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

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

July 8, 2010

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 23, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 23435:

SDG #	Fraction
G0D160486, G0E180597 G0E200416, G0E210563 G0E240433	Dioxins/Dibenzofurans

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,

Erlinda T. Rauto
Operations Manager/Senior Chemist

DL 06/23/10

Attachment 1

EDD Stage 2B/4

LDC #23435 (Tronox LLC-Northgate, Henderson NV / Tronox PCS)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Dioxins (8290)																															
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	G0D160486	06/23/10	07/15/10	0	2																														
A	G0D160486	06/23/10	07/15/10	0	2																														
B	G0E180597	06/23/10	07/15/10	0	3																														
C	G0E200416	06/23/10	07/15/10	0	3																														
C	G0E200416	06/23/10	07/15/10	0	2																														
D	G0E210563	06/23/10	07/15/10	0	7																														
D	G0E210563	06/23/10	07/15/10	0	2																														
E	G0E240433	06/23/10	07/15/10	0	1																														
Total	T/LR			0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). These sample counts do not include MS/MSD, and DUPs

LDC #: 23435
SDG #: G0D160486, G0E180597, G0E200416, G0E210563, G0E240433

Reviewer: JE
2nd Reviewer: BC

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?	X			
III. EDD Lab Anomalies				
Were EDD anomalies identified?		X		
If yes, were they corrected or documented for the client?			X	See EDD_discrepancy_ form_LDC23435_070710.doc
IV. EDD Delivery				
Was the final EDD sent to the client?	X			

Tronox LLC Facility, PCS, Henderson, Nevada
Data Validation Reports
LDC #23435

Dioxins/Dibenzofurans

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 14, 2010

LDC Report Date: July 4, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D160486

Sample Identification

SSAN6-01-3BPC**
SSAL2-01-4BPC
SSAL2-01-5BPC
RSAL2-8BPC**
SSAN6-01-3BPCMS
SSAN6-01-3BPCMSD
RSAL2-8BPCMS
RSAL2-8BPCMSD

**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
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	RSAL2-8BPC**
0112236MB	4/22/10	OCDD 1,2,3,4,6,7,8-HpCDF OCDF	0.85 pg/g 0.64 pg/g 1.3 pg/g	SSAN6-01-3BPC**
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	SSAL2-01-4BPC SSAL2-01-5BPC

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

Samples EB-04142010-RIG2-RZC (from SDG G0D130519) and EB-04142010-RIG1-RZC (from SDG G0D160472) 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-04142010-RIG2-RZC	4/14/10	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 OCDF	0.29 pg/L 0.39 pg/L 0.77 pg/L 2.5 pg/L 3.3 pg/L 1.6 pg/L 0.73 pg/L 4.2 pg/L 2.2 pg/L 0.71 pg/L 0.43 pg/L 6.6 pg/L 1.9 pg/L 13 pg/L	SSAN6-01-3BPC**

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04142010-RIG1-RZC	4/14/10	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 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	1.2 pg/L 9.2 pg/L 0.50 pg/L 0.32 pg/L 0.69 pg/L 0.39 pg/L 0.28 pg/L 0.20 pg/L 0.79 pg/L 0.30 pg/L 1.8 pg/L	SSAN6-01-3BPC**

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

Samples FB-04072010-RZC (from SDG G0D130519) and FB-04072010-RZD (from SDG G0D090441) 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 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	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 0.67 pg/L 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 2.1 pg/L 1.5 pg/L 6.7 pg/L	SSAN6-01-3BPC**
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 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 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	SSAL2-01-4BPC SSAL2-01-5BPC RSAL2-8BPC**

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 MS 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
SSAL2-01-4BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	38 (40-135) 36 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	P
SSAL2-01-5BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	24 (40-135) 29 (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)	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
SSAN6-01-3BPC**	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) J (all detects) J (all detects) J (all detects) J (all detects)	P
SSAL2-01-4BPC	1,2,3,4,6,7,8-HpCDD 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 OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P
SSAL2-01-5BPC	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P
RSAL2-8BPC**	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D160486	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 G0D160486	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

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 G0D160486

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D160486	SSAL2-01-4BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D160486	SSAL2-01-5BPC	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)
G0D160486	SSAN6-01-3BPC**	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) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0D160486	SSAL2-01-4BPC	1,2,3,4,6,7,8-HpCDD 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 OCDF	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0D160486	SSAL2-01-5BPC	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0D160486	RSAL2-8BPC**	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	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0D160486	SSAN6-01-3BPC** SSAL2-01-4BPC SSAL2-01-5BPC RSAL2-8BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D160486	SSAN6-01-3BPC** SSAL2-01-4BPC SSAL2-01-5BPC RSAL2-8BPC**	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 G0D160486

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D160486

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D160486

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23435A21
SDG #: G0D160486
Laboratory: Test America

Date: 6/30/10
Page: 1 of 1
Reviewer: a
2nd Reviewer: v

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: 4/14/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	A	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	(G0D160417 2) 2B-04142010-R1G1-R2C, 2B-04142010-R1G2-R2C
XV.	Field blanks	SW	FB-04072010-R2C (G0D80599), FB-04072010-R2D (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: ** Indicates sample underwent Stage 4 validation

All soils

1 1	SSAN6-01-3BPC** C	11	0112236MB	21		31	
2 2	SSAL2-01-4BPC D	12	0113286MB	22		32	
3 1	SSAL2-01-5BPC	13	0116296MB	23		33	
4 3	RSAL2-8BPC**	14		24		34	
5	SSAN6-01-3BPCMS	15		25		35	
6	SSAN6-01-3BPCMSD	16		26		36	
7	RSAL2-8BPCMS	17		27		37	
8	RSAL2-8BPCMSD	18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 23235B21
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 9
2nd Reviewer: W

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) ≤ 20% for unlabeled standards and ≤ 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?	✓			

LDC #: 23425A21
SDG #: Bercewer

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: W

VIII. Regional Quality Assurance and Quality Control					
Were performance evaluation (PE) samples performed?		✓			
Were the performance evaluation (PE) samples within the acceptance limits?			✓		
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					
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 ≥ 2.5, at ± 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					
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.	✓				

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. 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	I. 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:

LDC #: 23435A1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

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

Blank extraction date: 4/26/10 **Blank analysis date:** 5/14/10
Conc. units: pg/g Associated Samples: 4 (>5x)

Compound	Blank ID	Sample Identification								
0 1 2 3 4 6 7 8 HpCDD	96MB									
C	0.20									
E	0.17									
F	1.2									
H	0.33									
J	0.45									
O	1.5									
Q	1.6									

Blank extraction date:_____ **Blank analysis 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".

LDC #: 23435A21
SDG #: Second Over

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: Q
2nd Reviewer: [illegible]

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

Blank extraction date: 4/22/10 **Blank analysis date:** 4/27/10
Conc. units: pg/g Associated Samples: 1 (>5x)

Compound	Blank ID	Sample Identification								
01236MB	01236MB									
F	0.85									
O	0.64									
R	1.3									

Blank extraction date: 4/23/10 **Blank analysis date:** 4/30/10
Conc. units: pg/g Associated Samples: 2-3 (>5x)

Compound	Blank ID	Sample Identification								
01236MB	01236MB									
G	0.75									
H	0.22									
I	0.25									
K	0.35									
O	0.50									
P	0.16									
R	0.75									

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".

LDC #:23435A21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: [illegible]

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:** pg/g
Sampling date: 4/8/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification									
	FB-04072010-RZC	5X									
C	0.77	0.00385									
D	0.74	0.0037									
E	0.82	0.0041									
F	4.2	0.021									
G	37	0.185									
H	0.57	0.00285									
I	0.96	0.0048									
J	0.67	0.00335									
K	1.1	0.0055									
L	0.96	0.0048									
M	1.0	0.005									
N	1.0	0.005									
O	2.1	0.0105									
P	1.5	0.0075									
Q	6.7	0.0335									
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 #: 23435A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: W

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:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 2-4 (>5X)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZD	5X								
C	0.89	0.00445								
E	1.5	0.0075								
F	2.2	0.011								
G	8.3	0.0415								
K	1.4	0.007								
L	1.6	0.008								
M	1.5	0.0075								
N	1.6	0.008								
O	1.3	0.0065								
P	1.4	0.007								
Q	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 #: 23435A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: W

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:** pg/g
Sampling date: 4/14/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification								
	EB-04142010-RIG2-RZC	5X								
D	0.29	0.00145								
E	0.39	0.00195								
F	0.77	0.00385								
G	2.5	0.0125								
H	3.3	0.0165								
I	1.6	0.008								
J	0.73	0.00365								
K	4.2	0.021								
L	2.2	0.011								
M	0.71	0.00355								
N	0.43	0.00215								
O	6.6	0.033								
P	1.9	0.0095								
Q	13	0.065								
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 #: 23435A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: 12

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:** pg/g
Sampling date: 4/14/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification								
	EB-04142010-RIG1-RZC	5X								
F	1.2	0.006								
G	9.2	0.046								
H	0.50	0.0025								
I	0.32	0.0016								
K	0.69	0.00345								
L	0.39	0.00195								
M	0.28	0.0014								
N	0.20	0.001								
O	0.79	0.00395								
P	0.30	0.0015								
Q	1.8	0.009								
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 #: 23435A1
SDG #: Sequoia

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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 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 N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		5/6	%R and RPD out	( )	( )	( )	1	No qual (MS or LCS in)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
		7/8	%R and RPD out	( )	( )	( )	4	No qual (MS, or LCS in)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: ~~23425A1~~
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 9
2nd Reviewer: [illegible]

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 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?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (i)
		2	~~E~~	38 (40-135)	J/UJ/P (E. 0-Q)
			I	36 ( )	
				( )	
		3	~~G~~	24 ( )	(F-G. 0-Q)
			H	29 ( )	
			J	14 ( )	
				( )	
		5(MS)	J	35 ( )	No qual
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		I.	^{13}C-OCDD	
B.	^{13}C-2,3,7,8-TCDD		K.	^{13}C-1,2,3,4-TCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		M		
E.	^{13}C-1,2,3,4,7,8-HxCDF		N.		
F.	^{13}C-1,2,3,6,7,8-HxCDD		O.		
G.	^{13}C-1,2,3,4,6,7,8-HpCDF		P.		
H.	^{13}C-1,2,3,4,6,7,8-HpCDD				

LDC #: 34254#1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
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?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	cpds > calib range Finding	Associated Samples	Qualifications
		1	H, K, O, P, Q	1	J dets/P (e)
		2	F, I, J, K, L, M, N, O, P, Q	2	
		3	I, K, L, O, P, Q	3	
		4	H, I, J, K, L, O, P, Q	4	
		all	2MPC	all	J K (K)

Comments: See sample calculation verification worksheet for recalculations

LDC #: 23425A
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 12

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 = $(A_x)(C_{is})/(A_{is})(C_x)$
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_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (C13 std)	Recalculated RRF (C13 std)	Reported %RSD	Recalculated %RSD
1	ICAL (105)	1/10/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.860	0.860	0.87	0.87	10.4	10.6
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.934	0.934	0.95	0.95	12.9	12.8
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.058	1.058	1.09	1.09	11.2	11.0
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	0.998	0.998	1.05	1.05	12.2	12.2
			OCDF (^{13}C-OCDD)	1.437	1.437	1.52	1.52	14.1	14.0
2	ICAL	4/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.088	1.10	1.10	1.29	1.20
			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 (^{13}C-OCDD)						
3	ICAL (405)	4/12/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	0.945	0.98	0.98	4.44	4.33
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	1.021	1.04	1.04	3.03	2.97
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.114	1.19	1.19	5.33	5.35
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.072	1.11	1.11	3.60	3.75
			OCDF (^{13}C-OCDD)	1.445	1.445	1.51	1.51	5.85	5.89

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 #: 23435A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: Q
2nd Reviewer: W

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:

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

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3std)	Recalculated RRF (CS3std)	Reported %RSD	Recalculated %RSD
1	ICAL	5/11/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.017	1.017	1.06	1.06	5.39	5.70
	405		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.991	0.991	1.0	1.01	5.11	4.90
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.155	1.155	1.21	1.21	7.50	7.75
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.044	1.044	1.12	1.12	8.91	8.81
			OCDF (^{13}C-OCDD)	1.544	1.544	1.66	1.66	8.84	8.72
2			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 (^{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 (^{13}C-OCDD)						
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 (^{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 (^{13}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 #: 23425A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: Q
2nd Reviewer: W

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
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	26APIOA1DS	4/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.860	0.92	0.92	7.0	7.0
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.934	0.93	0.93	0.1	0.1
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.058	1.15	1.15	8.9	9.0
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	0.998	1.06	1.06	6.2	6.2
			OCDF (^{13}C-OCDD)	1.437	1.54	1.54	7.2	7.2
2	03MX10A4DS	5/3/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	0.98	0.98	3.2	3.2
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	0.98	0.98	3.7	3.7
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.20	1.20	7.8	7.8
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.06	1.06	1.2	1.2
			OCDF (^{13}C-OCDD)	1.445	1.46	1.46	1.3	1.3
3	04MX10A5D2	5/4/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.10	1.10	1.4	1.4
			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 (^{13}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 #: 33725A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: 9
2nd Reviewer: 1w

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
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	23MV10405	5/14/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.017	1.09	1.09	7.2	7.2
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.991	1.03	1.03	3.5	3.5
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.155	1.22	1.22	5.6	5.6
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.044	1.13	1.13	7.9	7.9
			OCDF (^{13}C-OCDD)	1.544	1.63	1.63	5.5	5.5
2	4MV10412	5/14/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.20	1.07	8.3	8.3
			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 (^{13}C-OCDD)					
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 (^{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 (^{13}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 #: 23435A-1
SDG #: Reviewer

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: 9
2nd Reviewer: W

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

RPD = I MSR - MSDR I * 2/(MSR + MSDR) MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples: 5/6

Compound	Spike Added (~~PS~~/g)		Sample Concentration (~~PS~~/g)	Spiked Sample Concentration (~~PS~~/)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		Reported RPD	Recalculated RPD
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	-----	----
2,3,7,8-TCDD	21.0	20.4	13	37.7	35.4	118	118	110	110	6.3	6.3
1,2,3,7,8-PeCDD	105	102	46	~~108~~ 160	155	108	109	106	107	3.3	3.2
1,2,3,4,7,8-HxCDD	↓	↓	33	157	137	118	118	102	102	14	14
1,2,3,4,7,8,9-HpCDF	↓	↓	1700	2090	1950	397	371	372	345	6.9	6.9
OCDF	210	204	9700	10600	11200	424	429	716	785	5.2	5.5

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 #: 23425A2
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
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 = I LCS - LCSD I * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 011236

Compound	Spike Added (pg/g)		Spiked Sample Concentration (pg/g)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	21.1	NA	106	106				
1,2,3,7,8-PeCDD	100	↓	110	↓	110	110				
1,2,3,4,7,8-HxCDD	↓	↓	85.2	↓	85	85				
1,2,3,4,7,8,9-HpCDF	↓	↓	91.1	↓	91	91				
OCDF	200	↓	212	↓	106	106				

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]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_8{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 23435A2
SDG #: Soil 001

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

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

I_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. 1 , A :

Conc. = $\frac{(10128\text{-}0)(2000)(\quad)}{(164062\text{-}00)(1.021)(10.49)(0.943)}$

= 12.93 pg/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: May 7, 2010

LDC Report Date: July 4, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0E180597

Sample Identification

SSAN5-02-4BPC
SSAM6-02-4BPC
SSAM6-02-5BPC

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 with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
6/7/10	^{13}C-OCDD	35.1	SSAM6-02-4BPC SSAM6-02-5BPC	OCDD OCDF	J+ (all detects) J+ (all detects)	P

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
0144238MB	5/24/10	OCDD	1.5 pg/g	All samples in SDG G0E180597

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

Sample FB-04072010-RZC (from SDG G0D130519) 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-RZC	4/8/10	1,2,3,4,7,8-HxCDD	0.77 pg/L	All samples in SDG G0E180597
		1,2,3,6,7,8-HxCDD	0.74 pg/L	
		1,2,3,7,8,9-HxCDD	0.82 pg/L	
		1,2,3,4,6,7,8-HpCDD	4.2 pg/L	
		OCDD	37 pg/L	
		2,3,7,8-TCDF	0.57 pg/L	
		1,2,3,7,8-PeCDF	0.96 pg/L	
		2,3,4,7,8-PeCDF	0.67 pg/L	
		1,2,3,4,7,8-HxCDF	1.1 pg/L	
		1,2,3,6,7,8-HxCDF	0.96 pg/L	
		2,3,4,6,7,8-HxCDF	1.0 pg/L	
		1,2,3,7,8,9-HxCDF	1.0 pg/L	
		1,2,3,4,6,7,8-HpCDF	2.1 pg/L	
		1,2,3,4,7,8,9-HpCDF	1.5 pg/L	
		OCDF	6.7 pg/L	

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
SSAN5-02-4BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	21 (40-135) 22 (40-135) 12 (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
SSAM6-02-4BPC	^{13}C-OCDD	37 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAM6-02-5BPC	^{13}C-OCDD	35 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
0144238MB	^{13}C-1,2,3,4,7,8-HxCDF ^{13}C-1,2,3,6,7,8-HxCDD	24 (40-135) 35 (40-135)	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	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
SSAN5-02-4BPC	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) J (all detects) J (all detects) J (all detects) J (all detects)	P
SSAM6-02-4BPC	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)	P

Sample	Compound	Finding	Criteria	Flag	A or P
SSAM6-02-5BPC	2,3,7,8-TCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E180597	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 G0E180597	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 G0E180597

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E180597	SSAM6-02-4BPC SSAM6-02-5BPC	OCDD OCDF	J+ (all detects) J+ (all detects)	P	Routine calibration (%D) (c)
G0E180597	SSAN5-02-4BPC	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)
G0E180597	SSAM6-02-4BPC SSAM6-02-5BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0E180597	SSAN5-02-4BPC	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) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E180597	SSAM6-02-4BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E180597	SSAM6-02-5BPC	2,3,7,8-TCDF OCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E180597	SSAN5-02-4BPC SSAM6-02-4BPC SSAM6-02-5BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E180597	SSAN5-02-4BPC SSAM6-02-4BPC SSAM6-02-5BPC	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 G0E180597

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E180597

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 23435B21
SDG #: G0E180597
Laboratory: Test America

Date: 6/3/10
Page: 1 of 1
Reviewer: Q
2nd Reviewer: W

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: 5/7/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	SW	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	No ass'd spl - No Cmpd.
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	FB-040T2010-RZCC(G0D130519)

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	SSAN5-02-4BPC S	11	0144-38MB3	21		31	
2	SSAM6-02-4BPC	12		22		32	
3	SSAM6-02-5BPC	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. 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. 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	I. 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:

LDC #: 23425B21
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: a
2nd Reviewer: [illegible]

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 Was a routine calibration was performed at the beginning and end of each 12 hour period?

Y N N/A Were all percent differences (%D) of RRFs ≤ 20% for unlabeled compounds and ≤ 30% for labeled?

Y N N/A Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications (C)
	6/7/10	OTN 1035 DS-16	^{13}C-OCDD	35.1		2-3	J+ (all dets) FIG. Q

	PCDDs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

	PCDFs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

LDC #: 23485B21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

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

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

Blank extraction date: 5/24/10 **Blank analysis date:** 6/4/10
Conc. units: pg/g Associated Samples: all (>5x)

Compound	Blank ID	Sample Identification								
	0144238MB									
G	1.5									

Blank extraction date: _____ **Blank analysis 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".

LDC #:23435B21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: W

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:** pg/g
Sampling date: 4/8/10
Field blank type: (circle one) Field Blank / Rinsate / Other: FB Associated Samples: All (>5X)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZC	5X								
C	0.77	0.00385								
D	0.74	0.0037								
E	0.82	0.0041								
F	4.2	0.021								
G	37	0.185								
H	0.57	0.00285								
I	0.96	0.0048								
J	0.67	0.00335								
K	1.1	0.0055								
L	0.96	0.0048								
M	1.0	0.005								
N	1.0	0.005								
O	2.1	0.0105								
P	1.5	0.0075								
Q	6.7	0.0335								
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 #: 23435B21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: Q
2nd Reviewer: W

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 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?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (I)
		1	G	91 (40-135)	V/MV/P(F-G, O-Q)
			H	22 ( )	
			I	12 ( )	
				( )	
		2	J	37 ( )	(G, Q)
				( )	
		3	J	35 ( )	
				( )	
				( )	
		0144238MB	E	24 ( )	(E-E, K-N)
			F	35 ( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		I.	^{13}C-OCDD	
B.	^{13}C-2,3,7,8-TCDD		K.	^{13}C-1,2,3,4-TCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		M		
E.	^{13}C-1,2,3,4,7,8-HxCDF		N.		
F.	^{13}C-1,2,3,6,7,8-HxCDD		O.		
G.	^{13}C-1,2,3,4,6,7,8-HpCDF		P.		
H.	^{13}C-1,2,3,4,6,7,8-HpCDD				

LDC #: 23435B21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Reviewer: 9
2nd Reviewer: 1A

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?
Y N (N/A) Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding (cpds > calib range)	Associated Samples	Qualifications
		1	H, K, O, P, Q	1	J dets / P (e)
		2	H, O, Q	2	↓
		3	H, Q	3	↓
		All	All EMPC	All	J K (E)

Comments: See sample calculation verification worksheet for recalculations

COMQUA??.?1

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: May 18, 2010

LDC Report Date: July 4, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0E200416

Sample Identification

SSAM6-04-1BPC**
SSAL6-01-1BPC
RSAJ6-10BPC**
SSAJ6-01-11BPC
SSAK7-01-11BPC
SSAM6-04-1BPCMS
SSAM6-04-1BPCMSD
SSAJ6-01-11BPCMS
SSAJ6-01-11BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 9 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA 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
0144238MB	5/24/10	OCDD	1.5 pg/g	SSAM6-04-1BPC** SSAL6-01-1BPC SSAK7-01-11BPC
0140389MB	5/20/10	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 OCDF	0.092 pg/g 0.37 pg/g 0.098 pg/g 0.065 pg/g 0.045 pg/g 0.042 pg/g 0.037 pg/g 0.092 pg/g 0.14 pg/g	RSAJ6-10BPC**
0155333MB	5/20/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-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 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF	0.026 pg/g 0.033 pg/g 0.056 pg/g 0.22 pg/g 0.16 pg/g 0.044 pg/g 0.044 pg/g 0.041 pg/g 0.087 pg/g	SSAJ6-01-11BPC

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
SSAL6-01-1BPC	OCDD	6.8 pg/g	6.8U pg/g

Sample EB-05182010-RZC (from SDG G0E200430) 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
EB-05182010-RZC	5/18/10	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 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	1.8 pg/L 3.0 pg/L 2.7 pg/L 22 pg/L 120 pg/L 9.0 pg/L 9.8 pg/L 6.5 pg/L 28 pg/L 19 pg/L 6.5 pg/L 3.9 pg/L 61 pg/L 25 pg/L 150 pg/L	SSAM6-04-1BPC**

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

Samples FB-04072010-RZC (from SDG G0D130519) and FB-04072010-RZD (from SDG G0D090441) 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 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	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 0.67 pg/L 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 2.1 pg/L 1.5 pg/L 6.7 pg/L	SSAM6-04-1BPC**
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 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 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	SSAL6-01-1BPC RSAJ6-10BPC** SSAJ6-01-11BPC SSAK7-01-11BPC

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
SSAM6-04-1BPC**	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	32 (40-135) 30 (40-135) 16 (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
SSAL6-01-1BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	21 (40-135) 19 (40-135) 9.9 (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
RSAJ6-10BPC**	^{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	34 (40-135) 35 (40-135) 22 (40-135) 22 (40-135) 15 (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

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK7-01-11BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	34 (40-135) 37 (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)	P
0144238MB	^{13}C-1,2,3,4,7,8-HxCDF ^{13}C-1,2,3,6,7,8-HxCDD	24 (40-135) 35 (40-135)	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	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
SSAM6-04-1BPC** SSAK7-01-11BPC	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) J (all detects) J (all detects)	P
SSAJ6-01-11BPC	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E200416	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 G0E200416	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

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 G0E200416

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E200416	SSAM6-04-1BPC** SSAL6-01-1BPC SSAK7-01-11BPC	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)
G0E200416	RSAJ6-10BPC**	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	Internal standards (%R) (i)
G0E200416	SSAM6-04-1BPC** SSAK7-01-11BPC	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)	P	Project Quantitation Limit (e)
G0E200416	SSAJ6-01-11BPC	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E200416	SSAM6-04-1BPC** SSAL6-01-1BPC RSAJ6-10BPC** SSAJ6-01-11BPC SSAK7-01-11BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E200416	SSAM6-04-1BPC** SSAL6-01-1BPC RSAJ6-10BPC** SSAJ6-01-11BPC SSAK7-01-11BPC	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 G0E200416

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0E200416	SSAL6-01-1BPC	OCDD	6.8U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0E200416

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E200416

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23435C21
SDG #: G0E200416
Laboratory: Test America

Date: 7/1/10
Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

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: 5/18/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	A	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	FB-040(2010-R2C (G0E200430) FB-040(2010-R2D(G0D090441). FB-040(2010-R2C (G0D130579)

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

Validated Samples: ** Indicates sample underwent Stage 4 validation

MI SO.15

1	1 SSAM6-04-1BPC**	C	11	0K4238MB	21		31	
2	1 SSAL6-01-1BPC	D	12	0K40389MB	22		32	
3	2 RSAJ6-10BPC**	D	13	0155333MB	23		33	
4	3 SSAJ6-01-11BPC	D	14		24		34	
5	1 SSAK7-01-11BPC	D	15		25		35	
6	SSAM6-04-1BPCMS		16		26		36	
7	SSAM6-04-1BPCMSD		17		27		37	
8	SSAJ6-01-11BPCMS		18		28		38	
9	SSAJ6-01-11BPCMSD		19		29		39	
10			20		30		40	

Notes: _____

LDC #: 23135C2
SDG #: See cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 9
2nd Reviewer: W

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) ≤ 20% for unlabeled standards and ≤ 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?	✓			

LDC #: 23425C2/
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer: W

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
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				
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 ≥ 2.5, at ± 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				
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.	✓			

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. 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	I. 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:

LDC #: 23435cd
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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

Blank extraction date: 5/24/10 **Blank analysis date:** 6/4/10
Conc. units: pg/g Associated Samples: 1-2, 5 (bl)

Compound	Blank ID	Sample Identification								
01234678HpCDD	MB 2									
G	1.5	6.8/U								

Blank extraction date: _____ **Blank analysis 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".

LDC #: 23435C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer: lm

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

Blank extraction date: 5/20/10 **Blank analysis date:** 5/25/10
Conc. units: pg/g **Associated samples:** 3 (> 5X)

Compound	Blank ID	Sample Identification									
	0140389MB	5X									
F	0.092	0.46									
G	0.37	1.85									
H	0.098	0.49									
K	0.065	0.325									
L	0.045	0.225									
M	0.042	0.21									
N	0.037	0.185									
O	0.092	0.46									
Q	0.14	0.7									

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 #: 23435C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer: W

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

Blank extraction date: 5/20/10 **Blank analysis date:** 5/25/10
Conc. units: pg/g **Associated samples:** 4 (> 5X)

Compound	Blank ID	Sample Identification									
	0155333MB	5X									
C	0.026	0.13									
D	0.033	0.165									
F	0.056	0.28									
G	0.22	1.1									
H	0.16	0.8									
K	0.044	0.22									
L	0.044	0.22									
M	0.041	0.205									
O	0.087	0.435									

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 #:23435C21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: T
2nd Reviewer: W

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:** pg/g
Sampling date: 5/18/10
Field blank type: (circle one) Field Blank / Rinsate / Other: FB Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification								
	EB-05182010-RZC	5X								
C	1.8	0.009								
D	3.0	0.015								
E	2.7	0.0135								
F	22	0.11								
G	120	0.6								
H	9.0	0.045								
I	9.8	0.049								
J	6.5	0.0325								
K	28	0.14								
L	19	0.095								
M	6.5	0.0325								
N	3.9	0.0195								
O	61	0.305								
P	25	0.125								
Q	150	0.75								
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 #:23435C21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: h

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:** pg/g
Sampling date: 4/8/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZC	5X								
C	0.77	0.00385								
D	0.74	0.0037								
E	0.82	0.0041								
F	4.2	0.021								
G	37	0.185								
H	0.57	0.00285								
I	0.96	0.0048								
J	0.67	0.00335								
K	1.1	0.0055								
L	0.96	0.0048								
M	1.0	0.005								
N	1.0	0.005								
O	2.1	0.0105								
P	1.5	0.0075								
Q	6.7	0.0335								
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 #: 23435C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 4
2nd Reviewer: [illegible]

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:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 2 - 5 (>5X)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZD	5X								
C	0.89	0.00445								
E	1.5	0.0075								
F	2.2	0.011								
G	8.3	0.0415								
K	1.4	0.007								
L	1.6	0.008								
M	1.5	0.0075								
N	1.6	0.008								
O	1.3	0.0065								
P	1.4	0.007								
Q	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 #: 23435C21
SDG #: Screen

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: 9
2nd Reviewer: V

METHOD: HRGC/HRMS Polychlorinated Biphenyls (EPA Method 1668)

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

(Y) N 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) N N/A — Was a MS/MSD analyzed every 20 samples of each matrix?

Y (N) N/A — Were the MS/MSD concentrations and the relative percent differences (RPD) within the QC limits stated below?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		6/7	70R	out ( )	( )	( )	1	No qual
				( )	( )	( )		(MSD or LCS in)
				( )	( )	( )		
		8/9	70R	out ( )	( )	( )	4	No qual
				( )	( )	( )		(LCS in)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 23435c2
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

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

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 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?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (1)
		1	G	32 (40-135)	J/M/P (F-G, O-Q)
			H	30 ( )	
			I	16 ( )	
				( )	
		2	G	21 ( )	
			H	19 ( )	
			I	9.9 ( )	
				( )	
		3	E	34 ( )	(C-E, K-Q)
			F	35 ( )	
			G	22 ( )	
			H	22 ( )	
			I	15 ( )	
				( )	
		5	G	34 ( )	
			H	37 ( )	
			I	18 ( )	
				( )	
		OHH338MB	E	24 ( )	(C-E, F-N)
			F	35 ( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		I.	^{13}C-OCDD	
B.	^{13}C-2,3,7,8-TCDD		K.	^{13}C-1,2,3,4-TCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		M		
E.	^{13}C-1,2,3,4,7,8-HxCDF		N.		
F.	^{13}C-1,2,3,6,7,8-HxCDD		O.		
G.	^{13}C-1,2,3,4,6,7,8-HpCDF		P.		
H.	^{13}C-1,2,3,4,6,7,8-HpCDD				

LDC #: 23435-1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 4
2nd Reviewer: M

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 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?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications
		6 (MS)	F	24 (40-135)	No anal
			H	25 ( )	
			I	10 ( )	
		T (MSD)	F	26 ( )	
			H	26 ( )	
			I	9.9 ( )	
				( )	
		8		( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		I.	^{13}C-OCDD	
B.	^{13}C-2,3,7,8-TCDD		K.	^{13}C-1,2,3,4-TCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		M		
E.	^{13}C-1,2,3,4,7,8-HxCDF		N.		
F.	^{13}C-1,2,3,6,7,8-HxCDD		O.		
G.	^{13}C-1,2,3,4,6,7,8-HpCDF		P.		
H.	^{13}C-1,2,3,4,6,7,8-HpCDD				

LDC #: 23435c4
SDG #: Secow

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: A
2nd Reviewer: W

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?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding (conc > calib range)	Associated Samples	Qualifications
		1, 5	H, O, P, Q		J dets A (e)
					↓
		4	I, K, L, O P, Q		
		wl	ZMPc	wl	J+ (e)

Comments: See sample calculation verification worksheet for recalculations

LDC #: 23435(2)
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: 9
2nd Reviewer: 1

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:

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

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL (105)	5/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.926	0.926	0.97	0.97	14.3	14.5
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.913	0.913	0.92	0.92	16.8	16.8
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.110	1.110	1.15	1.15	14.2	14.3
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.023	1.023	1.04	1.04	11.3	11.4
			OCDF (^{13}C-OCDD)	1.383	1.383	1.48	1.48	19.4	19.6
2	ICAL	4/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.088	1.10	1.10	1.39	1.20
			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 (^{13}C-OCDD)						
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 (^{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 (^{13}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 #: 23425c2-1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: 9
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:

RRF = $(A_x)(C_{is})/(A_{is})(C_x)$
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_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL (405)	3/18/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.004	1.004	1.06	1.06	8.10	8.24
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.049	1.049	1.06	1.06	5.12	5.00
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.163	1.20	1.20	8.25	8.13
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.073	1.073	1.11	1.11	7.66	7.86
			OCDF (^{13}C-OCDD)	1.523	1.523	1.58	1.58	8.42	8.35
2			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 (^{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 (^{13}C-OCDD)						
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 (^{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 (^{13}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 #: 23475C4
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	04JN10A1D5	6/4/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.926	0.79	0.79	14.5	14.5
	-2		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.913	0.77	0.77	15.4	15.4
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.110	1.04	1.04	6.0	6.0
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.023	0.98	0.98	3.8	3.8
			OCDF (^{13}C-OCDD)	1.383	1.36	1.36	1.4	1.4
2	04J105D2	6/4/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.10	1.10	0.8	0.9
			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 (^{13}C-OCDD)					
3	23MY1040S	5/25/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.004	1.08	1.08	7.7	7.7
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.049	1.06	1.06	0.9	0.9
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.24	1.24	6.5	6.5
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.073	1.13	1.13	4.9	5.0
			OCDF (^{13}C-OCDD)	1.523	1.70	1.70	11.6	11.5

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 #: 23495C2
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: 9
2nd Reviewer: h

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
$RRF = (A_x)(C_h)/(A_h)(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_h = Area of associated internal standard
C_x = Concentration of compound, C_h = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	26MX10BSD	5/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	0.99	0.99	8.8	8.8
			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 (^{13}C-OCDD)					
2	23MX10405	5/25/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.004	1.09	1.09	8.3	8.3
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.049	1.05	1.05	0.4	0.4
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.23	1.23	5.9	5.9
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.073	1.16	1.16	7.7	7.7
			OCDF (^{13}C-OCDD)	1.523	1.70	1.70	11.6	11.5
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 (^{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 (^{13}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 #: 23435e1
SDG #: Encoder

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

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

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

RPD = | MSR - MSDR | * 2/(MSR + MSDR) MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples: 6/7

Compound	Spike Added (pg/g)		Sample Concentration (pg/g)	Spiked Sample Concentration (pg/g)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		Reported RPD	Recalculated RPD
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	----	----
2,3,7,8-TCDD	19.9	21.2	12	36.6	38.2	125	124	124	124	4.0	4.3
1,2,3,7,8-PeCDD	99.3	106	47	152	169	106	106	114	115	1.0	1.0
1,2,3,4,7,8-HxCDD	↓	↓	34	163	165	129	130	123	124	1.3	1.2
1,2,3,4,7,8,9-HpCDF	↓	↓	2300	2210	2550	0.0	0.0	258	236	0.8	14
OCDF	199	212	13000	11100	13900	0.0	0.0	519	545	0.0	22

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 #: 34325C1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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 = I LCS - LCSD I * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0140389

Compound	Spike Added (PG/G)		Spiked Sample Concentration (PG/G)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	22.1	NA	110	110				
1,2,3,7,8-PeCDD	100		112		112	112				
1,2,3,4,7,8-HxCDD	↓		109		109	109				
1,2,3,4,7,8,9-HpCDF			112		112	112				
OCDF	200		233		117	117				

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]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_8{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 34235c2l
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: [signature]

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

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

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

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

I_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. 1 , H :

Conc. = $\frac{(2196)(3000)(2000)(\quad)}{(13049)(2000)(1.088)(10.16)(0.942)}$

= 323.2 pg/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: May 19, 2010

LDC Report Date: July 4, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0E210563

Sample Identification

SSAK7-02-12BPC
SSAM3-02-11BPC**
SSAM3-02-11BPC-FD
RSAJ7-10BPC
RSAK7-10BPC
SA201-10BPC
SSAI2-02-11BPC
RSAI2-15BPC
RSAI3-16BPC**
SSAM3-02-11BPCMS
SSAM3-02-11BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 11 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 with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
6/7/10	^{13}C-OCDD	35.1	SSAM3-02-11BPC-FD RSAJ7-10BPC 0145164MB	OCDD OCDF	J+ (all detects) J+ (all detects)	P

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
6/8/10	^{13}C-OCDD	46.6	SSAM3-02-11BPC** RSAK7-10BPC SA201-10BPC SSAI2-02-11BPC RSAI2-15BPC RSAI3-16BPC** SSAM3-02-11BPCMS SSAM3-02-11BPCMSD	OCDD OCDF	J+ (all detects) J+ (all detects)	P

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
0145164MB	5/25/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-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 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.054 pg/g 0.068 pg/g 0.030 pg/g 0.16 pg/g 0.083 pg/g 0.096 pg/g 0.073 pg/g 0.040 pg/g 0.075 pg/g 0.092 pg/g 0.17 pg/g	All samples in SDG G0E210563

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
SSAM3-02-11BPC**	1,2,3,7,8,9-HxCDF	0.28 pg/g	0.28U pg/g
SSAI2-02-11BPC	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 2,3,7,8-TCDF	0.14 pg/g 0.22 pg/g 0.39 pg/g	0.14U pg/g 0.22U pg/g 0.39U pg/g
RSAI2-15BPC	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD	0.16 pg/g 0.25 pg/g	0.16U pg/g 0.25U pg/g

Samples FB-04072010-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-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 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 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	SSAK7-02-12BPC RSAJ7-10BPC RSAK7-10BPC SA201-10BPC SSAI2-02-11BPC RSAI2-15BPC RSAI3-16BPC**
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	SSAM3-02-11BPC** SSAM3-02-11BPC-FD

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 MS 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
SSAM3-02-11BPC-FD	^{13}C-OCDD	38 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
RSAJ7-10BPC	^{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) 38 (40-135) 19 (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
SA201-10BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	39 (40-135) 38 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	P
SSAI2-02-11BPC	^{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	33 (40-135) 34 (40-135) 13 (40-135) 12 (40-135) 8.9 (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
RSAI2-15BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	34 (40-135) 32 (40-135) 35 (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
RSAI3-16BPC**	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	23 (40-135) 22 (40-135) 20 (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

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
SSAK7-02-12BPC	2,3,7,8-TCDF 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) J (all detects)	P
RSAJ7-10BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P
RSAK7-10BPC	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
RSAI3-16BPC**	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E210563	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 G0E210563	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

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 SSAM3-02-11BPC** and SSAM3-02-11BPC-FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAM3-02-11BPC**	SSAM3-02-11BPC-FD				
2,3,7,8-TCDD	0.82	0.76	-	0.06 (≤0.56)	-	-
1,2,3,7,8-PeCDD	0.31	0.59	-	0.28 (≤2.8)	-	-
1,2,3,4,7,8-HxCDD	2.6	3.0	-	0.4 (≤2.8)	-	-
1,2,3,6,7,8-HxCDD	1.4	1.4	-	0 (≤2.8)	-	-
1,2,3,7,8,9-HxCDD	0.62	0.49	-	0.13 (≤2.8)	-	-
1,2,3,4,6,7,8-HpCDD	5.4	5.7	-	0.3 (≤2.8)	-	-
OCDD	6.2	6.1	-	0.1 (≤5.6)	-	-
2,3,7,8-TCDF	43	46	7 (≤50)	-	-	-
1,2,3,7,8-PeCDF	6.7	6.9	-	0.2 (≤2.8)	-	-
2,3,4,7,8-PeCDF	22	26	-	4 (≤5.9)	-	-
1,2,3,4,7,8-HxCDF	13	12	-	1 (≤2.8)	-	-
1,2,3,6,7,8-HxCDF	3.5	3.2	-	0.3 (≤2.8)	-	-
2,3,4,6,7,8-HxCDF	2.8	2.7	-	0.1 (≤5.9)	-	-
1,2,3,7,8,9-HxCDF	0.28	0.38	-	0.1 (≤2.8)	-	-
1,2,3,4,6,7,8-HpCDF	7.2	5.4	-	1.8 (≤2.8)	-	-
1,2,3,4,7,8,9-HpCDF	4.2	3.7	-	0.5 (≤2.8)	-	-
OCDF	34	29	16 (≤50)	-	-	-

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0E210563

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E210563	SSAM3-02-11BPC** SSAM3-02-11BPC-FD RSAJ7-10BPC RSAK7-10BPC SA201-10BPC SSAI2-02-11BPC RSAI2-15BPC RSAI3-16BPC**	OCDD OCDF	J+ (all detects) J+ (all detects)	P	Routine calibration (%D) (c)
G0E210563	SSAM3-02-11BPC-FD	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0E210563	RSAJ7-10BPC RSAI2-15BPC RSAI3-16BPC**	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)
G0E210563	SA201-10BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0E210563	SSAI2-02-11BPC	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	Internal standards (%R) (i)
G0E210563	SSAK7-02-12BPC	2,3,7,8-TCDF 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) J (all detects)	P	Project Quantitation Limit (e)
G0E210563	RSAJ7-10BPC	OCDF	J (all detects)	P	Project Quantitation Limit (e)
G0E210563	RSAK7-10BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (e)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E210563	RSAI3-16BPC**	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) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E210563	SSAK7-02-12BPC SSAM3-02-11BPC** SSAM3-02-11BPC-FD RSAJ7-10BPC RSAK7-10BPC SA201-10BPC SSAI2-02-11BPC RSAI2-15BPC RSAI3-16BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E210563	SSAK7-02-12BPC SSAM3-02-11BPC** SSAM3-02-11BPC-FD RSAJ7-10BPC RSAK7-10BPC SA201-10BPC SSAI2-02-11BPC RSAI2-15BPC RSAI3-16BPC**	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 G0E210563

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0E210563	SSAM3-02-11BPC**	1,2,3,7,8,9-HxCDF	0.28U pg/g	A	bl
G0E210563	SSAI2-02-11BPC	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 2,3,7,8-TCDF	0.14U pg/g 0.22U pg/g 0.39U pg/g	A	bl
G0E210563	RSAI2-15BPC	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD	0.16U pg/g 0.25U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E210563

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23435D21
SDG #: G0E210563
Laboratory: Test America

Date: 6/30/10
Page: 1 of 1
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: 5/19/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/~~CV~~	SW	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	A	
XIV	Field duplicates	SW	D = 2+3
XV.	Field blanks	SW	~~FB-040720100-R2D(G0D090441), FB-041320100-R1(G2-522~~ (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: ** Indicates sample underwent Stage 4 validation

All Soils

1	SSAK7-02-12BPC D	11	SSAM3-02-11BPCMSD	21	0145164 MB	31	
2	SSAM3-02-11BPC** E	12		22		32	
3	SSAM3-02-11BPC-FD E	13		23		33	
4	RSAJ7-10BPC D	14		24		34	
5	RSAK7-10BPC	15		25		35	
6	SA201-10BPC	16		26		36	
7	SSAI2-02-11BPC	17		27		37	
8	RSAI2-15BPC	18		28		38	
9	RSAI3-16BPC**	19		29		39	
10	SSAM3-02-11BPCMS	20		30		40	

Notes: _____

LDC #: 03435021
SDG #: see cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 9
2nd Reviewer: W

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) ≤ 20% for unlabeled standards and ≤ 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?	✓			

LDC #: 23425D2
SDG #: 580600

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
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				
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 ≥ 2.5, at ± 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				
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.	✓			

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. 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	I. 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:

LDC #: 23435D2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: K
2nd Reviewer: M

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 Was a routine calibration was performed at the beginning and end of each 12 hour period?
Y N N/A Were all percent differences (%D) of RRFs ≤ 20% for unlabeled compounds and ≤ 30% for labeled?
Y N N/A Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications (c)
	6/7/10	OTN103D5-16	13C-OCDD	35.1		3-4. BLK	J+ detects (E. Q)
	6/8/10	OTN103D5-31	13C-OCDD	46.6		B2. 5-11	J+ detects (E. Q)

	PCDDs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

	PCDFs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

LDC #: 23435E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer: 1

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

Blank extraction date: 5/25/10 **Blank analysis date:** 6/7/10
Conc. units: pg/L **Associated samples:** All (bl)

Compound	Blank ID	Sample Identification									
	0145164MB	5X	2	7	8		all > 5X				
C	0.054	0.27		0.14/U	0.16/U						
D	0.068	0.34		0.22/U	0.25/U						
F	0.030	0.15		-	-						
G	0.16	0.8		-	-						
H	0.083	0.415		0.39/U	-						
K	0.096	0.48		-	-						
L	0.073	0.365		-	-						
M	0.040	0.2		-	-						
N	0.075	0.375	0.28/U	-	-						
O	0.092	0.46		--	-						
Q	0.17	0.85			-						

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 #: 23435D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 4
2nd Reviewer: L

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:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1, 4-9 (>5X)

Compound	Blank ID	Sample Identification									
	FB-04072010-RZD	5X									
C	0.89	0.00445									
E	1.5	0.0075									
F	2.2	0.011									
G	8.3	0.0415									
K	1.4	0.007									
L	1.6	0.008									
M	1.5	0.0075									
N	1.6	0.008									
O	1.3	0.0065									
P	1.4	0.007									
Q	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 #:23435D21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: 12

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:** pg/g
Sampling date: 4/13/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 2-3 (>5X)

Compound	Blank ID	Sample Identification								
	FB-04132010-RIG2-RZE	5X								
E	0.40	0.002								
F	0.65	0.00325								
G	2.5	0.0125								
K	0.66	0.0033								
M	0.41	0.00205								
O	0.53	0.00265								
Q	0.97	0.00485								
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 #: 23435D2
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

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

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 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) N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y (N) N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		10/11	C	( )	171 (65-144)	( )	2	~~J dets/A~~ No Qual
			J	( )	136 (76-132)	( )		↓
			P	152 (79-139)	159 (79-139)	( )		
				( )	( )	( )		(MS or LCS in)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 23435D2
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 9
2nd Reviewer: h

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 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?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (i)
		3	J	38 (40-135)	J/UJ/A (C. Q)
				( )	
		4	C	35 ( )	(F-C. O-Q)
			H	38 ( )	
			I	19 ( )	
				( )	
		6	H	39 ( )	(F-C. Q)
			I	38 ( )	
				( )	
		7	C	33 ( )	(C-C. K-Q)
			F	34 ( )	
			C	13 ( )	
			H	12 ( )	
			J	8.9 ( )	
				( )	
		8	C	34 ( )	
			H	32 ( )	
			I	35 ( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		I.	^{13}C-OCDD	
B.	^{13}C-2,3,7,8-TCDD		K.	^{13}C-1,2,3,4-TCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		M		
E.	^{13}C-1,2,3,4,7,8-HxCDF		N.		
F.	^{13}C-1,2,3,6,7,8-HxCDD		O.		
G.	^{13}C-1,2,3,4,6,7,8-HpCDF		P.		
H.	^{13}C-1,2,3,4,6,7,8-HpCDD				

LDC #: 23435>1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

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

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 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?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (i)
		9	G	23 (40-135)	J/UJ/P (F-G, 0-8)
			H	22 ( )	
			I	20 ( )	
				( )	
		10 (MS)	J	34 ( )	No Cmpd
		11 (MSD)	~~J~~	33 ( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		I.	^{13}C-OCDD	
B.	^{13}C-2,3,7,8-TCDD		K.	^{13}C-1,2,3,4-TCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		M		
E.	^{13}C-1,2,3,4,7,8-HxCDF		N.		
F.	^{13}C-1,2,3,6,7,8-HxCDD		O.		
G.	^{13}C-1,2,3,4,6,7,8-HpCDF		P.		
H.	^{13}C-1,2,3,4,6,7,8-HpCDD				

LDC #: 23435D2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	qds > calib range Finding	Associated Samples	Qualifications
		1	H, K, O, Q	1	J (all pos det)
		4	Q	4	
		5	O, Q	5	
		9	H, I, K, L, O, P, Q	9	
		MI	2NPC	MI	J (all pos det)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23435D21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: Q
2nd Reviewer: W

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

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

Compound	Concentration (pg/g) 2	Concentration (pg/g) 3	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
A	0.82	0.76		0.06	(≤0.56)	
B	0.31	0.59		0.28	(≤2.8)	
C	2.6	3.0		0.4	(≤2.8)	
D	1.4	1.4		0	(≤2.8)	
E	0.62	0.49		0.13	(≤2.8)	
F	5.4	5.7		0.3	(≤2.8)	
G	6.2	6.1		0.1	(≤5.6)	
H	43	46	7			
I	6.7	6.9		0.2	(≤2.8)	
J	22	26		4	(≤5.9)	
K	13	12		1	(≤2.8)	
L	3.5	3.2		0.3	(≤2.8)	
M	2.8	2.7		0.1	(≤5.9)	
N	0.28	0.38		0.1	(≤2.8)	
O	7.2	5.4		1.8	(≤2.8)	
P	4.2	3.7		0.5	(≤2.8)	
Q	34	29	16			

LDC #: 33435D2
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

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 = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	6/3/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.9436	0.9436	1.00695	1.00695	9.5494	9.5407
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.1387	1.1387	1.1512	1.1512	5.5453	5.5484
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.1302	1.1302	1.1940	1.1940	8.3419	8.3432
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.0217	1.0217	1.0714	1.0714	10.0648	10.0681
			OCDF (^{13}C-OCDD)	1.4868	1.4868	1.5579	1.5579	9.1625	
2	ICAL	4/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.088	1.10	1.10	1.29	1.20
			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 (^{13}C-OCDD)						
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 (^{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 (^{13}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 #: 23435D2J
SDG #: Jercower

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	0TN1030S1	6/7/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.94366	0.99016	0.99016	4.9	4.9
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.13874	1.12979	1.12979	0.8	0.8
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.13023	1.1514T	1.1514T	1.9	1.9
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.0241T	1.0486T	1.0486T	2.4	2.4
			OCDF (^{13}C-OCDD)	1.48668	1.52284	1.52284	2.4	2.4
2	0TN1030S2	6/7/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.94366	1.03225	1.03225	9.4	9.4
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.13874	1.10481	1.10481	3.0	3.0
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.13023	1.12132	1.12132	0.8	0.8
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.0241T	1.07409	1.07409	4.9	4.9
			OCDF (^{13}C-OCDD)	1.48668	1.46726	1.46726	1.3	1.3
3	08N1030S2	6/8/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.12	1.12	3.2	3.2
			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 (^{13}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 #: 24350-1
SDG #: Recovery

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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

RPD = I MSR - MSDR I * 2/(MSR + MSDR) MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples: 10/11

Compound	Spike Added (pg/g)		Sample Concentration (pg/g)	Spiked Sample Concentration (pg/g)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		Reported RPD	Recalculated RPD
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	----	----
2,3,7,8-TCDD	24.8	23.5	0.8>	24.8	23.3	110	110	105	115	6.0	6.2
1,2,3,7,8-PeCDD	109	107	0.31	122	118	112	112	110	110	3.0	3.3
1,2,3,4,7,8-HxCDD	↓	↓	2.6	157	186	142	142	171	171	17	17
1,2,3,4,7,8,9-HpCDF	↓	↓	4.2	169	175	152	151	159	160	3.3	3.5
OCDF	218	215	34	324	327	133	133	137	136	0.94	0.92

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 #: 23435D2
SDG #: Sediment

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

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

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 = | LCS - LCSD | * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 045164

Compound	Spike Added (~~ng~~)		Spiked Sample Concentration (~~ng~~)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	22.7	NA	114	114				
1,2,3,7,8-PeCDD	100	↓	113	↓	113	113				
1,2,3,4,7,8-HxCDD	↓	↓	124	↓	124	124				
1,2,3,4,7,8,9-HpCDF	↓	↓	118	↓	118	118				
OCDF	200	↓	247	↓	123	123				

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]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 23435D2/
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: W

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

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

$$\text{Concentration} = \frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$$

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

I_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. 2 , F :

Conc. = $\frac{(5700.18)(2000)(\quad)}{(2252.38)(1.0241)(10.11)(0.89)}$

= 5.37 ng/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 23, 2010

LDC Report Date: July 4, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0E240433

Sample Identification

SSAJ2-01-2BPC

Introduction

This data review covers one soil 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 with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
6/7/10	^{13}C-OCDD	35.1	All samples in SDG G0E240433	OCDD OCDF	J+ (all detects) J+ (all detects)	P

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
0145164MB	5/25/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-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 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.054 pg/g 0.068 pg/g 0.030 pg/g 0.16 pg/g 0.083 pg/g 0.096 pg/g 0.073 pg/g 0.040 pg/g 0.075 pg/g 0.092 pg/g 0.17 pg/g	All samples in SDG G0E240433

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

Sample FB-0407210-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 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 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E240433

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
SSAJ2-01-2BPC	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)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E240433	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 G0E240433	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 G0E240433

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E240433	SSAJ2-01-2BPC	OCDD OCDF	J+ (all detects) J+ (all detects)	P	Routine calibration (%D) (c)
G0E240433	SSAJ2-01-2BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E240433	SSAJ2-01-2BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E240433	SSAJ2-01-2BPC	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 G0E240433

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E240433

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 23435E21
SDG #: G0E240433
Laboratory: Test America

Date: 6/30/10
Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

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: 4/23/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	SW	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	No ass'd spl - No Cmal.
VII.	Laboratory control samples	A	LCs
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	FB-040720 10-R2D (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	SSAJ2-01-2BPC S	11	0145164MB	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. 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. 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	I. 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:

LDC #: 33352
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

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 Was a routine calibration was performed at the beginning and end of each 12 hour period?
Y (N) N/A Were all percent differences (%D) of RRFs ≤ 20% for unlabeled compounds and ≤ 30% for labeled?
(Y) N N/A Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications (c)
	6/5/10	OTN 10325-16	^{13}C-OCDD	35.1		MB+BK	J+ dets/A (4, 8)

	PCDDs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

	PCDFs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

LDC #: 23435E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: Q
2nd Reviewer: M

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

Blank extraction date: 5/25/10 **Blank analysis date:** 6/7/10
Conc. units: pg/g **Associated samples:** All (>5X)

Compound	Blank ID	Sample Identification									
	0145164MB	5X									
C	0.054	0.27									
D	0.068	0.34									
F	0.030	0.15									
G	0.16	0.8									
H	0.083	0.415									
K	0.096	0.48									
L	0.073	0.365									
M	0.040	0.2									
N	0.075	0.375									
O	0.092	0.46									
Q	0.17	0.85									

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 #: 23435E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: W

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:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: All (>5X)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZD	5X								
C	0.89	0.00445								
E	1.5	0.0075								
F	2.2	0.011								
G	8.3	0.0415								
K	1.4	0.007								
L	1.6	0.008								
M	1.5	0.0075								
N	1.6	0.008								
O	1.3	0.0065								
P	1.4	0.007								
Q	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 #: 23435221
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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?
Y N (N/A) Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		1	H.O. & > calib range	1	J+/UJ (e)
		all	2nd C	all	J+/UJ (e)

Comments: See sample calculation verification worksheet for recalculations