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

August 12, 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 July 27, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 23663:

SDG #	Fraction
G0E280415, G0F190506 G0F240560, G0F260448 G0G010578	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

Stage 2B/4

LDC #23663 (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	W	S
A	G0E280415	07/27/10	08/17/10	0	3																																
B	G0F190506	07/27/10	08/17/10	0	15																																
B	G0F190506	07/27/10	08/17/10	0	1																																
C	G0F240560	07/27/10	08/17/10	0	3																																
D	G0F260448	07/27/10	08/17/10	3	9																																
D	G0F260448	07/27/10	08/17/10	0	4																																
E	G0G010578	07/27/10	08/17/10	1	12																																
E	G0G010578	07/27/10	08/17/10	0	1																																
Total	T/LR			4	47	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	0	0	51

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

LDC #: 23663
SDG #: G0E280415, G0F190506, G0F240560, G0F260448, G0G010578

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_LDC23663_081110.doc
IV. EDD Delivery				
Was the final EDD sent to the client?	X			

Tronox LLC Facility, PCS, Henderson, Nevada
Data Validation Reports
LDC #23663

Dioxins/Dibenzofurans

LDC

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: May 3, 2010

LDC Report Date: August 9, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0E280415

Sample Identification

SSAK8-06-1BPC
SSAK8-06-2BPC
SSAK8-06-3BPC
SSAK8-06-1BPCMS
SSAK8-06-1BPCMSD

Introduction

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

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

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

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

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

The following are definitions of the data qualifiers:

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

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

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

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

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

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

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

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

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

I. Technical Holding Times

All technical holding time requirements were met.

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

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

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

III. Initial Calibration

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

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

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

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

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

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
0152441MB	6/1/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.059 pg/g 0.23 pg/g 0.094 pg/g 0.070 pg/g 0.12 pg/g 0.13 pg/g	All samples in SDG G0E280415

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

Sample FB-04072010-RZD (from SDG G0D090441) 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	0.89 pg/L	All samples in SDG G0E280415
		1,2,3,7,8,9-HxCDD	1.5 pg/L	
		1,2,3,4,6,7,8-HpCDD	2.2 pg/L	
		OCDD	8.3 pg/L	
		1,2,3,4,7,8-HxCDF	1.4 pg/L	
		1,2,3,6,7,8-HxCDF	1.6 pg/L	
		2,3,4,6,7,8-HxCDF	1.5 pg/L	
		1,2,3,7,8,9-HxCDF	1.6 pg/L	
		1,2,3,4,6,7,8-HpCDF	1.3 pg/L	
		1,2,3,4,7,8,9-HpCDF	1.4 pg/L	
		OCDF	4.1 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. 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
SSAK8-06-1BPC	^{13}C-OCDD	36 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

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

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK8-06-1BPC	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 1,2,3,4,6,7,8-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
SSAK8-06-2BPC	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-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) J (all detects) J (all detects)	P
SSAK8-06-3BPC	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 G0E280415	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 G0E280415	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 G0E280415

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E280415	SSAK8-06-1BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0E280415	SSAK8-06-1BPC	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 1,2,3,4,6,7,8-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)
G0E280415	SSAK8-06-2BPC	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-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) J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0E280415	SSAK8-06-3BPC	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)
G0E280415	SSAK8-06-1BPC SSAK8-06-2BPC SSAK8-06-3BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E280415	SSAK8-06-1BPC SSAK8-06-2BPC SSAK8-06-3BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0E280415

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E280415

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 23663A21
SDG #: G0E280415
Laboratory: Test America

Date: 8/4/10
Page: 1 of 1
Reviewer: 9
2nd Reviewer: lw

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

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 5/3/10
II.	HRGC/HRMS Instrument performance check	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	N	
XI.	Compound quantitation and CRQLs	SN	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SN	FB-040710-R2D (400090441)

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

Validated Samples:

1	SSAK8-06-1BPC S	11	0152441MB	21		31	
2	SSAK8-06-2BPC	12		22		32	
3	SSAK8-06-3BPC	13		23		33	
4	SSAK8-06-1BPCMS	14		24		34	
5	SSAK8-06-1BPCMSD	15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

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

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total 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 #: 23663A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: V
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: 6/1/10 **Blank analysis date:** 6/10/10
Conc. units: pg/g Associated Samples: MA (>5x)

Compound	Blank ID	Sample Identification								
	015244/MB									
F	0.059									
G	0.23									
K	0.094									
L	0.070									
O	0.12									
R	0.13									

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 #: 23663A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: 1

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								
(G0D090441)	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 #: 23683B21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: Q
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 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
		4/5	%R and RPD out for several cpds			( )	1	No qual
			(high conc)	( )	( )	( )		(MS or LCS)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 23663A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

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 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	I	36 (40-135)	J/UH/P (6.8)
				( )	
		2	R	36 ( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	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 #: 23663A21
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	Finding: cpds > calib range	Associated Samples	Qualifications
		1	H.J.K.L.M.O.P.Q	1	J dets/P
		2	F.H→M.O→Q	2	
		3	H→L.O-Q	3	
		all	ZMP c	all	J+(Q)

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: June 17, 2010

LDC Report Date: August 9, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0F190506

Sample Identification

SA33-0BPC
SSAN6-06-0BPC
SA200-0BPC
RSAL8-0BPC
RSAK8-0BPC_FD
RSAK8-0BPC
SSAK8-02-0BPC
SA70-0BPC
RSAH3-0BPC
SA82-0BPC
SSAK4-01-0BPC
SA167-0BPC
RSAO3-0BPC
SSAK6-01-0BPC
SSAK3-01-0BPC
SA198-0BPC**

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 16 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
7/7/10	1,2,3,4,7,8-HxCDD	20.3	RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SA70-0BPC	1,2,3,4,7,8-HxCDD	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
0716172MB	6/28/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.078 pg/g 0.40 pg/g 1.1 pg/g 0.13 pg/g 0.48 pg/g 0.37 pg/g 0.45 pg/g	All samples in SDG G0F190506

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
RSAL8-0BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.37 pg/g 1.8 pg/g 2.7 pg/g	0.37U pg/g 1.8U pg/g 2.7U pg/g

Samples FB-04072010-RZD (from SDG G0D090441), FB-04072010-RZC (from SDG G0D130519), and FB-04062010-RZB (from SDG G0D120488) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-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	RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SSAK8-02-0BPC SA70-0BPC RSAH3-0BPC SA82-0BPC SSAK6-01-0BPC SSAK3-01-0BPC SSAK4-01-0BPC SA167-0BPC
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	SSAN6-06-0BPC SA200-0BPC RSAO3-0BPC SA198-0BPC**
FB04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SA33-0BPC

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

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

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

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

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
RSAK8-0BPC_FD	^{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) 39 (40-135) 26 (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
RSAK8-0BPC	^{13}C-OCDD	31 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) 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
SA33-0BPC SSAN6-06-0BPC SSAK8-02-0BPC SA198-0BPC**	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
SA200-0BPC RSAO3-0BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P
RSAK8-0BPC_FD RSAK8-0BPC	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

Sample	Compound	Finding	Criteria	Flag	A or P
SA82-0BPC	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
SSAK6-01-0BPC	2,3,7,8-TCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-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) 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 G0F190506	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 G0F190506	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 RSAK8-0BPC_FD and RSAK8-0BPC 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
	RSAK8-0BPC	RSAK8-0BPC_FD				
2,3,7,8-TCDD	23	33	36 (≤50)	-	-	-
1,2,3,7,8-PeCDD	67	98	38 (≤50)	-	-	-
1,2,3,4,7,8-HxCDD	53	78	38 (≤50)	-	-	-
1,2,3,6,7,8-HxCDD	95	130	31 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	58	72	22 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	320	400	22 (≤50)	-	-	-
OCDD	300	320	6 (≤50)	-	-	-
2,3,7,8-TCDF	480	720	40 (≤50)	-	-	-
1,2,3,7,8-PeCDF	970	1400	36 (≤50)	-	-	-
2,3,4,7,8-PeCDF	510	780	42 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	1300	1800	32 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	1000	1400	33 (≤50)	-	-	-
2,3,4,6,7,8-HxCDF	260	340	27 (≤50)	-	-	-
1,2,3,7,8,9-HxCDF	230	360	44 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDF	3800	4700	21 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	2200	3100	34 (≤50)	-	-	-
OCDF	10000	11000	10 (≤50)	-	-	-

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0F190506

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F190506	RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SA70-0BPC	1,2,3,4,7,8-HxCDD	J+ (all detects)	P	Routine calibration (%D) (c)
G0F190506	RSAK8-0BPC_FD	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)
G0F190506	RSAK8-0BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0F190506	SA33-0BPC SSAN6-06-0BPC SSAK8-02-0BPC SA198-0BPC**	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0F190506	SA200-0BPC RSAO3-0BPC	OCDF	J (all detects)	P	Project Quantitation Limit (e)
G0F190506	RSAK8-0BPC_FD RSAK8-0BPC	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)
G0F190506	SA82-0BPC	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)
G0F190506	SSAK6-01-0BPC	2,3,7,8-TCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-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) J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (e)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F190506	SA33-0BPC SSAN6-06-0BPC SA200-0BPC RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SSAK8-02-0BPC SA70-0BPC RSAH3-0BPC SA82-0BPC SSAK4-01-0BPC SA167-0BPC RSAO3-0BPC SSAK6-01-0BPC SSAK3-01-0BPC SA198-0BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0F190506	SA33-0BPC SSAN6-06-0BPC SA200-0BPC RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SSAK8-02-0BPC SA70-0BPC RSAH3-0BPC SA82-0BPC SSAK4-01-0BPC SA167-0BPC RSAO3-0BPC SSAK6-01-0BPC SSAK3-01-0BPC SA198-0BPC**	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 G0F190506

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F190506	RSAL8-0BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.37U pg/g 1.8U pg/g 2.7U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0F190506

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23663B21
SDG #: G0F190506
Laboratory: Test America

Date: 8/4/10
Page: 1 of 1
Reviewer: 9
2nd Reviewer: VC

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: 6/17/10
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	N	client specified
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 = 5+6
XV.	Field blanks	SW	FB-040720 10-R2D (G0D090441), FB040620 10-R2B (G0D120488) FB-040720 10-R2C (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: ** Indicates sample underwent Stage 4 validation

All Soils

1	SA33-0BPC B	11	SSAK4-01-0BPC	21	017617 2MB	31	
2	SSAN6-06-0BPC C	12	SA167-0BPC	22		32	
3	SA200-0BPC C	13	RSAO3-0BPC C	23		33	
4	RSAL8-0BPC D	14	SSAK6-01-0BPC D	24		34	
5	RSAK8-0BPC_FD	15	SSAK3-01-0BPC D	25		35	
6	RSAK8-0BPC	16	SA198-0BPC** C	26		36	
7	SSAK8-02-0BPC	17		27		37	
8	SA70-0BPC	18		28		38	
9	RSAH3-0BPC	19		29		39	
10	SA82-0BPC	20		30		40	

Notes: _____

LDC #: 2663B2/
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer: V

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?	✓ 0	0		
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 #: 36633>1
SDG #: Second

VALIDATION FINDINGS CHECKLIST

Reviewer: Q
2nd Reviewer:

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.	✓	Ø		
Target compounds were detected in the field blanks.	✓	Ø		

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 #: 22663B2/
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: Q
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)
	7/7/10	07LL01053	c	20.3		4-6, 8	V+ detects/P (c only)

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 #: 23663B21
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: 6/28/10 **Blank analysis date:** 7/7/10
Conc. units: pg/g Associated Samples: all (bl)

Compound	Blank ID	Sample Identification								
OTCDF	1.2 MB	4		others > 5x						
E	0.078	0.3T/U								
F	0.40	1.8/U								
G	1.1	2.T/U								
K	0.13									
O	0.48									
P	0.37									
Q	0.45									

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 #: 23663B21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: 1

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: 4-12, 14-15 (>5X)

Compound	Blank ID	Sample Identification								
(C0D090441)	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 #:23663B21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer:
2nd Reviewer:

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

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/8/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 2-3, 13, 16 (>5X)

Compound	Blank ID	Sample Identification								
(G0D130519)	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 #: 23663B21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 0
2nd Reviewer: 0

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: 4/6/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification								
(G0D120488)	FB04062010-RZB	5X								
E	0.68	0.0034								
F	2.5	0.0125								
G	6.2	0.031								
H	2.7	0.0135								
K	1.4	0.007								
L	0.82	0.0041								
N	0.94	0.0047								
O	1.8	0.009								
P	1.2	0.006								
Q	4.4	0.022								
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 #: 36638-1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

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 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)
		5	F	34 (40-135)	✓ (U) 9 (F-F. 0-2)
			H	39 ( )	
			I	26 (↓)	↓
				( )	
		6	J	31 (↓)	↓ (F. 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 #: 02663B1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 6

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, 2, 7, 16	0, Q	1, 2, 7, 16	J (all pos) / P
		3, 13	Q	3, 13	
		5-6	H, I, K, L, O, P, Q	5-6	
		8, 10	H, I, O, Q	10	
		14	A, D, F → Q	14	
		all	2378-TCDD=	all	J+ (E)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23663B21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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)		(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
	6	5				
A	23	33	36			
B	67	98	38			
C	53	78	38			
D	95	130	31			
E	58	72	22			
F	320	400	22			
G	300	320	6			
H	480	720	40			
I	970	1400	36			
J	510	780	42			
K	1300	1800	32			
L	1000	1400	33			
M	260	340	27			
N	230	360	44			
O	3800	4700	21			
P	2200	3100	34			
Q	10000	11000	10			

V:\FIELD DUPLICATES\23663B21.wpd

LDC #: 23663B24
SDG #: 580 COW1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

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 (405)	5/18/10	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	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 (105)	6/17/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.944	0.944	0.91	0.91	10.9	10.6
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.945	0.945	0.88	0.88	17.8	18.0
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.136	1.136	1.14	1.14	15.3	15.5
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.065	1.065	1.06	1.06	16.7	16.5
			OCDF (^{13}C-OCDD)	1.639	1.639	1.68	1.68	17.3	17.2

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 #: 22663B4
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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

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	0701105 (105)	7/7/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.944	0.87	0.87	8.3	8.2
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.945	0.89	0.89	6.1	6.1
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.136	1.14	1.14	0.6	0.6
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.065	1.13	1.13	6.0	5.9
			OCDF (^{13}C-OCDD)	1.639	1.57	1.57	4.1	4.1
2	0801104DS	7/8/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.004	1.01	1.01	0.3	0.2
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.049	1.00	1.00	5.1	5.1
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.16	1.16	0.3	0.4
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.073	1.08	1.08	1.0	1.0
			OCDF (^{13}C-OCDD)	1.523	1.55	1.55	1.8	1.8
3	1401105D2	7/14/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.06	1.06	2.4	2.4
			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 #: 23663B7
SDG #: Several

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

LCS ID: 017617

Compound	Spike Added (~~PG~~/g)		Spiked Sample Concentration (~~PG~~)		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	20.1	NA	100	100				
1,2,3,7,8-PeCDD	100	↓	103	↓	103	103				
1,2,3,4,7,8-HxCDD	↓	↓	91.5	↓	91	91				
1,2,3,4,7,8,9-HpCDF	↓	↓	114	↓	114	114				
OCDF	200	↓	228	↓	114	114				

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 #: 23663B21
SDG #: Recover

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?

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

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. 16 , A :

Conc. = $\frac{(555810)(2000)(\quad)}{(8891740)(1.049)(10)(0.989)}$

= 120.5 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: June 21, 2010

LDC Report Date: August 9, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0F240560

Sample Identification

SA68-0.00BPC
SSAK5-01-0.00BPC
SA75-0.00BPC

Introduction

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

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

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

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

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

The following are definitions of the data qualifiers:

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

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

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

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

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

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

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

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

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

I. Technical Holding Times

All technical holding time requirements were met.

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

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

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

III. Initial Calibration

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

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

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

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

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

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

V. Blanks

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

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0716172MB	6/28/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.078 pg/g 0.40 pg/g 1.1 pg/g 0.13 pg/g 0.48 pg/g 0.37 pg/g 0.45 pg/g	All samples in SDG G0F240560

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
SA75-0.00BPC	1,2,3,4,6,7,8-HpCDD OCDD	1.0 pg/g 1.6 pg/g	1.0U pg/g 1.6U pg/g

Samples FB-04072010-RZD (from SDG G0D090441) and FB-04062010-RZB (from SDG G0D120488) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-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	SSAK5-01-0.00BPC SA75-0.00BPC
FB04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SA68-0.00BPC

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
SA68-0.00BPC	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

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0F240560	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 G0F240560	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 G0F240560

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F240560	SA68-0.00BPC	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)
G0F240560	SA68-0.00BPC SSAK5-01-0.00BPC SA75-0.00BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0F240560	SA68-0.00BPC SSAK5-01-0.00BPC SA75-0.00BPC	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 G0F240560

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F240560	SA75-0.00BPC	1,2,3,4,6,7,8-HpCDD OCDD	1.0U pg/g 1.6U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0F240560

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 23663C21
SDG #: G0F240560
Laboratory: Test America

Date: 8/4/10
Page: 1 of 1
Reviewer: a
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: 6/21/10
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	No ass'd spl - No Cmpl
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	FB0406 2010-R2B, FB-040T2010-R2D

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	SA68-0.00BPC S	11	0176172NKB	21		31	
2	SSAK5-01-0.00BPC b	12		22		32	
3	SA75-0.00BPC b	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 #: 23663C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: Q
2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

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: 6/28/10 **Blank analysis date:** 7/7/10
Conc. units: pg/g **Associated samples:** All (bl)

Compound	Blank ID	Sample Identification									
	0176172MB	5X	3								
E	0.078	0.39			RPM ≤ > ≤ X						
F	0.40	2	1.0/U								
G	1.1	5.5	1.6/U								
K	0.13	0.65									
O	0.48	2.4									
P	0.37	1.85									
Q	0.45	2.25									

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 #: 23663C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: T
2nd Reviewer: LA

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: 2-3(>5X)

Compound	Blank ID	Sample Identification								
(C0D090441)	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 #: 23663C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: T
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: 4/6/10
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: 1 (>5X)

Compound	Blank ID	Sample Identification								
(G0D120488)	FB04062010-RZB	5X								
E	0.68	0.0034								
F	2.5	0.0125								
G	6.2	0.031								
H	2.7	0.0135								
K	1.4	0.007								
L	0.82	0.0041								
N	0.94	0.0047								
O	1.8	0.009								
P	1.2	0.006								
Q	4.4	0.022								
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 #: 22622-21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: F
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 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	↓ dets/P

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: June 24 through June 25, 2010

LDC Report Date: August 9, 2010

Matrix: Soil/Water

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0F260448

Sample Identification

SSAR4-04-1.00BPC
SSAR4-04-2.00BPC
SSAR4-04-3.00BPC**
SSAR4-04-1.00BPC_FD
EB06242010-RZD
SSAJ8-01-6.00BPC
SSAJ8-01-6.00BPC_FD
EB0624010-RZB
SSAK8-03-5BPC
SSAK8-03-10BPC
SSAK8-03-15BPC**
SSAK8-03-15BPC_FD**
SSAJ8-02-5BPC
SSAJ8-02-10BPC
SSAJ8-02-15BPC**
EB-06252010-RZD
SSAR4-04-3.00BPCMS
SSAR4-04-3.00BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 15 soil samples and 3 water 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
0181166MB	6/30/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.4 pg/L 6.3 pg/L 3.8 pg/L 7.5 pg/L 4.8 pg/L 14 pg/L	All water samples in SDG G0F260448
0182443MB	7/1/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.13 pg/g 0.56 pg/g 0.10 pg/g 0.10 pg/g 0.044 pg/g 0.21 pg/g 0.099 pg/g 0.68 pg/g	All soil samples in SDG G0F260448

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
EB06242010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	9.7 pg/L 16 pg/L 11 pg/L 20 pg/L 13 pg/L 53 pg/L	9.7U pg/L 16U pg/L 11U pg/L 20U pg/L 13U pg/L 53U pg/L
EB0624010-RZB	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.1 pg/L 7.4 pg/L 5.5 pg/L 11 pg/L 3.7 pg/L 22 pg/L	4.1U pg/L 7.4U pg/L 5.5U pg/L 11U pg/L 3.7U pg/L 22U pg/L
EB-06252010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	5.0 pg/L 10 pg/L 3.9 pg/L 12 pg/L 4.3 pg/L 25 pg/L	5.0U pg/L 10U pg/L 3.9U pg/L 12U pg/L 4.3U pg/L 25U pg/L
SSAR4-04-1.00BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.55 pg/g 2.7 pg/g	0.55U pg/g 2.7U pg/g
SSAR4-04-2.00BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.57 pg/g 1.8 pg/g 0.26 pg/g	0.57U pg/g 1.8U pg/g 0.26U pg/g

Sample	Compound	Reported Concentration	Modified Final Concentration
SSAR4-04-3.00BPC**	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.37 pg/g 2.2 pg/g 0.40 pg/g	0.37U pg/g 2.2U pg/g 0.40U pg/g
SSAR4-04-1.00BPC_FD	2,3,7,8-TCDF	0.43 pg/g	0.43U pg/g
SSAK8-03-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.15 pg/g 0.58 pg/g 0.13 pg/g 0.20 pg/g 0.13 pg/g 0.37 pg/g 0.20 pg/g 0.86 pg/g	0.15U pg/g 0.58U pg/g 0.13U pg/g 0.20U pg/g 0.13U pg/g 0.37U pg/g 0.20U pg/g 0.86U pg/g
SSAK8-03-10BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.18 pg/g 0.73 pg/g 0.095 pg/g 0.085 pg/g 0.21 pg/g 0.12 pg/g 0.76 pg/g	0.18U pg/g 0.73U pg/g 0.095U pg/g 0.085U pg/g 0.21U pg/g 0.12U pg/g 0.76U pg/g
SSAK8-03-15BPC**	OCDD	2.1 pg/g	2.1U pg/g
SSAK8-03-15BPC_FD**	OCDD	2.0 pg/g	2.0U pg/g
SSAJ8-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.11 pg/g 0.70 pg/g 0.12 pg/g 0.15 pg/g 0.055 pg/g 0.30 pg/g 0.13 pg/g 0.62 pg/g	0.11U pg/g 0.70U pg/g 0.12U pg/g 0.15U pg/g 0.055U pg/g 0.30U pg/g 0.13U pg/g 0.62U pg/g
SSAJ8-02-10BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.25 pg/g 0.74 pg/g 0.27 pg/g	0.25U pg/g 0.74U pg/g 0.27U pg/g
SSAJ8-02-15BPC**	1,2,3,4,6,7,8-HpCDD OCDD	0.49 pg/g 1.2 pg/g	0.49U pg/g 1.2U pg/g

Samples EB06242010-RZD, EB0624010-RZB, and EB-06252010-RZD 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
EB06242010-RZD	6/24/10	1,2,3,7,8-PeCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 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	4.3 pg/L 3.7 pg/L 4.1 pg/L 9.7 pg/L 16 pg/L 5.1 pg/L 6.7 pg/L 11 pg/L 7.6 pg/L 3.9 pg/L 4.4 pg/L 20 pg/L 13 pg/L 53 pg/L	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD
EB0624010-RZB	6/24/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.1 pg/L 7.4 pg/L 5.5 pg/L 11 pg/L 3.7 pg/L 22 pg/L	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_FD
EB-06252010-RZD	6/25/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	5.0 pg/L 10 pg/L 2.9 pg/L 3.9 pg/L 3.3 pg/L 12 pg/L 4.3 pg/L 25 pg/L	SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC**

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

Samples FB-04072010-RZD (from SDG G0D090441) and FB-04062010-RZB (from SDG G0D120488) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-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	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC**

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_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. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

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

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAR4-04-2.00BPC	^{13}C-OCDD	29 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAJ8-01-6.00BPC	^{13}C-OCDD	33 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) 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
SSAR4-04-3.00BPC** SSAK8-03-5BPC SSAJ8-02-5BPC SSAJ8-02-10BPC EB06242010-RZD EB-06252010-RZD	2,3,7,8-TCDF	2nd column confirmation was not performed for this compound.	This compound must be confirmed on the 2nd column per the method.	None	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0F260448	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 G0F260448	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 SSAR4-04-1.00BPC and SSAR4-04-1.00BPC_FD, samples SSAJ8-01-6.00BPC and SSAJ8-01-6.00BPC_FD, and samples SSAK8-03-15BPC** and SSAK8-03-15BPC_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
	SSAR4-04-1.00BPC	SSAR4-04-1.00BPC_FD				
1,2,3,4,7,8-HxCDD	0.12	0.14	-	0.02 (≤2.6)	-	-
1,2,3,6,7,8-HxCDD	0.24	0.27	-	0.03 (≤2.6)	-	-
1,2,3,7,8,9-HxCDD	0.31	0.27	-	0.04 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	0.55	0.73	-	0.18 (≤2.6)	-	-
OCDD	2.7	3.8	-	1.1 (≤5.3)	-	-
2,3,7,8-TCDF	0.57	0.43	-	0.14 (≤0.53)	-	-
1,2,3,7,8-PeCDF	0.72	0.43	-	0.29 (≤2.6)	-	-
2,3,4,7,8-PeCDF	0.40	0.33	-	0.07 (≤2.6)	-	-
1,2,3,4,7,8-HxCDF	1.1	0.70	-	0.4 (≤2.6)	-	-
1,2,3,6,7,8-HxCDF	0.79	0.46	-	0.33 (≤2.6)	-	-
2,3,4,6,7,8-HxCDF	0.17	0.15	-	0.02 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.27	0.16	-	0.11 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDF	2.6	1.7	-	0.9 (≤2.6)	-	-
1,2,3,4,7,8,9-HpCDF	0.98	0.57	-	0.41 (≤2.6)	-	-
OCDF	6.3	4.1	-	2.2 (≤5.3)	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAJ8-01-6.00BPC	SSAJ8-01-6.00BPC_FD				
2,3,7,8-TCDD	0.36	0.26	-	0.1 (≤0.54)	-	-
1,2,3,7,8-PeCDD	1.2	0.7	-	0.5 (≤2.7)	-	-
1,2,3,4,7,8-HxCDD	0.96	0.65	-	0.31 (≤2.7)	-	-
1,2,3,6,7,8-HxCDD	1.5	1.0	-	0.5 (≤2.7)	-	-
1,2,3,7,8,9-HxCDD	1.2	0.90	-	0.3 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDD	5.6	4.4	-	1.2 (≤2.7)	-	-
OCDD	7.0	5.1	-	1.9 (≤5.4)	-	-
2,3,7,8-TCDF	7.9	4.7	51 (≤50)	-	J (all detects)	A
1,2,3,7,8-PeCDF	16	9.6	-	6.4 (≤2.7)	J (all detects)	A
2,3,4,7,8-PeCDF	8.6	5.3	-	3.3 (≤2.7)	J (all detects)	A
1,2,3,4,7,8-HxCDF	30	21	35 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	21	15	33 (≤50)	-	-	-
2,3,4,6,7,8-HxCDF	4.6	3.8	-	0.8 (≤2.7)	-	-
1,2,3,7,8,9-HxCDF	4.0	2.7	-	1.3 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDF	83	62	29 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	35	31	12 (≤50)	-	-	-
OCDF	210	150	33 (≤50)	-	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK8-03-15BPC**	SSAK8-03-15BPC_FD**				
1,2,3,4,7,8-HxCDD	0.21	0.17	-	0.04 (≤2.6)	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK8-03-15BPC**	SSAK8-03-15BPC_FD**				
1,2,3,6,7,8-HxCDD	0.26	0.33	-	0.07 (≤2.6)	-	-
1,2,3,7,8,9-HxCDD	0.34	0.35	-	0.01 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	1.1	1.1	-	0 (≤2.6)	-	-
OCDD	2.1	2.0	-	0.1 (≤5.3)	-	-
2,3,7,8-TCDF	1.3	1.0	-	0.3 (≤0.53)	-	-
1,2,3,7,8-PeCDF	2.5	2.0	-	0.5 (≤2.6)	-	-
2,3,4,7,8-PeCDF	1.3	1.2	-	0.1 (≤2.6)	-	-
1,2,3,4,7,8-HxCDF	4.3	4.5	-	0.2 (≤2.6)	-	-
1,2,3,6,7,8-HxCDF	3.2	3.1	-	0.1 (≤2.6)	-	-
2,3,4,6,7,8-HxCDF	0.78	0.72	-	0.06 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.52	0.61	-	0.09 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDF	12	12	-	0 (≤2.6)	-	-
1,2,3,4,7,8,9-HpCDF	4.8	4.8	-	0 (≤2.6)	-	-
OCDF	24	24	-	0 (≤5.3)	-	-
1,2,3,7,8-PeCDD	2.6U	0.22	-	2.38 (≤2.6)	-	-

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0F260448

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F260448	SSAR4-04-2.00BPC SSAJ8-01-6.00BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0F260448	SSAR4-04-3.00BPC** SSAK8-03-5BPC SSAJ8-02-5BPC SSAJ8-02-10BPC EB06242010-RZD EB-06252010-RZD	2,3,7,8-TCDF	None	P	Project Quantitation Limit (2nd column confirmation) (o)
G0F260448	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_FD EB06242010-RZD SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD EB0624010-RZB SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC** EB-06252010-RZD	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0F260448	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_FD EB06242010-RZD SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD EB0624010-RZB SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC** EB-06252010-RZD	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)
G0F260448	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD	2,3,7,8-TCDF	J (all detects)	A	Field duplicates (RPD) (fd)
G0F260448	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD	1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF	J (all detects) J (all detects)	A	Field duplicates (Difference) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0F260448

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F260448	EB06242010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	9.7U pg/L 16U pg/L 11U pg/L 20U pg/L 13U pg/L 53U pg/L	A	bl
G0F260448	EB0624010-RZB	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.1U pg/L 7.4U pg/L 5.5U pg/L 11U pg/L 3.7U pg/L 22U pg/L	A	bl
G0F260448	EB-06252010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	5.0U pg/L 10U pg/L 3.9U pg/L 12U pg/L 4.3U pg/L 25U pg/L	A	bl
G0F260448	SSAR4-04-1.00BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.55U pg/g 2.7U pg/g	A	bl
G0F260448	SSAR4-04-2.00BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.57U pg/g 1.8U pg/g 0.26U pg/g	A	bl
G0F260448	SSAR4-04-3.00BPC**	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.37U pg/g 2.2U pg/g 0.40U pg/g	A	bl
G0F260448	SSAR4-04-1.00BPC_FD	2,3,7,8-TCDF	0.43U pg/g	A	bl
G0F260448	SSAK8-03-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.15U pg/g 0.58U pg/g 0.13U pg/g 0.20U pg/g 0.13U pg/g 0.37U pg/g 0.20U pg/g 0.86U pg/g	A	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F260448	SSAK8-03-10BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.18U pg/g 0.73U pg/g 0.095U pg/g 0.085U pg/g 0.21U pg/g 0.12U pg/g 0.76U pg/g	A	bl
G0F260448	SSAK8-03-15BPC**	OCDD	2.1U pg/g	A	bl
G0F260448	SSAK8-03-15BPC_FD**	OCDD	2.0U pg/g	A	bl
G0F260448	SSAJ8-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.11U pg/g 0.70U pg/g 0.12U pg/g 0.15U pg/g 0.055U pg/g 0.30U pg/g 0.13U pg/g 0.62U pg/g	A	bl
G0F260448	SSAJ8-02-10BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.25U pg/g 0.74U pg/g 0.27U pg/g	A	bl
G0F260448	SSAJ8-02-15BPC**	1,2,3,4,6,7,8-HpCDD OCDD	0.49U pg/g 1.2U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0F260448

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0F260448

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23663D21
SDG #: G0F260448
Laboratory: Test America

Date: 8/4/10
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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: 6/24-25/10
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	A	
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=1+4, 6+7, 11+12
XV.	Field blanks	SW	EB=5, 8, 16. FB (see WS)

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

1	SSAR4-04-1.00BPC S	11	SSAK8-03-15BPC** S	21	0182443MB	31	
2	SSAR4-04-2.00BPC	12	SSAK8-03-15BPC_FD**	22	0181166MB	32	
3	SSAR4-04-3.00BPC**	13	SSAJ8-02-5BPC	23		33	
4	SSAR4-04-1.00BPC_FD	14	SSAJ8-02-10BPC	24		34	
5	EB06242010-RZD W	15	SSAJ8-02-15BPC**	25		35	
6	SSAJ8-01-6.00BPC S	16	EB-06252010-RZD W	26		36	
7	SSAJ8-01-6.00BPC_FD	17	SSAR4-04-3.00BPCMS	27		37	
8	EB0624010-RZB W	18	SSAR4-04-3.00BPCMSD	28		38	
9	SSAK8-03-5BPC S	19		29		39	
10	SSAK8-03-10BPC S	20		30		40	

Notes: _____

LDC #: 23663021
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

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

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 #: 23663D2
SDG #: Beacon

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 #: 23663D21
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: 6/30/10 **Blank analysis date:** 7/9/10
Conc. units: pg/L **Associated samples:** All H2Os (bl)

Compound	Blank ID	Sample Identification									
	0181166MB	5X	5	8	16						
F	4.4	22	9.7/U	4.1/U	5.0/U						
G	6.3	31.5	16/U	7.4/U	10/U						
K	3.8	19	11/U	5.5/U	3.9/U						
O	7.5	37.5	20/U	11/U	12/U						
P	4.8	24	13/U	3.7/U	4.3/U						
Q	14	70	53/U	22/U	25/U						

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 #: 23663D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

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: 7/1/10 **Blank analysis date:** 7/11/10
Conc. units: pg/g **Associated samples:** All Soils (bl)

Compound	Blank ID	Sample Identification									
	0182443MB	5X	1	2	3	4	9	10	11	12	13
F	0.13	0.65	0.55/U	0.57/U	0.37/U		0.15/U	0.18/U			0.11/U
G	0.56	2.8	2.7/U	1.8/U	2.2/U		0.58/U	0.73/U	2.1/U	2.0/U	0.70/U
H	0.10	0.5		0.26/U	0.40/U	0.43/U	0.13/U				0.12/U
K	0.10	0.5					0.20/U	0.095/U			0.15/U
L	0.044	0.22					0.13/U	0.085/U			0.055/U
O	0.21	1.05					0.37/U	0.21/U			0.30/U
P	0.099	0.495					0.20/U	0.12/U			0.13/U
Q	0.68	3.4					0.86/U	0.76/U			0.62/U

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 #: 23663D21
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: 7/1/10 **Blank analysis date:** 7/11/10
Conc. units: pg/g **Associated samples:** All Soils (bl)

Compound	Blank ID	Sample Identification									
	0182443MB	5X	14	15							
F	0.13	0.65	0.25/U	0.49/U							
G	0.56	2.8	0.74/U	1.2/U							
H	0.10	0.5	0.27/U								
K	0.10	0.5									
L	0.044	0.22									
O	0.21	1.05									
P	0.099	0.495									
Q	0.68	3.4									

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 #: 23663D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: T
2nd Reviewer: N

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: 6/24/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 6 - 7 (> 5X)

Compound	Blank ID	Sample Identification								
	EB06242010-RZD	5X								
B	4.3	0.0215								
D	3.7	0.0185								
E	4.1	0.0205								
F	9.7	0.0485								
G	16	0.08								
H	5.1	0.0255								
I	6.7	0.0335								
K	11	0.055								
L	7.6	0.038								
M	3.9	0.0195								
N	4.4	0.022								
O	20	0.1								
P	13	0.065								
Q	53	0.265								
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 #: 23663D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer:
2nd Reviewer:

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

(Y) N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 6/24/10
Field blank type: (circle one) Field Blank / Rinsate / Other: FB Associated Samples: 1 - 4 (> 5X)

Compound	Blank ID	Sample Identification								
	EB06242010-RZB	5X								
F	4.1	0.0205								
G	7.4	0.037								
K	5.5	0.0275								
O	11	0.055								
P	3.7	0.0185								
Q	22	0.11								
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 #: 23663D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: T
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: 6/25/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 9 - 15 (> 5X)

Compound	Blank ID	Sample Identification								
	EB ~~EB~~06252010-RZD	5X								
F	5.0	0.025								
G	10	0.05								
H	2.9	0.0145								
K	3.9	0.0195								
L	3.3	0.0165								
O	12	0.06								
P	4.3	0.0215								
Q	25	0.125								
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 #: 23663D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: [illegible]
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: 6 - 7, 9 - 15(>5X)

Compound	Blank ID	Sample Identification								
(G0D090441)	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 #: 23663D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: Y
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: 4/6/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1-4 (>5X)

Compound	Blank ID	Sample Identification								
(G0D120488)	FB04062010-RZB	5X								
E	0.68	0.0034								
F	2.5	0.0125								
G	6.2	0.031								
H	2.7	0.0135								
K	1.4	0.007								
L	0.82	0.0041								
N	0.94	0.0047								
O	1.8	0.009								
P	1.2	0.006								
Q	4.4	0.022								
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 #: 23663D2/
SDG #: Second Column

VALIDATION FINDINGS WORKSHEET
Internal Standards

Reviewer:
2nd Reviewer:

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

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
		2	I	29	(40-135)	J/UN/P (E.Q)
					( )	
		6	I	33	( )	
					( )	
					( )	
		IT (MS)	I	37	(40-135)	No Recal
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	
					( )	

	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 #: 23663D2/
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

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 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
		3, 9, 13, 14, 5, 16	No 2,3,7,8-TCDF confirmation		None/P
		all	2MPC	all	VR(IC)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23663D21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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) 1	Concentration (pg/g) 4	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
C	0.12	0.14		0.02	(≤2.6)	
D	0.24	0.27		0.03	(≤2.6)	
E	0.31	0.27		0.04	(≤2.6)	
F	0.55	0.73		0.18	(≤2.6)	
G	2.7	3.8		1.1	(≤5.3)	
H	0.57	0.43		0.14	(≤0.53)	
I	0.72	0.43		0.29	(≤2.6)	
J	0.40	0.33		0.07	(≤2.6)	
K	1.1	0.70		0.4	(≤2.6)	
L	0.79	0.46		0.33	(≤2.6)	
M	0.17	0.15		0.02	(≤2.6)	
N	0.27	0.16		0.11	(≤2.6)	
O	2.6	1.7		0.9	(≤2.6)	
P	0.98	0.57		0.41	(≤2.6)	
Q	6.3	4.1		2.2	(≤5.3)	

Compound	Concentration (pg/g) 6	Concentration (pg/g) 7	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
A	0.36	0.26		0.1	(≤0.54)	
B	1.2	0.70		0.5	(≤2.7)	
C	0.96	0.65		0.31	(≤2.7)	
D	1.5	1.0		0.5	(≤2.7)	
E	1.2	0.90		0.3	(≤2.7)	
F	5.6	4.4		1.2	(≤2.7)	
G	7.0	5.1		1.9	(≤5.4)	
H	7.9	4.7	51			Jdet3/B (Htd)
I	16	9.6		6.4	(≤2.7)	

LDC#: 22663D21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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) 6	Concentration (pg/g) 7	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
J	8.6	5.3		3.3	(≤2.7)	1 detect/A (fd)
K	30	21	35			
L	21	15	33			
M	4.6	3.8		0.8	(≤2.7)	
N	4.0	2.7		1.3	(≤2.7)	
O	83	62	29			
P	35	31	12			
Q	210	150	33			

Compound	Concentration (pg/g) 11	Concentration (pg/g) 12	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
C	0.21	0.17		0.04	(≤2.6)	
D	0.26	0.33		0.07	(≤2.6)	
E	0.34	0.35		0.01	(≤2.6)	
F	1.1	1.1		0	(≤2.6)	
G	2.1	2.0		0.1	(≤5.3)	
H	1.3	1.0		0.3	(≤0.53)	
I	2.5	2.0		0.5	(≤2.6)	
J	1.3	1.2		0.1	(≤2.6)	
K	4.3	4.5		0.2	(≤2.6)	
L	3.2	3.1		0.1	(≤2.6)	
M	0.78	0.72		0.06	(≤2.6)	
N	0.52	0.61		0.09	(≤2.6)	
O	12	12		0	(≤2.6)	
P	4.8	4.8		0	(≤2.6)	
Q	24	24		0	(≤5.3)	
B	2.6U	0.22		2.38	(<2.6)	

LDC #: 23663D2
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: 9
2nd Reviewer: [illegible]

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 (405)	5/18/10	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	8.35	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	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 #: 33623D2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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

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	IN404D5	7/11/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.004	1.05	1.05	4.3	4.3
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.049	0.99	0.99	5.2	5.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.15	1.15	1.3	1.3
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.073	1.06	1.06	1.3	1.3
			OCDF (^{13}C-OCDD)	1.523	1.50	1.50	1.5	1.5
2	12L404D5	7/12/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.004	0.92	0.92	8.7	8.7
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.049	0.91	0.91	13.0	13.0
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.08	1.08	7.5	7.5
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.073	1.02	1.02	4.9	4.9
			OCDF (^{13}C-OCDD)	1.523	1.39	1.39	9.0	9.0
3	15L405D2	7/15/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	0.88	0.88	18.8	18.8
			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)					

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 #: 36631-1
SDG #: Second

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer:
2nd Reviewer:

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

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

% Recovery = 100 * (SSR - SR)/SA 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: 17/18

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	21.3	21.0	ND	20.8	21.1	98	98	100	100	1.4	1.4
1,2,3,7,8-PeCDD	106	105	V	109	108	103	103	103	103	1.1	1.0
1,2,3,4,7,8-HxCDD	↓	↓	0.068	127	121	119	120	115	115	4.4	4.8
1,2,3,4,7,8,9-HpCDF	↓	↓	0.56	121	113	113	114	107	107	6.5	6.8
OCDF	213	210	3.6	236	225	109	109	105	105	4.9	4.8

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 #: 36632
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: T
2nd Reviewer: L

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: 0182443

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	19.5	NA	98	98				
1,2,3,7,8-PeCDD	100	↓	98.7	↓	99	99				
1,2,3,4,7,8-HxCDD	↓	↓	112	↓	112	112				
1,2,3,4,7,8,9-HpCDF	↓	↓	105	↓	105	105				
OCDF	200	↓	206	↓	103	103				

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	$C_{12}H_3{}^{35}Cl_5{}^{37}ClO$	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 #: 23663D2I
SDG #: Hercules

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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. 3 . F :

Conc. = $\frac{(174155)(2000)(\quad)}{(9141000)(1.073)(10.26)(0.93)}$

= 0.37 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: June 29 through June 30, 2010

LDC Report Date: August 9, 2010

Matrix: Soil/Water

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0G010578

Sample Identification

SSAK3-06-1BPC
SSAK3-06-2BPC
SSAJ2-05-1BPC
SSAJ2-05-5BPC_FD
SSAJ2-05-5BPC
SSAJ2-05-10BPC**
SSAK5-05-1BPC
SSAK5-05-9BPC
SSAK6-05-1BPC
SSAK6-05-1BPC_FD
EB-06292010-RZD
SA94-0BPC
SA105-0BPC
SSAJ2-05-1BPCMS
SSAJ2-05-1BPCMSD
SSAK6-06-1BPC

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 15 soil samples and one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

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

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

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

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
0187271MB	7/6/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.49 pg/g 2.7 pg/g 0.21 pg/g 0.42 pg/g 0.28 pg/g 0.76 pg/g	All soil samples in SDG G0G010578
0188260MB	7/7/10	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 1,2,3,4,7,8,9-HpCDF OCDF	1.8 pg/L 1.5 pg/L 2.8 pg/L 11 pg/L 1.4 pg/L 1.8 pg/L 2.0 pg/L 1.7 pg/L 1.5 pg/L 3.8 pg/L 1.1 pg/L 8.2 pg/L	All water samples in SDG G0G010578

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
SSAK3-06-2BPC	OCDD	12 pg/g	12U pg/g
SSAK5-05-9BPC	1,2,3,4,6,7,8-HpCDD OCDD	1.0 pg/g 2.8 pg/g	1.0U pg/g 2.8U pg/g
EB-06292010-RZD	OCDD 1,2,3,4,6,7,8-HpCDF	13 pg/L 5.5 pg/L	13U pg/L 5.5U pg/L

Sample EB-06292010-RZD 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-06292010-RZD	6/29/10	OCDD 1,2,3,4,6,7,8-HpCDF	13 pg/L 5.5 pg/L	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK5-05-9BPC SSAK6-05-1BPC SSAK6-05-1BPC_FD SSAK6-06-1BPC

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

Samples FB-04072010-RZD (from SDG G0D090441) and FB-04072010-RZC (from SDG G0D130519) 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	0.89 pg/L	SSAK3-06-1BPC
		1,2,3,7,8,9-HxCDD	1.5 pg/L	SSAK3-06-2BPC
		1,2,3,4,6,7,8-HpCDD	2.2 pg/L	SSAJ2-05-1BPC
		OCDD	8.3 pg/L	SSAJ2-05-5BPC_FD
		1,2,3,4,7,8-HxCDF	1.4 pg/L	SSAJ2-05-5BPC
		1,2,3,6,7,8-HxCDF	1.6 pg/L	SSAJ2-05-10BPC**
		2,3,4,6,7,8-HxCDF	1.5 pg/L	SSAK5-05-1BPC
		1,2,3,7,8,9-HxCDF	1.6 pg/L	SSAK5-05-9BPC
		1,2,3,4,6,7,8-HpCDF	1.3 pg/L	SSAK6-05-1BPC
		1,2,3,4,7,8,9-HpCDF	1.4 pg/L	SSAK6-05-1BPC_FD
		OCDF	4.1 pg/L	SSAK6-06-1BPC
FB-04072010-RZC	4/8/10	1,2,3,4,7,8-HxCDD	0.77 pg/L	SA94-0BPC
		1,2,3,6,7,8-HxCDD	0.74 pg/L	SA105-0BPC
		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 the QC limits. Since the samples were diluted out, no data were qualified.

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

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

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK3-06-1BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-OCDD	38 (40-135) 21 (40-135)	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
SSAK3-06-2BPC	^{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) 11 (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
SSAJ2-05-5BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD	39 (40-135) 28 (40-135)	1,2,3,4,6,7,8-HpCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ2-05-10BPC**	^{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) 39 (40-135) 32 (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
SSAK5-05-9BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	30 (40-135) 31 (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
SSAK6-05-1BPC	^{13}C-OCDD	38 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAK6-05-1BPC_FD	^{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) 31 (40-135) 17 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK6-06-1BPC	^{13}C-2,3,7,8-TCDF ^{13}C-2,3,7,8-TCDD ^{13}C-1,2,3,7,8-PeCDF ^{13}C-1,2,3,7,8-PeCDD ^{13}C-1,2,3,4,7,8-HxCDF ^{13}C-1,2,3,6,7,8-HxCDD ^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	24 (40-135) 22 (40-135) 25 (40-135) 28 (40-135) 24 (40-135) 24 (40-135) 14 (40-135) 14 (40-135) 9.9 (40-135)	All TCL compounds	J (all detects) UJ (all non-detects)	P
SA105-0BPC	^{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) 39 (40-135) 22 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

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
SSAJ2-05-1BPC	2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P
SSAJ2-05-5BPC_FD	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)	P
SSAJ2-05-5BPC	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)	P
SSAK6-05-1BPC	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

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK6-05-1BPC_FD	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) 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
SA94-0BPC	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
SA105-0BPC	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

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0G010578	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 G0G010578	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 SSAJ2-05-5BPC and SSAJ2-05-5BPC_FD and samples SSAK6-05-1BPC and SSAK6-05-1BPC_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
	SSAK6-05-1BPC	SSAK6-05-1BPC_FD				
2,3,7,8-TCDD	61	74	19 (≤50)	-	-	-
1,2,3,7,8-PeCDD	250	240	4 (≤50)	-	-	-
1,2,3,4,7,8-HxCDD	200	210	5 (≤50)	-	-	-
1,2,3,6,7,8-HxCDD	390	340	14 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	340	280	19 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	1100	1200	9 (≤50)	-	-	-
OCDD	1200	1200	0 (≤50)	-	-	-
2,3,7,8-TCDF	1700	1700	0 (≤50)	-	-	-
1,2,3,7,8-PeCDF	3900	3300	17 (≤50)	-	-	-
2,3,4,7,8-PeCDF	2400	1900	23 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	6800	5600	19 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	5000	4000	22 (≤50)	-	-	-
2,3,4,6,7,8-HxCDF	1000	900	11 (≤50)	-	-	-
1,2,3,7,8,9-HxCDF	1200	830	36 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDF	19000	15000	24 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	8200	7400	10 (≤50)	-	-	-
OCDF	54000	46000	16 (≤50)	-	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAJ2-05-5BPC_FD	SSAJ2-05-5BPC				
2,3,7,8-TCDD	130	190	38 (≤50)	-	-	-
1,2,3,7,8-PeCDD	530	610	14 (≤50)	-	-	-
1,2,3,4,7,8-HxCDD	420	430	2 (≤50)	-	-	-
1,2,3,6,7,8-HxCDD	760	860	12 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	680	730	7 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	2700	3600	29 (≤50)	-	-	-
OCDD	3100	3600	15 (≤50)	-	-	-
2,3,7,8-TCDF	3200	4200	27 (≤50)	-	-	-
1,2,3,7,8-PeCDF	9600	13000	30 (≤50)	-	-	-
2,3,4,7,8-PeCDF	5200	6700	25 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	19000	23000	19 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	11000	15000	31 (≤50)	-	-	-
2,3,4,6,7,8-HxCDF	2700	3700	31 (≤50)	-	-	-
1,2,3,7,8,9-HxCDF	2300	3300	36 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDF	50000	66000	28 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	26000	35000	30 (≤50)	-	-	-
OCDF	150000	200000	29 (≤50)	-	-	-

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0G010578

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0G010578	SSAK3-06-1BPC	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)
G0G010578	SSAK3-06-2BPC SSAJ2-05-10BPC** SSAK5-05-9BPC SSAK6-05-1BPC_FD SA105-0BPC	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)
G0G010578	SSAJ2-05-5BPC	1,2,3,4,6,7,8-HpCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0G010578	SSAK6-05-1BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0G010578	SSAK6-06-1BPC	All TCL compounds	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0G010578	SSAJ2-05-1BPC	2,3,7,8-TCDF	J (all detects)	P	Project Quantitation Limit (e)
G0G010578	SSAJ2-05-5BPC_FD	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)	P	Project Quantitation Limit (e)
G0G010578	SSAJ2-05-5BPC	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)	P	Project Quantitation Limit (e)
G0G010578	SSAK6-05-1BPC	2,3,7,8-TCDF OCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0G010578	SSAK6-05-1BPC_FD	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	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)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0G010578	SA94-0BPC	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)
G0G010578	SA105-0BPC	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)
G0G010578	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK5-05-9BPC SSAK6-05-1BPC SSAK6-05-1BPC_FD EB-06292010-RZD SA94-0BPC SA105-0BPC SSAK6-06-1BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0G010578	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK5-05-9BPC SSAK6-05-1BPC SSAK6-05-1BPC_FD EB-06292010-RZD SA94-0BPC SA105-0BPC SSAK6-06-1BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0G010578

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0G010578	SSAK3-06-2BPC	OCDD	12U pg/g	A	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0G010578	SSAK5-05-9BPC	1,2,3,4,6,7,8-HpCDD OCDD	1.0U pg/g 2.8U pg/g	A	bl
G0G010578	EB-06292010-RZD	OCDD 1,2,3,4,6,7,8-HpCDF	13U pg/L 5.5U pg/L	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0G010578

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0G010578

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23663E21
SDG #: G0G010578
Laboratory: Test America

Date: 8/4/10
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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: 6/29-30/10
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	4/15 ~~20~~ No Qual (20 x)
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 = 5 + 4 . 9 + 10
XV.	Field blanks	SW	~~EB~~ = 11 . FBs (see WS)

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

1	SSAK3-06-1BPC S	11	EB-06292010-RZD W	21	01872 71MB	31	
2	SSAK3-06-2BPC	12	SA94-0BPC S	22	01882 60MB	32	
3	SSAJ2-05-1BPC	13	SA105-0BPC	23		33	
4	SSAJ2-05-5BPC_FD	14	SSAJ2-05-1BPCMS	24		34	
5	SSAJ2-05-5BPC	15	SSAJ2-05-1BPCMSD	25		35	
6	SSAJ2-05-10BPC**	16	SSAK6-06-1BPC	26		36	
7	SSAK5-05-1BPC	17		27		37	
8	SSAK5-05-9BPC	18		28		38	
9	SSAK6-05-1BPC	19		29		39	
10	SSAK6-05-1BPC_FD	20		30		40	

Notes: _____

LDC #: 23663E21
SDG #: Barcoue

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 #: 23622/
SDG #: Recover

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 #: 23663E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer: 6

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: 7/6/10 **Blank analysis date:** 7/14/10
Conc. units: pg/g **Associated samples:** All Soils (bl)

Compound	Blank ID	Sample Identification									
	0187271MB	5X	2	8							
F	0.49	2.45		1.0/U		all s > 5X					
G	2.7	13.5	12/U	2.8/U							
K	0.21	1.05									
O	0.42	2.1									
P	0.28	1.4									
Q	0.76	3.8									

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 #: 23663E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer: lw

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: 7/7/10 **Blank analysis date:** 7/12/10
Conc. units: pg/L **Associated samples:** All H2Os (bl)

Compound	Blank ID	Sample Identification									
	0188260MB	5X	11								
C	1.8	9									
D	1.5	7.5									
F	2.8	14									
G	11	55	13/U								
H	1.4	7									
K	1.8	9									
L	2.0	10									
M	1.7	8.5									
N	1.5	7.5									
O	3.8	19	5.5/U								
P	1.1	5.5									
Q	8.2	41									

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 #: 23663E21
~~SDG #~~: _____

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: a
2nd Reviewer: R

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: 6/29/10
Field blank type: (circle one) Field Blank / Rinsate / (Other) EB Associated Samples: 1-10, 16 (25x)

Compound	Blank ID	Sample Identification								
	11									
C	13									
D	5.5									
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 #: 23663E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: [illegible]
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: 16, 1 - 10 (>5X)

Compound	Blank ID	Sample Identification								
(G0D090441)	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 #:23663E21
SDG #:See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 1
2nd Reviewer: 2

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: 12 - 13 (>5X)

Compound	Blank ID	Sample Identification								
(C0D130519)	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 #: 23663-1
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 (i)
		1	F	38	(40-135)		J/UJ/P (F. 0-Q)
			1	21	( )		
					( )		
		2	F	24	( )		(F-F. 0-Q)
			H	29	( )		
			1	11	( )		
					( )		
		5	F	39	( )		(F. 0-Q)
			H	28	( )		
					( )		
		6	F	33	( )		
			H	39	( )		
			1	32	( )		
					( )		
		8	F	30	( )		
			H	31	( )		
			1	20	( )		
					( )		
		9	J	38	( )		
					( )		

	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 #: 26632 (2nd review)
SDG #: (2nd review)

VALIDATION FINDINGS WORKSHEET
Internal Standards

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)
		10	C	32	(40-135)		J/UJ/P (C-C, O-Q)
			H	31	( )		
			I	17	( )		
					( )		
		16	A	24	( )		(all)
			B	22	( )		
			C	25	( )		
			D	28	( )		
			E	24	( )		
			F	24	( )		
			G	14	( )		
			H	14	( )		
			I	9.9	( )		
					( )		
		13	C	35	( )		
			H	39	( )		
			I	22	( )		
					( )		
					( )		
					( )		

	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 #: 23663Z1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

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 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 (qds > calib range)	Associated Samples	Qualifications
		3	H	3	J detects/P
		4	O-Q	4	
		5	K, O-Q	5	
		9	H, Q	9	
		10	F, H-L, O-Q	10	
		12	H, I, K, L, O-Q	12	
		13	H, K, O-Q	13	J
		M1	2MPC	M1	J (K)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23663D21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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)		(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
	9	10				
A	61	74	19			
B	250	240	4			
C	200	210	5			
D	390	340	14			
E	340	280	19			
F	1100	1200	9			
G	1200	1200	0			
H	1700	1700	0			
I	3900	3300	17			
J	2400	1900	23			
K	6800	5600	19			
L	5000	4000	22			
M	1000	900	11			
N	1200	830	36			
O	19000	15000	24			
P	8200	7400	10			
Q	54000	46000	16			

Compound	Concentration (pg/g)		(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
	4	5				
A	130	190	38			
B	530	610	14			
C	420	430	2			
D	760	860	12			
E	680	730	7			
F	2700	3600	29			
G	3100	3600	15			

LDC#: 22663E21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

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

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)		(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
	4	5				
H	3200	4200	27			
I	9600	13000	30			
J	5200	6700	25			
K	19000	23000	19			
L	11000	15000	31			
M	2700	3700	31			
N	2300	3300	36			
O	50000	66000	28			
P	26000	35000	30			
Q	150000	200000	29			

V:\FIELD DUPLICATES\23663E21.wpd

LDC #:_____
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
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:

$RRF = (A_x)(C_s)/(A_s)(C_x)$
average RRF = sum of the RRFs/number of standards
$\%RSD = 100 * (S/X)$

A_x = Area of compound, A_s = Area of associated internal standard
C_x = Concentration of compound, C_s = 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 (405)	5/18/10	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	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 (105)	6/17/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.944	0.944	0.91	0.91	10.9	10.6
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.945	0.945	0.88	0.88	17.8	18.0
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.136	1.136	1.14	1.14	15.3	15.5
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.065	1.065	1.06	1.06	16.7	16.5
			OCDF (^{13}C-OCDD)	1.639	1.639	1.68	1.68	17.3	17.2

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 #: 22622A1
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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

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	13L101DS	7/14/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.944	0.91	0.91	3.9	3.9
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.945	0.93	0.93	1.2	1.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.136	1.12	1.12	1.3	1.3
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.065	1.08	1.08	1.0	1.0
			OCDF (^{13}C-OCDD)	1.639	1.57	1.57	4.3	4.3
2	17L405D2	7/17/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.04	1.04	4.3	4.2
			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)					
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 #: 26632/
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 = | LCS - LCSD | * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0187-T1

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	20.0	NA	100	100				
1,2,3,7,8-PeCDD	100	↓	101	↓	101	101				
1,2,3,4,7,8-HxCDD	↓	↓	110	↓	110	110				
1,2,3,4,7,8,9-HpCDF	↓	↓	110	↓	110	110				
OCDF	200	↓	195	↓	97	97				

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	$C_{12}H_3{}^{35}Cl_5{}^{37}ClO$	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 #: 23663C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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. 6 , A :

Conc. = $\frac{(1214466)(2000)(\quad)}{(11348000)(0.945)(10.76)(6.92)}$

= 2.4 pg/g

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