂ 25C ₁ 87ClO C ₁₂ 25C ₁ 87ClO ₂ C ₁₂ 25C ₁ 87ClO ₂ 13C ₁₂ 25C ₁ 87ClO ₂ 13C ₁₂ 25C ₁ 87ClO ₂ C ₁₂ 25C ₁ 87Cl ₂ O	
Ol nol	M M M M M M M M M M M M M M M M M M M	M M M + + 2 4 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
Accurate Mass ^(a)	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775	
Descriptor	4	ശ	
Analyte	TCDF TCDF (S) TCDD TCDD TCDD TCDD (S) TCDD (S) HXCDPE	Pecde Pecde Pecde (S) Pecde Pecde Pecde Pecde (S) Pecde (S) Pecde (S)	HXCDF HXCDF (S) HXCDF (S) HXCDD HXCDD HXCDD (S) HXCDD (S) OCDPE PFK
Elemental Composition	C,24,301,0 C,24,301,37010 19C,24,301,0 C,24,301,37010 C,24,301,37010, 19C,24,301,0 19C,24,301,0 19C,24,301,0 C,24,301,37010,0 C,24,301,37010	C ₁₂ H ₃ 3C ₁ 3'ClO C ₁₂ H ₃ 3C ₁ 3'ClO C ₁₂ H ₃ 3C ₁ 3'ClO C ₁₂ H ₃ 3C ₁ 3'ClO ₂ C ₁₂ H ₃ 3C ₁ 3'ClO ₂ C ₁₂ H ₃ 3C ₁ 3'ClO ₂ 13C ₁₂ H ₃ 3C ₁ 3'ClO ₂ C ₁₂ H ₃ 3C ₁ 3'ClO ₂ C ₁₂ H ₃ 3C ₁ 3'ClO ₂ C ₁ 2'H ₃ 3C ₁ 3'ClO	C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₁ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ , TC ₂ O C ₁ , H ₂ , SC ₁ O C ₁ , H ₂ , SC ₂ O C ₁ , H ₂ , SC ₂ O C ₂ , H ₂ , SC ₂ O C ₂ , H ₂ , SC ₂ O C ₂ , H ₂ , SC ₂ O C ₃ , H ₂ , SC ₂ O C ₄ , H ₂ O C ₅ , H ₂ O C ₆ , H ₂ O C
Oi noi	M W W W W W W W W W W W W W W W W W W W	M W + 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	M+2 M+2 M+2 M+4 M+4 M+4
Accurate mass ^(a)	303.9016 305.8987 315.9419 317.9389 321.8956 331.9368 333.9338 375.8364 [354.9792]	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 443.7555
Descriptor	-	2	ო

The following nuclidic masses were used:

®

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}Cl = 34.968853$ $^{37}Cl = 36.965903$

S = internal/recovery standard

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 30, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E030477

Sample Identification

SSAQ5-01-2BPC

SSAQ5-01-1BPC

SSAQ5-01-1BPC FD

SSAQ5-01-2BPCMS

SSAQ5-01-2BPCMSD

Introduction

This data review covers 5 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0127206MB	5/7/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.053 pg/g 0.35 pg/g 0.13 pg/g 0.095 pg/g 0.24 pg/g	All samples in SDG G0E030477

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

Samples EB-04302010-RZB-1 and EB-04302010-RZB-2 (both from SDG G0E030473) were identified as equipment blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB04302010-RZB-1	4/30/10	1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.58 pg/L 2.9 pg/L 15 pg/L 5.5 pg/L 3.5 pg/L 7.1 pg/L 7.0 pg/L 2.0 pg/L 0.81 pg/L 20 pg/L 40 pg/L	All samples in SDG G0E030477
EB04302010-RZB-2	4/30/10	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.67 pg/L 0.46 pg/L 1.2 pg/L 5.7 pg/L 0.91 pg/L 0.78 pg/L 0.44 pg/L 0.85 pg/L 0.74 pg/L 0.68 pg/L 2.0 pg/L	All samples in SDG G0E030477

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

Sample FB-04062010-RZB (from SDG G0D120488) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	All samples in SDG G0E030477

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

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MS/MSD percent recoveries (%R) were not within QC limits for several compounds, the LCS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAQ5-01-1BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAQ5-01-1BPC_FD	1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E030477	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E030477	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

Samples SSAQ5-01-1BPC and SSAQ5-01-1BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentra	tion (pg/g)				
Compound	SSAQ5-01-1BPC	SSAQ5-01-1BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	95	300	104 (≤50)	-	J (all detects)	А
1,2,3,7,8-PeCDD	290	980	109 (≤50)	-	J (all detects)	А
1,2,3,4,7,8-HxCDD	180	900	133 (≤50)	-	J (all detects)	А
1,2,3,6,7,8-HxCDD	410	1600	118 (≤50)	-	J (all detects)	А
1,2,3,7,8,9-HxCDD	390	1600	122 (≤50)	-	J (all detects)	А
1,2,3,4,6,7,8-HpCDD	1500	5500	114 (≤50)	•	J (all detects)	А
OCDD	1600	5400	109 (≤50)	-	J (all detects)	А
2,3,7,8-TCDF	1700	5600	107 (≤50)	-	J (all detects)	Α
1,2,3,7,8-PeCDF	4000	14000	111 (≤50)	-	J (all detects)	А

	Concentra	ation (ug/L)				
Compound	SSAQ5-01-1BPC	SSAQ5-01-1BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,4,7,8-PeCDF	2200	7900	113 (≤50)	-	J (all detects)	А
1,2,3,4,7,8-HxCDF	8700	31000	112 (≤50)	-	J (all detects)	А
1,2,3,6,7,8-HxCDF	5400	20000	115 (≤50)	-	J (all detects)	А
2,3,4,6,7,8-HxCDF	1500	5700	117 (≤50)	•	J (all detects)	А
1,2,3,7,8,9-HxCDF	910	3800	123 (≤50)	•	J (all detects)	Α
1,2,3,4,6,7,8-HpCDF	18000	72000	120 (≤50)	-	J (all detects)	A
1,2,3,4,7,8,9-HpCDF	8100	30000	115 (≤50)	-	J (all detects)	Α
OCDF	62000	250000	121 (≤50)	-	J (all detects)	Α

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E030477

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E030477	SSAQ5-01-1BPC	OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E030477	SSAQ5-01-1BPC_FD	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E030477	SSAQ5-01-2BPC SSAQ5-01-1BPC SSAQ5-01-1BPC_FD	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E030477	SSAQ5-01-2BPC SSAQ5-01-1BPC SSAQ5-01-1BPC_FD	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)
G0E030477	SSAQ5-01-1BPC SSAQ5-01-1BPC_FD	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects)	A	Field duplicates (RPD) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E030477

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E030477

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E030477

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307I21	VALIDATION COMPLETENESS WORKSHEET
SDG #:G0E030477	Stage 2B
Laboratory: Test America	

	Date:	4/5/10
	Page:_	<u> </u>
	Reviewer:	
2nd	Reviewer:	_ h
		/

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	A	Sampling dates: 4/30/10
11.	HRGC/HRMS Instrument performance check	+	
111.	Initial calibration	A	
IV.	Routine calibration/low	4	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	W	
VII.	Laboratory control samples	\triangle	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Aw	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SN	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	W	D=>+3
XV.	Field blanks	av.	D=2+3 B04062010-R2B(4-0D120488) ZB-04302010-RZB ZB-0432200-D66

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	SSAQ5-01-2BPC	S 11	0/2/206MB	21	31
2	SSAQ5-01-1BPC	1 12	/	22	32
3	SSAQ5-01-1BPC_FD	13		23	33
4	SSAQ5-01-2BPCMS	14		24	34
5	SSAQ5-01-2BPCMSD	15		25	35
6		16		26	36
7		17		27	37
8		18		28	38
9		19		29	39
10		20		30	40

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

	U. Total Hood		V. Total TCDF		W. Total Beans		X. Total HXCOE		Y Total Hoone
	P. 1,2,3,4,7,8,9-HpCDF		S. OCOF		R. Total TCDD		S. Total PeCDD		T. Total HxCDD
K. 123478-HVCDE		L. 1.2.3.6.7 B.HYCDE		M 234678 HUDDI	יייי בייי	1001001001	TOOXE-8,0,1,0,2,1		O: 1,4,0,4,0,7,8+HPCDF
F. 1,2,3,4,6,7,8-HpCDD		G. OCDD		H. 2,3,7,8-TCDF		i. 1,2,3,7,8-PeCDF		J. 2,3,4,7,8-PeCDF	
A. 2,3,7,8-TCDD	B 12378 B2000	00094.6,7,5,5,7		OOXH-0','+'6'3', O		D. 1,4,5,6,7,8-MXCDD	1001001	C. 1,4,9,7,9,8-HXCDD	

Notes:

LDC #:23307/=| SDG #:281 COND

VALIDATION FINDINGS WORKSHEET

Blanks

2nd Reviewer._ Reviewer

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank analyzed for each matrix?

Y N N/A

Was the blank contaminated? If yes, please see qualification below. N N/A

🕖 Blank analysis date: 🧲 Blank extraction date: ゴ Conc. units: セタ/ タ Conc. units: P9/

(>S<)	Sample Identification							
M	Sample							
Associated Samples:		M						
	Blank ID	01=7206 MB	0053	0.35	0.13	0.095	p=0	
Conc. units: P5/9 //	Compound	2/2	<u>+</u>	19	9	Z.	\otimes	

Blank analysis date: Blank extraction date:

Conc. units:

Associated Samples:

Compound	Blank ID	Sample Identification

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #:See Cover LDC #:23307121

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Associated sample units:_ |V N N/A Were field blanks identified in this SDG? | Blank units: pg/L Associated sample units

Sampling date: 4/30/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

b/bd

Sample Identification All (>5X) 0.0029 0.0145 0.0275 0.0175 0.0355 0.00405 0.0305 0.075 0.035 0.01 2. 0.2 Ä EB-04302010-RZB~1 Blank ID 0.58 0.81 2.9 15 7.1 2.0 6.1 20 6 Compound ტ Σ

SDG #:See Cover LDC #:23307121

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:___ Reviewer:__

Page: 1 of

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units:

b/bd Blank units: pg/L Sampling date: 4/30/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Sample Identification All (>5X) Associated Samples: 0.00455 0.00335 0.00425 0.0023 0.0285 0.0039 0.0022 0.0037 0.0034 9000 0.01 젉 FB-04302010-RZB-2 Blank ID 0.46 0.44 0.67 0.78 0.85 0.74 0.68 0.91 1.2 5.7 2.0 Compound ტ 0

SDG #: See Cover LDC #: 23307121

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Associated sample units: X N/A Were field blanks identified in this SDG? Blank units: pg/L

Sampling date: 4/6/10

						Ī										
>5X)	tion															
All (>5X)	Sample Identification															
mples:	Sal															
Associated Samples:			:													
A																
Field blank type: (circle one) Field Blank Rinsate / Other:		5X	0.0034	0.0125	0.031	0.0135	0.007	0.0041	0.0047	600.0	900.0	0.022				
k Rinsate	IK ID	EB04062010-RZB	0.68	2.5	2	7	1.4	0.82	94	1.8	1.2	4.4				
Field Blar	Blank ID	FB04062	0.0	2.	6.2	2.7	1	0.8	0.94	1	1	4				
(circle one	ō															
ank type:	Compound															
Field bl			Ш	ட	ပ	エ	¥		z	0	Ъ	Ø				CROL

LDC #: 93307/12

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

| N/A | N/A | Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an

associated MS/MSD. Soil / Water.

Was a MS/MSD analyzed every 20 samples of each matrix? Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

				WS	MSD			
*	Date	MS/MSD ID	Compound	%R (Limits)	%R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		4/5	70 R	ackt Livi	Several	ants. 1	\ \$	Notheral
		/	Sano	be has	1	tangets (1b)		1
)	′)			
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LDC #:2330/ SDG #: 207

VALIDATION FINDINGS WORKSHEET Internal Standards

Reviewer:_

Page:_

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Are all internal standard recoveries were within the 40-135% criteria? Was the S/N ratio all internal standard peaks > 10?

$\overline{}$		Ī	Τ	T	T		٦	T	1	T						T	T							T	T	T	T	T	7
Qualifications	No Gas																				Check Standard Used						J		
40-135%)	1361-04)	((((((()	()) [()	()	()	Internal Standards			CDD					
% Recovery (Limit: 40-135%)) 00)))))))									Int	1. 13C-OCDD	K. 13C-1,2,3,4-TCDD	L. ¹³ C-1,2,3,7,8,9-HxCDD	Σ	ż	0.	o.	
																					P								
Internal Standard																					Check Standard Used								
900	(4/50)																				s,								
l sh ID/Reference		2/1/2																			Infernal Standards	TCDE	TCDD	8-PeCDF	8-PeCDD	¹³ C-1,2,3,4,7,8-HxCDF	¹³ C-1,2,3,6,7,8-HxCDD	¹³ C-1,2,3,4,6,7,8-HpCDF	¹³ C-1 2.3 4.6.7.8-HpCDD
9	280																					13C-2 3 7 8-TCDF	13C-2 3 7 8.TCDD	13C-1,2,3,7,8-PeCDF	¹³ C-1,2,3,7,8-PeCDD	¹³ C-1,2,3,4,	13C-1,2,3,6,	L	<u> </u>
*	-	$\frac{1}{2}$															1					□	a	نان	ات	ш	u.	ιj	I

LDC #: 2330/12/ SDG #: 22 COUP

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of A Reviewer: &

METHOD; HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

N N N N N

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	1dets/4010)	>		1 K(K)					
Associated Samples	٨	Υ		M					
Finding	& > calib sans	0. Q . L		ZMPO LASULAS					
Sample ID	2	8)		//&					
Date						0			
*									

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23307I21</u> SDG#: <u>See Cover</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:_/of_/ Reviewer:_____ 2nd Reviewer:_____

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

YN NA YN NA Were field duplicate pairs identified in this SDG? Were target analytes detected in the field duplicate pairs?

	Concentrat	ion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	2	3	RPD	Difference	Limits	(Parent Only)
Α	95	300	104			Jdots/A
В	290	980	109			
С	180	900	133			
D	410	1600	118			
E	390	1600	122			
F	1500	5500	114			
G	1600	5400	109			
Н	1700	5600	107			
1	4000	14000	111			
J	2200	7900	113			
к	8700	31000	112			
L	5400	20000	115			
М	1500	5700	117			
N	910	3800	123			
0	18000	72000	120			
Р	8100	30000	115			,
Q	62000	250000	121			

V:\FIELD DUPLICATES\23307I21.wpd

(fd)

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 30, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E030478

Sample Identification

SSAK6-02-5BPC SSAK6-03-3BPC

Introduction

This data review covers 2 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination.

 This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0127206MB	5/7/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.053 pg/g 0.35 pg/g 0.13 pg/g 0.095 pg/g 0.24 pg/g	SSAK6-03-3BPC

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0130380MB	5/10/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.41 pg/g 1.6 pg/g 0.65 pg/g 1.3 pg/g 0.67 pg/g 0.28 pg/g 2.0 pg/g 0.82 pg/g 4.0 pg/g	SSAK6-02-5BPC

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

Sample EB-04302010-RZD (from SDG G0E030473) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB04302010-RZD	4/30/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	1.7 pg/L 1.4 pg/L 1.5 pg/L 2.8 pg/L 7.2 pg/L 1.5 pg/L 2.2 pg/L 1.2 pg/L 1.9 pg/L 1.6 pg/L 2.4 pg/L 1.4 pg/L 5.0 pg/L	All samples in SDG G0E030478

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E030478

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK6-02-5BPC	¹³ C-OCDD	27 (40-135)	OCDD	J (all detects) UJ (all non-detects)	Р
		i I	OCDF	J (all detects) UJ (all non-detects)	
				(4.1. 116.1. 43.136.5)	

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK6-03-3BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E030478	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E030478	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E030478

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E030478	SSAK6-02-5BPC	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0E030478	SSAK6-03-3BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E030478	SSAK6-02-5BPC SSAK6-03-3BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E030478	SSAK6-02-5BPC SSAK6-03-3BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E030478

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E030478

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E030478

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

LDC #: 23307J21 SDG #: G0E030478 Stage 2B Laboratory: Test America METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

	Date: 6/07/80	
	Page: <u> </u>	
	Reviewer: <u>\frac{1}{2}</u>	
2nd	Reviewer:	
	4	
	/	

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
1.	Technical holding times	A	Sampling dates: 4/30/10
II.	HRGC/HRMS Instrument performance check	4	, ,
111.	Initial calibration	#	
IV.	Routine calibration/N	1	
V.	Blanks	ay	
VI.	Matrix spike/Matrix spike duplicates	W	No assid sauple - No Caral
VII.	Laboratory control samples	A	100
VIII.	Regional quality assurance and quality control	N	
lX.	Internal standards	W	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	#13-04072010-FZD(40D090441) ZB-04302010-FZT

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:

1 1	SSAK6-02-5BPC 5	11 1	0/30380MB	21	31
2	SSAK6-03-3BPC	ر 12	012T206MB	22	32
3		13		23	33
4		14		24	34
5		15		25	35
6		16		26	36
7		17		27	37
8		18		28	38
9		19		29	39
10		20		30	40

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HXODF	P 1234780 U200E	
00000				U. Iotal HpCDD
6. 1,2,3,7,0-PBCDD	g. ocen	L. 1,2,3,6,7,8•HXCDF	O. O.DE	1 60 4
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				V. Iotal I CDF
C. 1,4,3,4,7,8-HXCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	COT left	
				W. lotal PecoF
U. 1,2,3,6,7,8+HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HXODF	Contract of Total	
000000000000000000000000000000000000000				A. Lotal HXCDF
E: 1,4,3,7,8,9-HXCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T Total HyCOD	
				T. Oak HOCOT

Notes:

LDC #: 230712

VALIDATION FINDINGS WORKSHEET

Blanks

2nd Reviewer: Reviewer: Page:

METHOD; HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

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

Were all samples associated with a method blank? Y N N/A

Was the blank contaminated? If yes, please see qualification below. Was a method blank analyzed for each matrix?

Blank extraction date: タブル Blank analysis date: タイグ

X51 Sample Identification Associated Samples: (306MB) 0.053 560. 0.13 0.33 Blank ID 40 n Compound Conc. units: 22/ ď

Blank analysis date: Blank extraction date:

_		 			
	L				
	Sample Identification				
	Sar				
Associated Samples:					
Associat					
	Blank ID				
ınits:	Compound				
Conc. units:					

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307J21

VALIDATION FINDINGS WORKSHEET Blanks

Page:_ Reviewer:

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Y N N/A

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below.

| V/N N/A | Was the method | Blank extraction date: 5/10/10

Conc. units: pa/a

Associated samples: Blank analysis date: 5/21/10

1 (>5X)	Sample Identification															
Associated samples: 1 (>5X)	Sample k															
ociated san																
		5X	2.05	8	3.25	6.5	3.35	1.4	10	4.1	20					
	Blank ID	0130380MB	0.41	1.6	0.65	1.3	0.67	0.28	2.0	0.82	4.0					
Conc. units: pg/g	Compound		ĬĻ.	9		¥	-1	Σ	0	4	ø					

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

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SDG #:See Cover LDC #:23307J21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

b/bd Associated sample units: YN N/A Were field blanks identified in this SDG? Blank units: pg/L

Field blank type: (circle one) Field Blank / Rinsate / Ofher. Sampling date: 4/30/10

1/V

(>2X)

Sample Identification Associated Samples: 0.0085 0.0075 0.0075 0.0095 0.025 0.014 0.036 0.006 0.008 0.012 0.007 0.007 0.011 ž EB-04302010-RZD Blank ID 1.5 1.7 2.8 1.5 2.2 1.2 1.9 1.6 2.4 4. 5.0 4. Compound CRQL G Σ

SDG #: See Cover LDC #: 23307J21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:_ Page:__

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Associated sample units: YAN N/A Were field blanks identified in this SDG?

Blank units: pg/L Sampling date: 4/7/10

All (>5X) Associated Samples: Field blank tyne. (circle and Field Blank / Rinsate / Other

All (257)	Sample Identification																
Associated Samples:	Sam																
e / Otner:		5X	0.00445	0.0075	0.011	0.0415	0.007	0.008	0.0075	0.008	0.0065	0.007	0.0205				
Field blank type: (circle ang) Field Blank / Kinsate / Other:	Blank ID	FR-04072010-RZD	0.89	1.5	2.2	8.3	1.4	1.6	1.5	1.6	1.3	1.4	4.1				
ink type: (circle orie)	Compound																
Field bla			ပ	Ш	Ł	9	¥		Σ	z	0	۵	g				

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: =330[]=/ SDG #56 C)~~

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:__ Reviewer:__ 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Are all internal standard recoveries were within the 40-135% criteria? Was the S/N ratio all internal standard peaks > 10?

				¹³ C-1,2,3,4,6,7,8-HpCDD	_	I
		o:		¹³ C-1,2,3,4,6,7,8-HpCDF	-	ΰ
<i></i>		o o		¹³ C-1,2,3,6,7,8-HxCDD	¹³ C-1,2,3,6,	u.
		z		7,8-HxCDF	¹³ C-1,2,3,4,7,8-HxCDF	ш
		Σ		8-PeCDD	¹³ C-1,2,3,7,8-PeCDD	٥
	¹³ C-1,2,3,7,8,9-HxCDD	i.		8-PeCDF	¹³ C-1,2,3,7,8-PeCDF	ن
	¹³ C-1,2,3,4-TCDD	х, ¹³		TCDD	13C-2,3,7,8-TCDD	В
	¹³ C-OCDD			TCDF	13C-2,3,7,8-TCDF	∢
Check Standard Used	Internal Standards		Check Standard Used	Internal Standards		
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	()					
1	()	-				
1/4/4/4/4/A/	(+0-13C)	78	+		Cald	ŧ
Qualifications (/)	% Recovery (Limit: 40-135%)	% Re	Internal Standard	Lab ID/Reference	Date	#

LDC #:2330X12

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

Reviewer: __ 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

A Z Z Z Z

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	Llets (e)	(X) X7							
Associated Samples	lange o	, an							
Finding	4.0.4.8>calls	zwe usuts							
Sample ID	4								
Date						0			
*								<u></u>	

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

May 3, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E040578

Sample Identification

SSAK7-06-1BPC

SSAK8-07-1BPC

SSAL7-04-1BPC

SSAL2-03-1BPC

SSAK7-03-1BPCMS

SSAK7-03-1BPCMSD

Introduction

This data review covers 6 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0131390MB	5/11/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.073 pg/g 0.40 pg/g 0.12 pg/g 0.12 pg/g 0.075 pg/g 0.18 pg/g 0.42 pg/g	All samples in SDG G0E040578

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E040578

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

VI. 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.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK7-06-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	36 (40-135) 33 (40-135) 25 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р
SSAL7-04-1BPC	¹³ C-OCDD	37 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK8-07-1BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P	
All samples in SDG G0E040578	All compounds reported below the PQL.	J (all detects)	Α	

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E040578	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E040578

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E040578	SSAK7-06-1BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0E040578	SSAL7-04-1BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0E040578	SSAK8-07-1BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E040578	SSAK7-06-1BPC SSAK8-07-1BPC SSAL7-04-1BPC SSAL2-03-1BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E040578	SSAK7-06-1BPC SSAK8-07-1BPC SSAL7-04-1BPC SSAL2-03-1BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E040578

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E040578

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307K21	VALIDATION COMPLETENESS WORKSHEET
SDG #: G0E040578	Stage 2B
Laboratory: Test America	

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	A	Sampling dates: 5/10
II.	HRGC/HRMS Instrument performance check	4	
111.	Initial calibration	1	
IV.	Routine calibration/l	A	
V.	/ Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	\$	
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
lX.	Internal standards	an	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	₹\N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	Im/	TB-04072010-RZD (FDD090441)

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	SSAK7-08-1BPC	5 11	0131390118	21	31
2	SSAK8-07-1BPC	12	/	22	32
3	SSAL7-04-1BPC	13		23	33
4	SSAL2-03-1BPC	14		24	34
5	SSAK7-03-1BPCMS	15		25	35
6	SSAK7-03-1BPCMSD	16		26	36
7		17		27	37
8		18		28	38
9		19		29	39
10		20		30	40

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

				-
A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U Total HnCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HXCDF	Q. OCDF	V Total TCDE
C. 1,5,6,4,7,8-HXCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total DeCDE
1				
U. 1,2,3,6,7,8•HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HXCDF	S. Total PeCDD	X Total Hyone
1				
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y Total Hoode

Notes:

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7K2	S
2330	See
#.	#
20	SDG

VALIDATION FINDINGS WORKSHEET Blanks

Page: 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. N/A

Blank extraction date: 5/11/10 Conc. units: pg/g N/N N/A

Associated samples: Blank analysis date: 5/21/10

All (>5X)

Compound	Blank iD			Sample I	Sample Identification			
	L°	XS						
L	تـــــــا	0.365						
9	0.40	2						
I	0.12	9.0						
X	0.12	9.0					***************************************	
7	0.075	0.375						
0	0.18	6:0						
Ø	0.42	2.1						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307K21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:_

\ot/

Page:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Were field blanks identified in this SDG?

b/bd Associated sample units:_ Blank units: pg/L

Sampling date: 4/7/10

Sampling date. 4/1/10 Field blank type: (circle one) Field Blank Rinsate / Other:	Field Blank/Rinsate	/ Other:	Associated Samples:	All (>5X)	
Compound	Blank ID		S	Sample Identification	
	FB-04072010-RZD	5X			
U	0.89	0.00445			
Ш	1.5	0.0075			
Щ	2.2	0.011			
9	8.3	0.0415			
¥	1,4	0.007			
7	1.6	0.008			
Σ	1.5	0.0075			
Z	1.6	0.008			
0	1.3	0.0065			
<u>a</u>	1.4	0.007			
O	4.1	0.0205			
	- Wilderman				
CROL					

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

SDG #200 COULD LDC #: <u>9339714</u>3

VALIDATION FINDINGS WORKSHEET Internal Standards

2nd Reviewer: Reviewer:__ Page:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

NA Wes the SN ratio all internal standard peaks 2 107 Wes the SN ratio all internal standard peaks 2 107 Wes the SN ratio all internal standard peaks 2 107 Wes the SN ratio all internal standard peaks 2 107 Wes the SN ratio all internal standard peaks 2 107 Wes the SN ratio all internal standard peaks 2 107 Wes the SN ratio all internal standards Wes the SN ratio all internal standards		Qualifications ()	111 / P (F-4, 0-8)	- - - -						o leval.													Check Standard Used		
N/A Was the S/N ratio all internal standard recoveries were within the 40-135% criteria? N/A Was the S/N ratio all internal standard peaks ≥ 10? ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★		ery (Limit: 40-135%)	(15/204)					, A		(40-130) A	()	(()	()	()	()	()	()	()	()	(()	Internal Standards	QQ	,3,4-TCDD
N/A Date Date 13-2-2,3,7	oriteria?		14	\ \ \ \	100	020	100		,	<u> </u>													q	-	
N/A Date Date 13-2-2,3,7	were within the 40-135% card peaks > 10?	Internal Standard		1				-		th													Check Standard Used		
N/A N/A Date Date 13C-2.3.7	all internal standard recoveries the S/N ratio all internal stand	in the Ont Tatio an income of the state of t	/				•	<u>)</u>		6 (MSD)													Internal Standards	- DE	aac
** * * * * * * * * * * * * * * * * * *	<u></u>	9,5	Cate																					ᆙ	+-
	X	TN .	ŧ																					□	E m

¹³C-1,2,3,4,6,7,8-HpCDD ¹³C-1,2,3,4,6,7,8-HpCDF ¹³C-1,2,3,6,7,8-HxCDD ¹³C-1,2,3,4,7,8-HxCDF

છં

¹³C-1,2,3,7,8,9-HxCDD

≥ ż

¹³C-1,2,3,7,8-PeCDF 13C-1,2,3,7,8-PeCDD

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SDG #: 200 CEMEN

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLS

Page: of 2

Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

A N N Y

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	1446 (C)		(F)							
Associated Samples			$\mu \lambda$							
2pds > calebrary	H. K. O. P. X		ZUTE MANTS							
Sample ID	C		14.1							
Date						0				
*									<u>L</u>	<u> </u>

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

May 3, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E040582

Sample Identification

SSAK8-06-4BPC

SSAK8-06-5BPC

SSAL2-02-3BPC

Introduction

This data review covers 3 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0134189MB	5/14/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.14 pg/g 0.41 pg/g 0.12 pg/g 0.11 pg/g 0.15 pg/g 0.14 pg/g 0.35 pg/g	SSAK8-06-4BPC SSAK8-06-5BPC
0131390MB	5/11/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.073 pg/g 0.40 pg/g 0.12 pg/g 0.12 pg/g 0.075 pg/g 0.18 pg/g 0.42 pg/g	SSAL2-02-3BPC

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E040582

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK8-06-4BPC SSAL2-02-3BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAK8-06-5BPC	1,2,3,4,7,8-HxCDF 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E040582	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E040582	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E040582

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E040582	SSAK8-06-4BPC SSAL2-02-3BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	P	Project Quantitation Limit (e)
G0E040582	SSAK8-06-5BPC	1,2,3,4,7,8-HxCDF 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E040582	SSAK8-06-4BPC SSAK8-06-5BPC SSAL2-02-3BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E040582	SSAK8-06-4BPC SSAK8-06-5BPC SSAL2-02-3BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E040582

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E040582

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

LDC #: 23307L21 VALIDATION COMPLETENESS WORKSHE
SDG #: G0E040582 Stage 2B
Laboratory: Test America

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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: 5/3/10
II.	HRGC/HRMS Instrument performance check	#	, ,
111.	Initial calibration	#_	
IV.	Routine calibration/I	A ,	
V.	Blanks	W,	
VI.	Matrix spike/Matrix spike duplicates	M	No assid sample - No Conal
VII.	Laboratory control samples	4	205
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	₹N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	W/	TB-040T2010-R2D(GOD090441)

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	SSAK8-06-4BPC	5	11	013418923	21	31
2	SSAK8-06-5BPC		12		22	32
- — 3	SSAL2-02-3BPC	$ \vee$	13		23	33
4			14		24	34
5			15		25	35
6			16		26	36
7			17		27	37
8			18		28	38
9			19		29	39
10			20		30	40

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
A. 2,3,7,8-1CDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	g. ocpp	L. 1,2,3,6,7,8-HxCDF		V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	
				VY. LOCAL PECOF
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X Total HxCDE
1,4,3,7,8,9+HXCUU	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y Total Hoode
E. 1,2,3,7,8,9•HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCl	ر مو

Notes:

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VALIDATION FINDINGS WORKSHEET

Blanks

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? Was the method blank contaminated? If yes, please see qualification below.

1-2 (>5X)

Associated samples:

Blank analysis date: 5/21/10 Blank extraction date: 5/14/10 Conc. units: pg/g Sample Identification 0.75 1.75 2.05 0.55 9.0 0.7 0.7 X 0134189MB Blank ID 0.14 0.41 0.12 0.15 0.14 0.35 0.11 Compound G 0 Ø

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

VALIDATION FINDINGS WORKSHEET	

Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

SDG #: See Cover

LDC #: 23307L21

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. Y N/A Y/N N/A

3 (>5X)

Associated samples:

Blank analysis date: 5/21/10 Blank extraction date: 5/11/10 Conc. units: pg/g

		- i		1			T		- 1	Т	Т	Т	7	7	Т	T	Т	T	T	=
Sample Identification																				
Sample lo																				
	>2	0.365	2	9.0	0.6	0.375	6.0	2.1												
Blank ID	0424300848	0.073	0.40	0.12	0.12	0.075	0.18	0.42												
pul																				
Compound																				
		ц	ع	<u> </u>	_ ×	<u> </u>	0	0				<u> </u>			<u>L</u>				<u> </u>	L

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #: See Cover LDC #: 23307L21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units:

b/bd

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank Rinsate / Other:

All (>5X) Sample Identification Associated Samples: 0.0205 0.00445 0.0415 0.0075 0.0065 0.0075 0.008 0.008 0.007 0.011 0.007 ž EB-04072010-RZD Blank ID 0.89 1.5 2.2 8.3 1. 1.6 1.5 1.6 1.3 4. Compound G

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #:233076-7 SDG #:222 52409

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLS

Page: Of/ Reviewer: 9

METHOD; HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

AN X

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dijutions and dry weight factors (if necessary).

Qualifications	Idoteto (e)	1		1 (E)							
Associated Samples	€ ' /	٨		m							
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O e o o o o o o o o o o o o o o o o o o	4	0		1"1	MAY						
Cate							0				
*		1	<u></u>				<u></u>	 	 	 <u> </u>	_

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

May 4, 2010

LDC Report Date:

June 17, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E050582

Sample Identification

SSAL3-05-1BPC SSAM5-03-4BPC**

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 2 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B 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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0127206MB	5/7/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.053 pg/g 0.35 pg/g 0.13 pg/g 0.095 pg/g 0.24 pg/g	SSAL3-05-1BPC
0134189MB	5/14/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.14 pg/g 0.41 pg/g 0.12 pg/g 0.11 pg/g 0.15 pg/g 0.14 pg/g 0.35 pg/g	SSAM5-03-4BPC**

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	Compound	Reported Concentration	Modified Final Concentration
SSAL3-05-1BPC	OCDD	0.44 pg/g	0.44U pg/g

Sample EB05042010-RZE (from SDG G0E050610) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB05042010-RZE	5/4/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	1.1 pg/L 3.6 pg/L 2.2 pg/L 2.8 pg/L 1.3 pg/L 0.99 pg/L 0.88 pg/L 4.6 pg/L 2.2 pg/L 8.8 pg/L	SSAM5-03-4BPC**

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

Samples FB-0407210-RZD (from SDG G0D090441) and FB-04132010-RIG2-RZE (from SDG G0D150582) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04132010-RIG2-RZE	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40 pg/L 0.65 pg/L 2.5 pg/L 0.66 pg/L 0.41 pg/L 0.53 pg/L 0.97 pg/L	SSAM5-03-4BPC**
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.4 pg/L 1.4 pg/L 4.1 pg/L	SSAL3-05-1BPC

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Internal Standards	%R (Limits)	Compound	Flag	A or P
¹³ C-OCDD	30 (40-135)	OCDD	J (all detects)	Р
		OCDF	J (all detects) UJ (all non-detects)	
			¹³ C-OCDD 30 (40-135) OCDD	13C-OCDD 30 (40-135) OCDD J (all detects) UJ (all non-detects) J (all detects)

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAM5-03-4BPC**	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E050582	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E050582	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E050582

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E050582	SSAM5-03-4BPC**	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0E050582	SSAM5-03-4BPC**	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0E050582	SSAL3-05-1BPC SSAM5-03-4BPC**	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E050582	SSAL3-05-1BPC SSAM5-03-4BPC**	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E050582

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0E050582	SSAL3-05-1BPC	OCDD	0.44U pg/g	Α .	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E050582

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E050582

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307M21	VALIDATION COMPLETENESS WORKSH
SDG #: G0E050582	Stage 2B
Laboratory: Test America	
METHOD, HDCC/HDMC Diavi	as/Dibonzofurans (EDA SW 846 Method 8290)

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

I. Technical holding times A Sampling dates: 5/4 / 1 b II. HRGC/HRMS Instrument performance check A III. Initial calibration A IV. Routine calibration A V. Blanks W V. Matrix spike/Matrix spike duplicates W A VII. Laboratory control samples VIII. Regional quality assurance and quality control N IX. Internal standards W X. Target compound identifications A XI. Compound quantitation and CRQLs XN XII. System performance A XIV. Field duplicates N XIV. Field duplic		Validation Area		Comments
III. Initial calibration IV. Routine calibration/ISW V. Blanks VI. Matrix spike/Matrix spike duplicates VII. Laboratory control samples VIII. Regional quality assurance and quality control IX. Internal standards X. Target compound identifications XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	l.	Technical holding times	A	Sampling dates: 5/4/10
IV. Routine calibration V V. Blanks WII. Matrix spike/Matrix spike duplicates WIII. Laboratory control samples VIII. Regional quality assurance and quality control IX. Internal standards XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	11.	HRGC/HRMS Instrument performance check	4	, ,
VI. Matrix spike/Matrix spike duplicates WII. Laboratory control samples VIII. Regional quality assurance and quality control IX. Internal standards XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	111.	Initial calibration	4	
VI. Matrix spike/Matrix spike duplicates WII. Laboratory control samples VIII. Regional quality assurance and quality control IX. Internal standards X. Target compound identifications XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	IV.	Routine calibration/low	4	
VII. Regional quality assurance and quality control IX. Internal standards X. Target compound identifications XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	V.	/	av	
VII. Regional quality assurance and quality control IX. Internal standards X. Target compound identifications XI. Compound quantitation and CRQLs XIII. System performance XIII. Overall assessment of data XIV. Field duplicates	VI.	Matrix spike/Matrix spike duplicates	w	No spassed - No anal
IX. Internal standards X. Target compound identifications XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	VII.	Laboratory control samples	4	109
X. Target compound identifications XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	VIII.	Regional quality assurance and quality control	N	
XI. Compound quantitation and CRQLs XII. System performance XIII. Overall assessment of data XIV. Field duplicates	IX.	Internal standards	w	
XII. System performance XIII. Overall assessment of data XIV. Field duplicates	X.	Target compound identifications	A	
XIII. Overall assessment of data XIV. Field duplicates N	XI.	Compound quantitation and CRQLs	ŹN	
XIV. Field duplicates N	XII.	System performance	A	
	XIII.	Overall assessment of data	A	
	XIV.	Field duplicates	N,	
XV. Field blanks W FB-047210 F2X(F0D090441)_FB-04732010-F142-	XV.	Field blanks	W	FB-0407210 RZY 40D090441)_ FB-04132010-R142-R2E

Note:

A = Acceptable N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

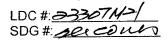
D = Duplicate TB = Trip blank

EB = Equipment blank

Validated Samples:

						 	
1 🎝	SSAL3-05-1BPC	5	11	01-7206MB	21	 31	
2 &	SSAM5-03-4BPC	** /	12	/	22	32	
3			13		23	33	
4			14		24	34	
5			15		25	35	· · · · · · · · · · · · · · · · · · ·
6			16		26	36	
7			17		27	 37	
8			18		28	38	
9			19		29	39	
10			20		30	40	

Notes:	

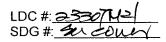


VALIDATION FINDINGS CHECKLIST

Page: of A Reviewer: 2nd Reviewer:

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Wetnod: Dioxins/Dibenzoturans (EPA SVV 646 Metriod 6290	Yes	No	NA	Findings/Comments
Technical holding times	1	1	1	
All technical holding times were met.	/			
Cooler temperature criteria was met.	/			
ii. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	/			
Were the retention time windows established for all homologues?	/			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	1			
Is the static resolving power at least 10,000 (10% valley definition)?	/			
Was the mass resolution adequately check with PFK?				
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?				
III. Initial calibration				<u></u>
Was the initial calibration performed at 5 concentration levels?				
Were all percent relative standard deviations (%RSD) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?				
IV. Continuing calibration	/			
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?			and the second	
V. Blanks	I 1			
Was a method blank associated with every sample in this SDG?				
Was a method blank performed for each matrix and concentration?	(
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?				
VI. Matrix spike/Matrix spike duplicates	· · · · · · · · · · · · · · · · · · ·			
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VII. Laboratory control samples	1		 3 may 200 s 	
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per extraction batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				



VALIDATION FINDINGS CHECKLIST

Page: of 2
Reviewer: 9
2nd Reviewer: 4

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VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

G. OCDD H. 2,3,7,8-TCDF H. 2,3,7,8-PeCDF N. 1,2,3,7,8,9-HxCDF S. Total PeCDD T. Total HyCDP	A. 2.3.7.8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
H. 2,3,7,8-TCDF M. 2,3,4,6,7,8-HxCDF R. Total TCDD I. 1,2,3,7,8-PeCDF N. 1,2,3,7,8,9-HxCDF S. Total PeCDD	B. 1.2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. 0CDF	V. Total TCDF
1. 1,2,3,7,8-PeCDF N. 1,2,3,7,8,9-HxCDF S. Total PeCDD	C 123478-HXCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
	D 123678-HxCDD	1, 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X, Total HxCDF
0, 7, 4, 7, 4, 7, 6, 10, 10, 1, 10, 10, 10, 10, 10, 10, 10,	E. 1.2.3.7.8.9-H×CDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:

SDG # ZER COUL LDC #: 233074

VALIDATION FINDINGS WORKSHEET Blanks

Reviewer. 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

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

Were all samples associated with a method blank? AN NA

Was the blank contaminated? If yes, please see qualification below. Was a method blank analyzed for each matrix? M N/A ∀N N≯

Associated Samples: Blank extraction date: 47/0 Blank analysis date: 57

cole 50

Conc. units: F2		
halloamoo	Blank ID	Sample Identification
	ON SOCKIO	
14	6.053	(58.9)
4	0.35	044/19
9	0.13	(5.3)
0	260.0	(g.4)
×	450	
Blank extraction date: 4/0 Blank analysis date: 5	_ Blank analy	ysis date: $\frac{5/3/l^2}{4}$ Associated Samples:
balloumo	Rlank ID	Sam
12. W	11 /	
H	0 14	
4	140	
4	0.12	
	11.0	
0	210	
4	4/0	

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: <u>23307M21</u> SDG #:<u>See Cover</u>

VALIDATION FINDINGS WORKSHEET FIELD Blanks

Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units: pg/g

Sampling date: 5/4/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

2 (>5X)

Sample Identification 0.00495 0.0055 0.0065 0.0044 0.018 0.011 0.014 0.023 0.044 0.011 ž EB05042010-RZE Blank ID 0.99 0.88 3.6 2.2 2.8 1.3 4.6 2.2 8.8 Compound ග Σ 0 Ø I ۵.

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

SDG #:See Cover LDC #:23307M21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

X N/A Were field blanks identified in this SDG?

b/bd Associated sample units: Blank units: pg/L

Sampling date: 4/13/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

ſ															Γ
	ıtion												=		
	Sample Identification														
	Sa														
		5X	0.002	0.00325	0.0125	0.0033	0.00205	0.00265	0.00485						
	Blank ID	FB-04132010-RIG2-RZF	0.40	0.65	2.5	0.66	0.41	0.53	0.97						
	Compound														
			Ш	ᄔ	ဖ	ᅩ	Σ	0	ø						

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 23307M21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

Jo Jo Page:_ 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N N/A Were field blanks identified in this SDG? Blank units: pg/L Associated sample units

b/bd Associated sample units:

Sampling date: 4/7/10

1 (>5X)

Field blank type: (circle one) Field Blank / Rinsate / Other:	γField Blank ∕Rinsate	/ Other:	Associated Samples:	1 (>5X)	
Compound	Blank ID			Sample Identification	
	FB-04072010-RZD	- X5			
S	0.89	0.00445			
Ш	1.5	0.0075			
u _	2.2	0.011			
9	8.3	0.0415			
X	1.4	0.007			
7	1.6	800'0			
M	1.5	0.0075			
Z	1.6	0.008			
0	1.3	0.0065			
Ь	1.4	0.007			
Q	4.1	0.0205			
CROI					****

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U". CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:

LDC #: 2830/N-7 SDG #: 564 CONS

VALIDATION FINDINGS WORKSHEET

Internal Standards

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". Are all internal standard recoveries were within the 40-135% criteria?

Was the S/N ratio all internal standard peaks > 10? N/A N/A N/A

*	ate a	Lab iD/Reference	Internal Standard	•	% Recovery (Limit: 40-135%)	0-135%)	Qualifications //
		9	+	l (V)	0	1241-04	1/x 4 (4 6)
		Ŏ				J	1
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)	(
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)		
)	(
		Internal Standards	Check Standard Used		Inte	Internal Standards	Check Standard Used
₹	13C-2,3,7,8-TCDF	CDF			ೆರ-೦೦ರರ		
m	<u> </u>	CDD		ᅶ	¹³ C-1,2,3,4-TCDD		
ن	╄	PeCDF		انـ	13C-1,2,3,7,8,9-HxCDD	00	
٥	 	-PeCDD		Σ			
ш	_	8-HxCDF		ż			
u.	<u> </u>	8-HxCDD		o			
ϋ	<u> </u>	,7,8-HpCDF		ď			
I		7,8-HpCDD					

LDC #: 233071/2-/ SDG #: 261 = 2010

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: ___of_ Reviewer: ____

Heviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Y N N/A

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	14/2/P(e)	1F(F)						
Associated Samples	lange	, m						
Finding	1.0.0 > calleb.	ZUDC USUMS						
Sample ID	7	(A)						
Date					0			
*								

Comments: See sample calculation verification worksheet for recalculations

LDC #: 25% 7421 SDG #: 265 CONST

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page: of Reviewer: 2nd Reviewer: 2

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

RRF = $(A_{\omega})(C_{\omega})/(A_{\omega})(C_{\omega})$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs, X =

A_B = Area of associated internal standard C_B = Concentration of internal standard S, X = Mean of the RRFs

L_				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (CSS std)	RRF (23 3 std)	%RSD	%RSD
-	1642	1. Hole	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0.936	1860	65.0	0.99	405	5.16
	(306)		2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1033	1.033	50.1	1.05	7.7.7	7.82
	,		1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.112	C//·/	1.16	1:16	4.39	4.28
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	0.957	1560	1.07	1.02	006	80.0
			OCDF (19C-OCDD)	1.347	1.347	1.47	1.47	9.57	19.6
2	1992	1.77	2.3,7,8-TCDF (¹3C-2,3,7,8-TCDF)	880.1	1.088	0/:/	01:1	15.9	S
		01/10/4	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (19C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			ocdf ("c-ocdd)						
ဗ			2,3,7,8-TCDF (*9-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF ("C-OCDD)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10,0% of the recalculated results.

· SDG #: 20 50 WAS LDC #: 23307/12/

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

Reviewer:

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF RRF = (A_)(C_*)/(A_*)(C_3)

ave, RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_{\rm s}=$ Area of associated internal standard $C_{\rm k}=$ Concentration of internal standard A_x = Area of compound, C_x = Concentration of compound,

L					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	Q%	Q%
_	SABITMIE	/ / / -	2,3,7,8-TCDF (*C-2,3,7,8-TCDF)	0.936	760	76.0	0.5	0.5
		01/15/9	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.033	0.84	1.87	781	182
		`	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	C//·/	1.19	6/1	8.8	8.9
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	756.0	8,6.0	0.98	90	0,6
			OCDF (3c-OCDD)	1.347	1.65	1.55	6.41	14.9
74	22M/10CD2 H. 21.	H-21.	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	1.088	ao:/	00.1	108	18.0
		01/2/10	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
Ш			OCDF (1°C-OCDD)					
က			2,3,7,8-TCDF (*C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (¹⁸ C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)					
			OCDF (3C-OCDD)					

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

LDC #2330TUL

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration SA = Spike added

RPD = ILCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0134139

			O F office	-	95-	U	I CSD	O.	I CS/I CSD	CSD
- Fairoamo C	Spire Added	ed e	Concentration	ampre gation	Percent Recovery	ecovery	Percent Recovery	ecovery	RPD	ס
a supporting to	93	l Csn	108	1 CSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2.3.7,8-TCDD	o az	XX	8-18	为	TOT	T 01				
1,2,3,7,8-PeCDD	(00)		104	•	109	109				
1,2,3,4,7,8-HxCDD			101		(0)	(0)				
1.2.3.4.7.8.9-HpCDF	<u> </u>		108	,	108	108				
	anc	-	Ø Ø	<i></i>	109	109				
						-				

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

lons Monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

Descriptor	Accitate mass(2)	CI aci	Elemental Composition	Analyta	Descriptor	Accurate Mass ^(a)	Ion ID	Elemental Composition	Analyte
Describio	Accurate mass	3 15	Elemental Composition	or frame					
-	900 0046	M		TODE	4	407 7818	M+2	C.H*Cl.37ClO	HDCDF
_	5106,500		0.12.14	100	•	400 77 00 A	NA LA	O 17% 17% 1	HOODE HOODE
	305.898/	7+K	CLO 2010 12 12 12 12 12 12 12 12 12 12 12 12 12	100		2000		130 130	(0) 11 (1)
	315,9419	Σ	O,US*,T.SO'	(s)		417.8250	≥ ,	C12 C12	(5) 100
	317,9389	M+2	13C12H435C1337C1O	TCDF (S)		419.8220	M+2		T 000
	319.8965	Σ	C''H'aci'o	7000 0001		423.7767	M+2	C12H~CIS,47CIO2	Hacon
	321,8936	M+2	C.,H.**CI,**C10,	TCDD		425.7737	M+4	C ₁₂ H ²² Cl ₂ O ₂	Hecop
	331,9368	Σ	130, H. 350, O.	TCDD (S)		435.8169	M+2	¹³C₁²H³⁵Cig³³CIO₂	HpCDD (S)
	00000000	M	13 T 35 T 37 T 37 T 37 T 37 T 37 T 37 T 3	TCDD (8)		437 8140	M+4	13C, H*CI, 37CI, O.	HPCDD (S)
	000.900	7 -		ממים (מ		470 7165	M+4	C 1020 300 0	NCOPE
	3/3.8364	M+K	CO.5.0.5.	יייייייייייייייייייייייייייייייייייייי		2010.001	- 2	(12' ('7' ('2')	700
	[354.9792]	X C C C	0,F ₁₃	AH.		[430.9728]	Y CO	71 LG)	<u>-</u>
6	339 8597	M+2	C.H.ªCl.37ClO	PecDF	S.	441.7428	M+2	C, **CI, **CIO	OCDF
1	341 8567	M+4	C H 30Cl 37Cl O	PecDF		443,7399	M+4	C,3*Cl,3*Cl,O	OCDF
	364 0000	C+14	13 L 3 (12 (12 (12 (12 (12 (12 (12 (12 (12 (12	PACDE (S)		457 7377	M+2	0,30,40,00	OCDD
	000000000000000000000000000000000000000	7 L IV	130 1 20 30 0	(2)		450 4240	V + W	2 3 3 3 3 C I O	מטט
	353.8970	M+4	O_2D	recur (3)		400.7040	+ (- :	(12 (16 (12 (12 (12 (12 (12 (12 (12 (12 (12 (12	0000
	355.8546	M+2	C12H3*C14*C1O2	Pecdo		469.7780	Z+Z	CC2, CC2, CC2	(8)
	357.8516	M+4	C ¹ EH ³ *Cl ³ O ³	Pecdo		471.7750	M+4	12 C C C C C C C C C C C C C C C C C C C	OCDD (S)
	367.8949	M+2	13C12H3*5C14*7C1O2	Pecdo (S)		513.6775	M+4	0,2,2,2,1,2,0,2,0	DCDPE 1
	369.8919	M+4	13C, H, 35Cl, 02, 02	Pecdd (S)		[422.9278]	Lock	C ₁₀ F ₁₇	PFK
	409.7974	M+2	C;,H,3°CI,3°CIO	HPCDPE					
	[354.9792]	Lock	,	PFK					
6	373.8208	M+2	O, H, &OI, **CIO	HXCDF					
)	375 8178		C.H. &C.I.37CI.O	HXCDF					
	383 8639		13C H 3CLO	HXCDF (S)					
	385.8610	0	13C H 35C IO	HXCDF (S)					
	200.000		(12, 12, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13	ביים (ביים					
	503.0130		12 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1 C C C					
	391.012/		12 12 02 02 02 02 02 02 02 02 02 02 02 02 02	(ש) בעניקו					
	401.0039	7 - 2	30 L 30 30 0	HVCDD (8)					
	403.0329	† † †	C H 350 30 0	OCDPE (C)					
	440.7000	1 6	12.12	ם לכי ו					
	[430.9728]	3	71 °C	<u>د</u>					

The following nuclidic masses were used:

©

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}Cl = 34.968853$ $^{37}Cl = 36.965903$

S = internal/recovery standard

<u>N N/A</u>

Y/N N/A

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Were all reported results recalculated and verified for all level IV samples?

Page:	/of/_
Reviewer:	9-
2nd reviewer:	レ
	7

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Со	ncentration	=
A _x	==	Area of the characteristic ion (EICP) for the compound to be measured
A _{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I,	=	Amount of internal standard added in nanograms (ng)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
RF	kF =	Relative Response Factor (average) from the initial calibration
Df	=	Dilution Factor.
0//		Paraent solids, applicable to soil and solid matrices

only.

Were all recalculated results for detected to	arget compounds agree within 10.0% of the reported results?
$\frac{(A_s)(I_s)(DF)}{(A_s)(RRF)(V_o)(\%S)}$ rea of the characteristic ion (EICP) for the ompound to be measured	Example: Sample I.D
rea of the characteristic ion (EICP) for the specific ternal standard mount of internal standard added in nanograms	Conc. = (2203888) (2000) ((866400) (1.033) (10.03) (186)
ng) olume or weight of sample extract in milliliters (ml) r grams (g).	<u>'</u>
elative Response Factor (average) from the initial alibration	= 5,71 P9/g

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
	Cumple 15				
 					
<u> </u>					
 					
-					
					
-					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

May 4, 2010

LDC Report Date:

June 14, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E050610

Sample Identification

EB05042010-RZE

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination.

 This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0127403MB	5/7/10	1,2,3,4,6,7,8-HpCDD OCDD	0.63 pg/L 2.0 pg/L	All samples in SDG G0E050610

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	Compound	Reported Concentration	Modified Final Concentration
EB05042010-RZE	1,2,3,4,6,7,8-HpCDD	1.1 pg/L	1.1U pg/L
	OCDD	3.6 pg/L	3.6U pg/L

Sample EB05042010-RZE was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB05042010-RZE	5/4/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	1.1 pg/L 3.6 pg/L 2.2 pg/L 2.8 pg/L 1.3 pg/L 0.99 pg/L 0.88 pg/L 4.6 pg/L 2.2 pg/L 8.8 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
EB05042010-RZE	2,3,7,8-TCDF	2nd column confirmation was not performed for this compound.	This compound must be confirmed on the 2nd column per the method.	None	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E050610	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E050610	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E050610

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E050610	EB05042010-RZE	2,3,7,8-TCDF	None	Р	Project Quantitation Limit (o)
G0E050610	EB05042010-RZE	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E050610	EB05042010-RZE	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E050610

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0E050610	EB05042010-RZE	1,2,3,4,6,7,8-HpCDD OCDD	1.1U pg/L 3.6U pg/L	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E050610

No Sample Data Qualified in this SDG

Tronox Northgate Henderson EET

LDC #: 23307N21	_ VALIDATION COMPLETENESS WORKSHE
SDG #: G0E050610	Stage 2B
Laboratory: Test America	
METHOD: HRGC/HRMS Dio	xins/Dibenzofurans (EPA SW 846 Method 8290)

	Date:	6/10/10
	Page:_	6f/_
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2nd	Reviewer:	Q
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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
1.	Technical holding times	A	Sampling dates: 5/4//0
11.	HRGC/HRMS Instrument performance check	À	,
III.	Initial calibration	4	
IV.	Routine calibration/IOX	A	
V.	Blanks	W	1
VI.	Matrix spike/Matrix spike duplicates	N	cient detre
VII.	Laboratory control samples	A	105/0
VIII.	Regional quality assurance and quality control	N	
iX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	1/W	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N,	
XV.	Field blanks	â	B=/.

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	EB05042010-RZE W	11	0/27403MB	21	3	31	
2		12	/	22	3	32	
3		13		23	3	33	
4		14		24	3	34	
5		15		25	3	35	
6		16		26	3	36	
7		17		27	;	37	
8		18		28		38	7.00
9		19		29		39	· · · · · · · · · · · · · · · · · · ·
10		20		30		40	

Notes:	

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HoCDF	U. Total HnCDD	
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V Total TCDE	
1					
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W Total Bache	
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HXCDF	S. Total PeCDD	X Total HxCDE	
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HocoF	

Notes:

LDC #:<u>23307/2/</u> SDG #:<u>484 GW</u>CM

VALIDATION FINDINGS WORKSHEET

Blanks

2nd Reviewer:

	1
	-
<u>~</u>	
Dioxins/Dibenzofurans (EPA Method 8290)	THE THE PERSON OF THE PERSON O
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ETHOD: HRGC/HRMS	
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METHOD: HRGC/HRMS Dioxins/Dibenzolurans (ברא ועופעונטע סבטט)

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

Was the blank, contaminated? If yes, please see, qualification below. Were all samples associated with a method blank? Was a method blank analyzed for each matrix?

Associated Samples: 💯 Blank analysis date: 🥿 Blank extraction date: 577

Sample Identification M) Blank ID 403h g Compound Conc. units: 25/4 P

Associated Samples: Blank analysis date:_ Blank extraction date:_ Conc. units:

on				
Sample Identification				
San				
Blank ID				
ਰ				
Сотроипа				

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #:See Cover LDC #: 23307N21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

b/bd Associated sample units:

Sampling date: 5/4/10

Field blank type: (circle one) Field Blank / Rinsate / Otber:

Associated Samples:

None

Compound	Blank ID			Sam	Sample Identification	ion		
	ER05042010-RZE	2X						
L	1.1	0.0055						
g	3.6	0.018						
Τ	2.2	0.011						
¥	2.8	0.014						
	1.3	0.0065						
Σ	0.99	0.00495						
Z	0.88	0.0044						
0	4.6	0.023						
ď	2.2	0.011						
C	æ	0.044						
CRQL								

SDG # 22 COM

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: Of A

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

ANN N N N N N N N

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	They s		(k)							
Associated Samples	/		m	/						
Finding	No 2.3.7.8-700F	en-firmation!	All supe usults							
Sample ID	/		<i>/m/</i>							
Date							0			
*										

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

May 5, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E060621

Sample Identification

SSAM7-05-1BPC

SSA03-02-1BPC

SSA07-03-1BPC

SSAQ5-02-1BPC

SSAO3-03-9BPC

Introduction

This data review covers 5 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0134189MB	5/14/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.14 pg/g 0.41 pg/g 0.12 pg/g 0.11 pg/g 0.15 pg/g 0.14 pg/g 0.35 pg/g	SSAO3-03-9BPC
0130380MB	5/10/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.41 pg/g 1.6 pg/g 0.65 pg/g 1.3 pg/g 0.67 pg/g 0.28 pg/g 2.0 pg/g 0.82 pg/g 4.0 pg/g	SSAM7-05-1BPC SSAO3-02-1BPC SSAO7-03-1BPC SSAQ5-02-1BPC

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	Compound	Reported Concentration	Modified Final Concentration
SSAQ5-02-1BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	0.30 pg/g 1.4 pg/g 0.72 pg/g 1.6 pg/g 1.1 pg/g 0.35 pg/g 3.3 pg/g 1.6 pg/g 10 pg/g	0.30U pg/g 1.4U pg/g 0.72U pg/g 1.6U pg/g 1.1U pg/g 0.35U pg/g 3.3U pg/g 1.6U pg/g 10U pg/g

Samples FB04062010-RZB (from SDG G0D120488), FB-04072010-RZC (from SDG G0D130519), and FB-04132010-RIG2-RZE (from SDG G0D150582) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04132010-RIG2-RZE	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40 pg/L 0.65 pg/L 2.5 pg/L 0.66 pg/L 0.41 pg/L 0.53 pg/L 0.97 pg/L	SSAM7-05-1BPC

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZC	4/8/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.77 pg/L 0.74 pg/L 0.82 pg/L 4.2 pg/L 37 pg/L 0.57 pg/L 0.96 pg/L 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	SSAO3-02-1BPC SSAO7-03-1BPC SSAO3-03-9BPC
FB04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SSAQ5-02-1BPC

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAM7-05-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	33 (40-135) 28 (40-135) 18 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р
SSAO7-03-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	31 (40-135) 29 (40-135) 13 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р
SSAQ5-02-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	27 (40-135) 27 (40-135) 14 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р
SSAO3-03-9BPC	¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	28 (40-135) 12 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	Р

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAO3-02-1BPC	2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAO7-03-1BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E060621	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E060621	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E060621

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E060621	SSAM7-05-1BPC SSAO7-03-1BPC SSAQ5-02-1BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0E060621	SSAO3-03-9BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0E060621	SSAO3-02-1BPC	2,3,7,8-TCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E060621	SSA07-03-1BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E060621	SSAM7-05-1BPC SSAO3-02-1BPC SSAO7-03-1BPC SSAQ5-02-1BPC SSAO3-03-9BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0E060621	SSAM7-05-1BPC SSAO3-02-1BPC SSAO7-03-1BPC SSAQ5-02-1BPC SSAO3-03-9BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E060621

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0E060621	SSAQ5-02-1BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.30U pg/g 1.4U pg/g 0.72U pg/g 1.6U pg/g 1.1U pg/g 0.35U pg/g 3.3U pg/g 1.6U pg/g 10U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E060621

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307O21	VALIDATION COMPLETENESS WORKSHEET	D
SDG #: G0E060621	Stage 2B	Pa
Laboratory: Test America		Revieve 2nd Revieve
	in a /Dib amont record /EDA CW 946 Mothed 9200\	2114 110110

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
l.	Technical holding times	4	Sampling dates: 5/5/10
11.	HRGC/HRMS Instrument performance check	A	/ /
· .	Initial calibration	A	
IV.	Routine calibration/Idv	A	
V.	Blanks	\m\	
VI.	Matrix spike/Matrix spike duplicates	w	NO 50 assid - No anal.
VII.	Laboratory control samples	4	103
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	111	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	√w	
XII.	System performance	N	
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	N	
XV.	Field blanks	W/	FB04062010-RZB (G0D120488) FB-04072010-RZC (G0D130519) FB-04132010-RIG2-RZE (G0D150582)

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	SSAM7-05-1BPC	11	0130380MB	21	31
2	SSAO3-02-1BPC	12	0 <i>130380MB</i> 0134189MB	22	32
3	SSAO7-03-1BPC	13		23	33
4	SSAQ5-02-1BPC	14		24	34
5 ×	SSAO3-03-9BPC	15		25	35
6		16		26	36
7		17		27	37
8		18		28	38
9		19		29	39
10		20		30	40

Notes:		
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VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
A. 2.3,7,8-1CDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HXCDF	P. 1,2,3,4,7,8,9-HoCDF	Cotal Hocon
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF		V Total TODE
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W Total DeCDE
U. 1,2,3,6,7,8•HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HXCDF	S. Total PeCDD	X Total HxCDE
1				
E. 1,2,3,7,8,9-HXCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y Total Hoode

Notes:

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 2nd Reviewer:___ Reviewer:_

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Y N N/A

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. VN N/A

Blank extraction date: 5/14/10

Blank analysis date: 5/21/10 Conc. units: pg/g

Conc. units: pg/g	1		Ass	ociated sar	Associated samples: 5 (>5X)	5 (>5X)		
Compound	Blank ID				Sample	Sample Identification		
	0134189MB							
Ŧ	0.14	0.7						
9	0.41	2.05						
¥	0.12	9.0						
ī	0.11	0.55						
0	0.15	0.75						
Ь	0.14	0.7						
Ø	0.35	1.75						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

واكواع) العلام عند المادية والمادية المادية على المادية المادية المادية المادية المادية المادية المادية المادي Y N N/A

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y N/A

Blank extraction date: 5/10/10 Y N/A

Conc. units: pg/g		•		Associa	ated sam	Associated samples: 1-4 (bl)	1-4 (bl)		
Compound	Blank ID					Sample	Identification		
100 cm	0430380MB	ξX	7		PICA	S V	> * ×		
ц	0.41	2.05	0.30/U						
	1.6	8	1.4/U						
	0.65	3.25	0.72/U						
¥	1.3	6.5	1.6/U						
	0.67	3.35	1.1/U						
W	0.28	1.4	0.35/U						
0	2.0	10	3.3/U						
d	0.82	4.1	1.6/U						
C	4.0	20	10/0						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were quaified as not detected, "U".

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

(Y N/A Were field blanks identified in this SDG?

b/bd Associated sample units: Blank units: pg/L

Sampling date: 4/13/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

1 (>5X)

Sample Identification 0.00205 0.00265 0.00325 0.0125 0.0033 0.00485 0.002 격 FB-04132010-RIG2-RZE Blank ID 0.40 0.65 0.66 0.53 0.41 0.97 2.5 Compound 9 Σ 0

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:_

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

Associated sample units:

b/bd Sampling date: 4/8/10

Field blank type: (circle one Field Blank / Rinsate / Other:

2,-3, 5 (>5X) Sample Identification Associated Samples: 0.00285 0.0048 0.00550.0048 0.0105 0.0075 0.0335 0.00385 0.00335 0.005 0.005 0.0037 0.0041 0.185 0.021 걺 FR-04072010-RZC Blank ID 96.0 0.77 0.74 0.82 96.0 0.67 1.0 0.57 4.2 [2.1 6.7 37 Compound 0 ۵ G Σ Z

LDC #: 23307021 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Associated sample units: Y N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

Sampling date: 4/6/10

b/bd

Sample Identification 4 (>5X) Associated Samples: 0.0034 0.0135 0.0125 0.0047 0.0041 0.00 900.0 0.007 0.022 0.031 Field blank type: (circle one) Field Blank / Rinsate / Other: ă EB04062010-RZB Blank ID 0.68 0.82 0.94 1.8 6.2 2.7 4. 1,2 4.4 Compound Ø O 0 I z

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

LDC #: 230702/ SDG #: 56cc2000

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

XIVINA Are all internal standard recoveries were within the 40-135% criteria?

XIVINA Was the S/N ratio all internal standard peaks > 10?

#	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	40-135%)			Qualifica	Qualifications (/)	
 		/	*	(S)	()	(40-13S	ŷ	70/7	1	0	श्र
			Ħ	26			(_		
			/	18)				
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		4	M	8			(
			+	29	ے)	Ĺ				
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		4	4	75)	î				
			+	10)	7				
				4))				
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		5	+	28)	`)	, 上一子 ,	Q
				4))	^			
)	`				
)	î				
)	ſ				
											Ī
							7				T
)	`				
		Internal Standards	Check Standard Used		nl In	Internal Standards	eg.		Check	Check Standard Used	
Α̈́	¹³ C-2,3,7,8-TCDF	ODF		<u></u>	್ತಿC-೦ℂDD						
B.	13C-2,3,7,8-TCDD	200		Α.	13C-1,2,3,4-TCDD						
ن	¹³ C-1,2,3,7,8-PeCDF	PecdF		ز	¹³ C-1,2,3,7,8,9-HxCDD	200					
Ġ	¹³ C-1,2,3,7,8-PeCDD	PeCDD		≥							
шi	¹³ C-1,2,3,4,7,8-HxCDF	8-HxCDF		z							T
n.	¹³ C-1,2,3,6,7,8-HxCDD	8-HxCDD		o							
Ö	¹³ C-1,2,3,4,6,7,8-HpCDF	7,8-HpCDF		o.				7			
Ï	¹³ C-1,2,3,4,6,7,8-HpCDD	7,8-HpCDD									

LDC #: 233010-1 SDG #: 281 COM

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of Beviewer:

METHOD; HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Y N N/A

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	Metst (e)	_			(9) 7 + FF					
Associated Samples	10	3		,	M					
Ends > caleb range		H, K, O. D. D.		,	ZNDC MSILTES					
Sample ID	٩	\wedge			M					
Date							0			
*										

Comments: See sample calculation verification worksheet for recalculations

** *** | C****

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 13, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E100428

Sample Identification

SSAK3-01-2BPC SSAK3-01-3BPC

Introduction

This data review covers 2 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0130380MB	5/10/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.41 pg/g 1.6 pg/g 0.65 pg/g 1.3 pg/g 0.67 pg/g 0.28 pg/g 2.0 pg/g 0.82 pg/g 4.0 pg/g	All samples in SDG G0E100428

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

Sample EB-04132010-RIG3-RZD (from SDG G0D150582) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04132010-RIG3-RZD	4/13/10	1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.39 pg/L 1.3 pg/L 3.1 pg/L 2.8 pg/L 2.3 pg/L 1.4 pg/L 4.6 pg/L 2.7 pg/L 1.0 pg/L 0.48 pg/L 2.3 pg/L 9.9 pg/L	All samples in SDG G0E100428

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.6 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E100428

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

VI. 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 not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK3-01-2BPC	¹³ C-OCDD	23 (40-135)	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Ð
SSAK3-01-3BPC	¹³ C-OCDD	22 (40-135)	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK3-01-2BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAK3-01-3BPC	1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E100428	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E100428	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E100428

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E100428	SSAK3-01-2BPC SSAK3-01-3BPC	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0E100428	SSAK3-01-2BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E100428	SSAK3-01-3BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E100428	SSAK3-01-2BPC SSAK3-01-3BPC	All compounds reported below the PQL.	J (all detects)	Α	Project Quantitation Limit (sp)
G0E100428	SSAK3-01-2BPC SSAK3-01-3BPC	All compounds reported as EMPC	JK (all detects)	Α	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E100428

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E100428

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E100428

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23307P21	VALIDATION COMPLETENESS WORKSHEET
SDG #: G0E100428	Stage 2B
Laboratory: Test America	
	: a/D:lana af ara a /EDA O/A/ 040 Mada ad 0000)

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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
1.	Technical holding times	★	Sampling dates: 4/3/10
11.	HRGC/HRMS Instrument performance check	$lack \Phi$	/ /
III.	Initial calibration	A	
IV.	Routine calibration/lox	A	
V.	Blanks	W	,
VI.	Matrix spike/Matrix spike duplicates	w	Na assid sample - No Cenal.
VII.	Laboratory control samples	\$	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	w	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	X	
XIV.	Field duplicates	N	2B-0X132010-RIG3-RZD (GODISOS82)
XV.	Field blanks	W	2B-04132010-R1G3-RZD(G0D150582) TB-040P010-RZD(G0D090441)

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	SSAK3-01-2BPC	11	0130380MB	21	31	
2	SSAK3-01-3BPC	12		22	32	
3	V	13		23	33	
4		14		24	34	
5		15		25	35	
6		16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20		30	40	

Notes:				

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

A. 2.3.7 8.TCDD				
222	r. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1234789-HACDE	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
B. 1.2,3,7,8-PeCDD	0.000			U. Total HPCDD
		L. 1,2,3,6,7,8-HxCDF	Q. 00DF	
C. 1,2,3,4,7,8-HxCDD	H 2378-TCDE			*: 1001 : 1001 : V
***************************************		M. 2,3,4,6,7,8-HxCDF	R, Total TCDD	14/ Total D. O. T.
D. 1,2,3,6,7,8-HxCDD	12378 0000			W. IOURI PECUF
	700 B 1-0, 1, 5, 3, 1 1,	N. 1,2,3,7,8,9-HXCDF	S. Total Pecini	
E. 1,2,3,7,8,9-HxCDD	70000			A. Iolal AXCUP
	1000 150' /'t'0' 15 C	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	

Notes:

SDG #: See Cover LDC #: 23307P21

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 Reviewer:__ 2nd Reviewer:_

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Y/N N/A

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. ∀Z Z ≫

Blank analysis date: 5/21/10 Blank extraction date: 5/10/10

Conc. units: pg/g

Associated samples:

Compound	Blank ID			Sample I	Sample Identification			
	0130380MB	5X						
	0.41	2.05					A CONTRACTOR OF THE CONTRACTOR	
	1.6	8						
	0.65	3.25						
	1.3	6.5						
	0.67	3.35						
	0.28	1.4						
	2.0	10						
	0.82	4.1						
	4.0	20						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were quaified as not detected, "U".

SDG #: See Cover LDC #:23307P21

VALIDATION FINDINGS WORKSHEET Field Blanks

Reviewer: 2nd Reviewer: Page:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y N/A Were field blanks identified in this SDG?

b/bd Associated sample units: Blank units: pg/L

d d Sampling date: 4/13/10
Field blank type: (circle one) Field Blank / Rinsate / Other

Field blank type: (circle one) Field Blank / Rinsate / Other:	e) Field Blank / Rinsate	/Other:	r. At	Associated Samples:	nples:	Η			
Compound	Blank ID				Sar	Sample Identification	tion		
	FB-04132010-RIG3-RZD	5X							
D	0.39	0.00195							
Ш	1.3	0.0065							
9	3.1	0.0155							
Ι	2.8	0.014							
	2.3	0.0115							
7	1.4	0.007							
×	4.6	0.023							
	2.7	0.0135							
×	1.0	0.005							
Z	0.48	0.0024							
0	5.9	0.0295							
Ь	2.3	0.0115							
Ø	6.6	0.0495							
CRQL									

SDG #:See Cover LDC #: 23307P21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

(Y/N N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L

b/ba Sampling date: 4/7/10

Field blank type: (circle one) Field Blank) Rinsate / Other:

ပ

All (>5X) Sample Identification Associated Samples: 0.00445 0.0415 0.0075 0.0065 0.0205 0.0075 0.008 0.008 0.011 0.007 0.007 섫 EB-04072010-RZD Blank ID 0.89 1.6 1.3 1.5 8.3 1.6 7.5 2.2 4.1 Compound മ

Σ

VALIDATION FINDINGS WORKSHEET Internal Standards

Reviewer:_ 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

SDG # Sec Confe LDC #10330 FP.

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

Are all internal standard recoveries were within the 40-135% criteria?

Was the S/N ratio all internal standard peaks > 10? A/A

Check Standards Check Standard Used Check Standard Used Check Standard Used Check Standards Check Standard Used Check Standards Check Standard Used Check Standards Check Standard Used Check Standard Check Standard Used Check Standard Used	*	Date	Lab ID/Reference	Internal Standard	6	% Recovery (Limit: 40-135%)	Qualifications ()
Internal Standards Check Standard Used Internal Standards Check Standard Used Internal Standards Inter			/	7	0	(40-1)	1 -/W/ FCF. 8/
Check Standard Used T)		
Internal Standards Check Standard Used			Λ	H	0		7
Internal Standards Check Standard Used Internal Standards Check Standard Used Internal Standards Inter)	
Internal Standards Check Standard Used Internal Standards Check Standard Used Internal Standards Inter	T)	
Internal Standards Check Standard Used I. 17-COCDD 17-C2.37.8-TCDF I. 17-COCDD 17-C1.2.37.8-PeCDP I. 17-C1.2.37.8-PeCDP I. 17-C1.2.37.8-PeCDD II. 17-C1.)	
Internal Standards Check Standard Used Internal Standards Intern	1)	
Internal Standards Internal Standard Internal Standards Internal	T)	
Internal Standards Internal Standard Internal Standards Internal	T)	
Internal Standards Interna	Π))
Internal Standards Check Standard Used I. "C-0.0DD II. "C-0.2.3.7.8.PeCDF I. "C-1.2.3.7.8.PeCDF I. "C-1.2.3.7.8-PeCDF I. "C-)	
Internal Standards Check Standard Used I. 13-C-OCDD 13-C-2.3.7.8-TCDF 13-C-2.3.7.8-PeCDF 14-C-2.3.7.8-PeCDF 15-C.3.3.7.8-PeCDF 15-C.3.3.7.8-))
Internal Standards Check Standard Used Internal Standards Intern	Τ)	
Internal Standards	Τ))
Internal Standards)	
Internal Standards Check Standard Used I. II. III. II. III. II. III. II. III. II.)	(
Internal Standards Check Standard Used I. 1°C-OCDD 1°C-2,3,7,8-TCDD 1°C-1,2,3,7,8-PeCDF 1°C-1,2,3,7,8-PeCDF 1°C-1,2,3,7,8-PeCDF 1°C-1,2,3,7,8-PeCDF 1°C-1,2,3,4,7,8-HxCDF 1°C-1,2,3,4,5,7,8-HyCDF 1°C-1,2,3,4,6,7,8-HpCDF 1°C-1,2,	T)	
Internal Standards Check Standard Used I. 13C-2.3.7.8-TCDF I. 13C-2.3.7.8-PeCDD I. 13C-1.2.3.7.8-PeCDD I. 13C-1.2.3.7.8-PeCDD I. 13C-1.2.3.7.8-PeCDD I. 13C-1.2.3.7.8-PeCDD I. 13C-1.2.3.7.8-PeCDD I.))
Internal Standards)	
Internal Standards Check Standard Used I ¹3C-2,3,7,8-TCDF I ¹3C-00DD ¹¹3C-2,3,7,8-TCDD K. ¹³C-1,2,3,7,8-PeCDD K. ¹³C-1,2,3,7,8-PeCDD ¹³C-1,2,3,7,8-PeCDD M M A'C-1,2,3,7,8-PeCDD ¹³C-1,2,3,4,7,8-HxCDF N. N. A'C-1,2,3,7,8-PeCDD ¹³C-1,2,3,4,6,7,8-HpCDF P. P. P. ¹³C-1,2,3,4,6,7,8-HpCDF P. P. P.))
13C-2.3.7,8-TCDF 1. 13C-2.3.7,8-TCDD K. 13C-1,2.3.7,8-PeCDF L. 13C-1,2.3.4,7,8-HxCDF M 13C-1,2.3,4,7,8-HxCDP N. 13C-1,2.3,4,6,7,8-HpCDF P. 13C-1,2.3,4,6,7,8-HpCDF P.			Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
13C-2,3,7,8-TCDD K. 13C-1,2,3,7,8-PeCDF L. 13C-1,2,3,7,8-PeCDD M 13C-1,2,3,4,7,8-HxCDF N. 13C-1,2,3,4,6,7,8-HpCDF O. 13C-1,2,3,4,6,7,8-HpCDF P.	ď	¹³ C-2,3,7,8-T	CDF			13C-OCDD	
13C-1,2,3,7,8-PeCDF L. 13C-1,2,3,7,8-PeCDD M 13C-1,2,3,4,7,8-HxCDF N. 13C-1,2,3,4,7,8-HxCDD O. 13C-1,2,3,4,6,7,8-HpCDF P. 13C-1,2,3,4,6,7,8-HpCDF P.	6	13C-2.3.7.8-T	CDD		Υ.	¹³ C-1,2,3,4-TCDD	
¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDF	ن	╄	-PeCDF		اد	¹³ C-1,2,3,7,8,9-HxCDD	
¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDP	ا	<u> </u>	-Pecdo		Σ		
¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	ய்	<u> </u>	, 8-HxCDF		z		
¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	u.	<u> </u>	,8-HxCDD		ö		
\sqsubseteq	ڻ	_	3,7,8-HpCDF		ď		
	r	\sqsubseteq	5,7,8-HpCDD				

SDG #: 28.6 COMPY

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

N N N X

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	MAS F(e)			1 (F)					
Associated Samples	/	2.		M					
gods > calls nange	H. I.K.L.O.P.R	0. \$ Q	Y	ZUP- MSULAS					
Sample ID	7	7		lu lu					
Date						0			
*									

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 16, 2010

LDC Report Date:

June 16, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E140423

Sample Identification

SSAI3-01-3BPC SSAI3-01-3BPCMS SSAI3-01-3BPCMSD

Introduction

This data review covers 3 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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 V.

Field duplicates are summarized in Section XIV.

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.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- 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. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0137352MB	5/17/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.24 pg/g 0.40 pg/g 0.067 pg/g 0.055 pg/g 0.18 pg/g 0.26 pg/g	All samples in SDG G0E140423

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

Samples EB-04152010-1-RZD (from SDG G0D170492) and EB-04152010-2-RZD (from SDG G0D200558) were identified as equipment blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04152010-1-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.34 pg/L 0.41 pg/L 0.41 pg/L 7.3 pg/L 60 pg/L 0.19 pg/L 0.39 pg/L 1.3 pg/L 0.33 pg/L 0.63 pg/L 2.2 pg/L 0.62 pg/L 6.8 pg/L	All samples in SDG G0E140423
EB-04152010-2-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD 0CDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	1.6 pg/L 2.9 pg/L 1.4 pg/L 2.6 pg/L 2.3 pg/L 9.8 pg/L 11 pg/L 45 pg/L 48 pg/L 29 pg/L 70 pg/L 56 pg/L 73 pg/L 7.6 pg/L 180 pg/L 58 pg/L 450 pg/L	All samples in SDG G0E140423

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

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E140423

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

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MS/MSD percent recoveries (%R) were not within QC limits for several compounds, the MS, MSD, or LCS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAI3-01-3BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	30 (40-135) 30 (40-135) 22 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E140423	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E140423	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E140423

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E140423	SSAI3-01-3BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0E140423	SSAI3-01-3BPC	All compounds reported below the PQL.	J (all detects)	Α	Project Quantitation Limit (sp)
G0E140423	SSAI3-01-3BPC	All compounds reported as EMPC	JK (all detects)	Α	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E140423

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E140423

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E140423

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

DC #: 23307Q21	VALIDATION COMPLETENESS WORKSHEET
SDG #: G0E140423	Stage 2B
_aboratory: <u>Test America</u>	

Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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: 4/16/10
11.	HRGC/HRMS Instrument performance check	4	/ /
III.	Initial calibration	A	
IV.	Routine calibration/I	A	
V.	Blanks	/w	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	105
VIII.	Regional quality assurance and quality control	N ,	
IX.	Internal standards	w	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	ŹN _	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N,	
XV.	Field blanks	an/	FB-04-07-2010-PZD (40 D090-441), 2B-04 15-2010-1-PZD 2B-04 15-2010-2PZD (40 D20058) (40 D170492)

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:

·				T	1		
1	SSAI3-01-3BPC	S 11	013735=113	21		31	
2	SSAI3-01-3BPCMS	12	/	22		32	
3	SSAI3-01-3BPCMSD	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:			

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

A, 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	7 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -		
			P. 1,2,3,4,7,8,9-HpCDF	U. Total HnCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1.2.3.6.7.8-H×CDF		
			5000	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2.3.4.6.7.8-HxCDF		
			7. 10tal 1000	W. Total PeCDF
U. 1,2,3,6,7,8-HxCDD	1, 1,2,3,7,8-PeCDF	N. 12.3.7.8 9.H×COE		
			S. Total Pecup	X. Total HXCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1.2.3.4.6.7 B.HDCDE		
			- Total axcoo	Y. Total Hoode

Notes:

SDG #: Sec LONG LDC #: -330782)

VALIDATION FINDINGS WORKSHEET

Blanks

2nd Reviewer:____ Reviewer: Page:

> Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 8290)

Were all samples associated with a method blank?

Was the blank contaminated? If yes, please see gualification below. Was a method blank analyzed for each matrix?

Associated Samples: 7/10 Blank analysis date: 5 Blank extraction date: Conc. units:

	ıtion								
	Sample Identification								
	, , , , , , , , , , , , , , , , , , ,								
Associated dalliples.									
SOCOLO									
		5							
	Blank ID	MC25/10	pc 0	0.40	1900	550.0	810	0.26	
	nd	70							
colle, ullies.	Compound		Ŧ	\p	\ -\7	1	0	\bigvee	

Blank analysis date: Blank extraction date:

Conc. units:

Associated Samples:

Blank ID Sample identification Sample identification			 		
Blank ID					
Blank ID					
Blank ID					
Blank ID	tion				
Blank ID	ample Identifica				
	S				
Compound	Blank ID				
Сотрс	pun				
	Compo				

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT: All contaminants within five times the method blank concentration were qualified as not detected, "U".

SDG #:See Cover LDC #: 23307Q21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Reviewer:_ Page:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

(Y/N N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L

Sampling date: 4/16/10

FIEID DIAILY LYPE: (CIICLE DIE) FIEID DIAILY MITSALE / OLI FIL.) FIEIU DIALIN / NILISAIC	/ Ourigi.	V	Associated Samples.	IIDICS.		(VC~) III		
Compound	Blank ID				San	Sample Identification	tion		
	FR-04152010-1-RZD	5X							
А	0.34	0.0017							
D	0.41	0.00205		•					
Ш	0.41	0.00205							
Ц	7.3	0.0365							
9	09	0.3							
ľ	0.19	0.00095							
	0.39	0.00195							
¥	1.3	900'0							
T	0.33	0.00165							
Z	0.63	0.00315							
0	2.2	0.011							
Ь	0.62	0.0031							
Ø	6.8	0.034							
CROL									

SDG #:See Cover LDC #: 23307Q21

VALIDATION FINDINGS WORKSHEET Field Blanks

ָืฮ่ 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

| N N/A Were field blanks identified in this SDG? | Blank units: __pg/L___ Associated sample units

b/bd Associated sample units:_

Sampling date: 4/16/10

Field blank type: (circle one) Field Blank / Rinsate / Other:	e) Field Blank / Rinsate	/Other: 25	Associated Samples:	All (>5X)	
Compound	Blank ID			Sample Identification	
	FR-04152010-2-RZD	5X			
А	1.6	0.008			
8	2.9	0.0145			
O	1.4	0.007			
D	2.6	0.013			
Ш	2.3	0.0115			
L.	9.8	0.049			
9	11	0.055			
I	45	0.225			
	48	0.24			
ſ	29	0.145			
X	70	0.35			
	56	0.28			
Σ	13	0.065			
Z	7.6	0.038			
0	180	6.0			
a.	58	0.29			
Ø	450	2.25			
CROL					

LDC #: 23307Q21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

NAME Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

b/bd Associated sample units:__

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank) Rinsate / Other.

All (>5X) Sample Identification Associated Samples: 0.00445 0.0075 0.0415 0.0075 0.0065 0.0205 0.008 0.008 0.011 0.007 0.007 섫 EB-04072010-RZD Blank ID 0.89 1.5 1.6 1.5 2.2 8.3 1.4 1.6 1.3 4. 4. Compound CROL G 0

LDC #:333078-> SDG #: 261 CON

Matrix Spike/Matrix Spike Duplicates VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

| N/A | N/A | Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an N N/A

associated MS/MSD. Soil / Water.

Was a MS/MSD analyzed every 20 samples of each matrix? Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

Qualifications	166,08							,	CNS MSO	0													
Associated Samples																							
RPD (Limits)	()	()	(()	()	()	()	(tordets 1	() /))	()	()	()	()	()	())		()		(
MSD %R (Limits)	(F+ 88) 09	0 (79-137	(/)	()	33 (72-140)	12 8 8/-13	65166,061	2757754411	Su souc of	()) ,	()	()	()	()		()	()	()	()	()	()	()	(
MS %R (Limits)	184-08 69	6 (79-137)	37 (8/134)	69 (76-132)	(72-14D)	16 (81-137)	(/))	le has W		()	()	()	()	(()	()	()	()	()	()	()	()
Compound	200					0	\$		(Sound		,												
¥	2/3																						
Date																							
*																							

SDG #: 48, COVE LDC #: 33 0/8/2/

VALIDATION FINDINGS WORKSHEET Internal Standards

Reviewer:_ 2nd Reviewer;

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". $\frac{\sqrt{N/N/A}}{\sqrt{N/N/A}}$ Are all internal standard recoveries were within the 40-135% criteria? $\frac{\sqrt{N/N/A}}{\sqrt{N/N/A}}$ Was the S/N ratio all internal standard peaks $\frac{10?}{10?}$

LDC #: <u>833078</u>2/ SDG #: <u>184 GDA</u>9

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page:

Reviewer: 2nd Reviewer:

METHOD; HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	UK (K)								
Associated Samples	JM(
Finding	2HBC 118W/B								
Sample ID	M								
Date						,			
*				<u> </u>		<u> </u>			

Comments: See sample calculation verification worksheet for recalculations