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

October 27, 2010

SUBJECT: Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada, Data Validation

Dear Ms. Arnold,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on September 30, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 24089:

SDG #	Fraction
G0G290426, G0H110567, G0H110575 G0H120594, G0H180547, G0H190584 G0H190600, G0H250498	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,

ERauto

Erlinda T. Rauto
Operations Manager/Senior Chemist

Stage 2B/4

LDC #24089 (Tronox LLC-Northgate, Henderson NV / Tronox PCS, Additional Sampling)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Dioxins (8290)																															
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	G0G290426	09/30/10	10/21/10	0	1																														
B	G0H110567	09/30/10	10/21/10	1	6																														
B	G0H110567	09/30/10	10/21/10	0	1																														
C	G0H110575	09/30/10	10/21/10	0	20																														
C	G0H110575	09/30/10	10/21/10	0	2																														
D	G0H120594	09/30/10	10/21/10	1	11																														
D	G0H120594	09/30/10	10/21/10	0	1																														
E	G0H180547	09/30/10	10/21/10	0	2																														
E	G0H180547	09/30/10	10/21/10	0	1																														
F	G0H190584	09/30/10	10/21/10	0	8																														
F	G0H190484	09/30/10	10/21/10	0	1																														
G	G0H190600	09/30/10	10/21/10	0	10																														
G	G0H190600	09/30/10	10/21/10	0	2																														
H	G0H250498	09/30/10	10/21/10	1	0																														
Total	T/LR			3	66	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	69

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

EDD CHECKLIST

LDC #: 24089
SDG #: G0G290426, G0H110567, G0H110575, G0H120594
G0H180547, G0H190584, G0H190600, G0H250498

Reviewer: TC
2nd Reviewer: JE

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_LDC24089_102710.doc
IV. EDD Delivery				
Was the final EDD sent to the client?	X			

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Collection Date:	June 29, 2010
LDC Report Date:	October 15, 2010
Matrix:	Soil
Parameters:	Dioxins/Dibenzofurans
Validation Level:	Stage 2B
Laboratory:	TestAmerica, Inc.

Sample Delivery Group (SDG): G0G290426

Sample Identification

SSAK6-06-2BPC
SSAK6-06-2BPCMS
SSAK6-06-2BPCMSD

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.

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
021094	7/29/10	OCDD	1.7 pg/g	All samples in SDG G0G290426

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:

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
021094	7/29/10	OCDD	1.7 pg/g	All samples in SDG G0G290426

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
SSAK6-06-2BPC	OCDD	7.2 pg/g	7.2U pg/g

No field blanks were identified in this SDG.

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
SSAK6-06-2BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	37 (40-135) 26 (40-135) 34 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	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.

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0G290426	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0G290426	All compounds reported by the lab 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 Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0G290426

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0G290426	SSAK6-06-2BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF 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)
G0G290426	SSAK6-06-2BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0G290426	SSAK6-06-2BPC	All compounds reported as EMPC.	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0G290426

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0G290426	SSAK6-06-2BPC	OCDD	7.2U pg/g	A	bl

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0G290426

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 24089A21
SDG #: G0G290426
Laboratory: Test America

Date: 10/12/10
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: 6/29/10
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	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

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

Validated Samples: SOIL

1	SSAK6-06-2BPC	11	021094	21		31	
2	SSAK6-06-2BPCMS	12		22		32	
3	SSAK6-06-2BPCMSD	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 #: 24089A2/

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

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 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?

Blank extraction date: 7/29/10 **Blank analysis date:** 8/13/10 **Associated samples:** All (bl)
Conc. units: pg/g

Compound	Blank ID	Sample Identification								
	0210294		1							
G	1.7		7.2/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 #: 24089A21

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

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	H	37 (40-135)	J/UJ/P (L) and F
			I	26 (↓)	G, Q
			G	34 (40-135)	Q, P
		2	H	37 ( )	no qual MS
			I	24 ( )	
			G	34 ( )	
		3	H	35 ( )	no qual MSD
			I	27 ( )	
			F	39 ( )	
			G	34 ( )	

	Internal Standards	Check Standard Used
A	^{13}C-2,3,7,8-TCDF	
B	^{13}C-2,3,7,8-TCDD	
C	^{13}C-1,2,3,7,8-PeCDF	
D	^{13}C-1,2,3,7,8-PeCDD	
F	^{13}C-1,2,3,6,7,8-HxCDF	
F	^{13}C-1,2,3,6,7,8-HxCDD	
G	^{13}C-1,2,3,4,6,7,8-HpCDF	
H	^{13}C-1,2,3,4,6,7,8-HpCDD	
I	^{13}C-OCDD	

	Recovery Standards	Check Standard Used
K	^{13}C-1,2,3,4-TCDD	
L	^{13}C-1,2,3,7,8,9-HxCDD	
M		
N		
O		
P		
Q		
R		
T		

LDC #: 24089A21
SDG #: pre cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: EJ
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
			All compound reported below PQL	All	J/A dit (sp)

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: August 7 through August 9, 2010

LDC Report Date: October 15, 2010

Matrix: Soil/Water

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0H110567

Sample Identification

SSAJ3-02-12BPC
SSAJ3-02-15BPC
SSAJ3-02-16BPC
SSAJ3-02-19BPC**
SSAJ3-02-8BPC_FD
SSAJ3-02-8BPC
SSAJ3-02-5BPC
EB-08072010

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 7 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.

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 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
0228363	8/16/10	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	0.12 pg/g 0.096 pg/g 0.80 pg/g 0.064 pg/g 0.26 pg/g 0.087 pg/g 0.16 pg/g	All soil samples in SDG G0H110567
0225283	8/13/10	OCDD	3.9 pg/L	All water samples in SDG G0H110567

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
SSAJ3-02-12BPC	1,2,3,7,8,9-HxCDD OCDD	0.20 pg/g 1.2 pg/g	0.20U pg/g 1.2U pg/g
SSAJ3-02-15BPC	1,2,3,7,8,9-HxCDD OCDD	0.15 pg/g 1.4 pg/g	0.15U pg/g 1.4U pg/g
SSAJ3-02-16BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.28 pg/g 0.27 pg/g 1.3 pg/g	0.28U pg/g 0.27U pg/g 1.3U pg/g
SSAJ3-02-19BPC**	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	0.16 pg/g 0.83 pg/g 0.24 pg/g 0.78 pg/g 0.29 pg/g	0.16U pg/g 0.83U pg/g 0.24U pg/g 0.78U pg/g 0.29U pg/g
SSAJ3-02-8BPC_FD	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.15 pg/g 0.36 pg/g 0.93 pg/g	0.15U pg/g 0.36U pg/g 0.93U pg/g
SSAJ3-02-8BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.16 pg/g 0.24 pg/g 1.5 pg/g	0.16U pg/g 0.24U pg/g 1.5U pg/g
SSAJ3-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF	0.21 pg/g 1.5 pg/g 0.23 pg/g 1.0 pg/g	0.21U pg/g 1.5U pg/g 0.23U pg/g 1.0U pg/g
EB-08072010	OCDD	7.6 pg/L	7.6U pg/L

Sample EB-08072010 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-08072010	8/13/10	OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	7.6 pg/L 1.5 pg/L 2.0 pg/L 1.0 pg/L 3.6 pg/L 9.5 pg/L	No associated samples in this SDG

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. The percent recoveries (%R) were within the 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
SSAJ3-02-16BPC	^{13}C-OCDD	32 (40-35)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAJ3-02-19BPC**	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	35 (40-35) 30 (40-35) 36 (40-35)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ3-02-8BPC_FD	^{13}C-OCDD	29 (40-35)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAJ3-02-5BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	35 (40-35) 19 (40-35) 37 (40-35)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which 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 PQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAJ3-02-12BPC SSAJ3-02-16BPC SSAJ3-02-19BPC** SSAJ3-02-8BPC SSAJ3-02-5BPC EB-08072010	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 G0H110567	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0H110567	All compounds reported by the lab 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 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 SSAJ3-02-8BPC_FD and SSAJ3-02-8BPC 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
	SSAJ3-02-8BPC_FD	SSAJ3-02-8BPC				
1,2,3,6,7,8-HxCDD	0.11	0.15	-	0.04 (≤2.7)	-	-
1,2,3,7,8,9-HxCDD	0.15	0.16	-	0.01 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDD	0.36	0.24	-	0.12 (≤2.7)	-	-
OCDD	0.93	1.5	-	0.57 (≤5.3)	-	-
2,3,7,8-TCDF	0.51U	0.37	-	0.14 (≤0.51)	-	-
1,2,3,7,8-PeCDF	0.52	0.48	-	0.04 (≤2.7)	-	-
2,3,4,7,8-PeCDF	0.30	0.24	-	0.06 (≤2.7)	-	-
1,2,3,4,7,8-HxCDF	1.0	0.67	-	0.33 (≤2.7)	-	-
1,2,3,6,7,8-HxCDF	0.73	0.68	-	0.05 (≤2.7)	-	-
2,3,4,6,7,8-HxCDF	0.23	0.16	-	0.07 (≤2.7)	-	-
1,2,3,7,8,9-HxCDF	0.29	0.26	-	0.03 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDF	2.6	1.9	-	0.7 (≤2.7)	-	-
1,2,3,4,7,8,9-HpCDF	0.98	0.75	-	0.23 (≤2.7)	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAJ3-02-8BPC_FD	SSAJ3-02-8BPC				
OCDF	5.3	4.4	-	0.9 (≤5.3)	-	-

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H110567

SDG	Sample	Compound	Flag	A or P	Reason
G0H110567	SSAJ3-02-16BPC SSAJ3-02-8BPC_FD	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0H110567	SSAJ3-02-19BPC** SSAJ3-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF 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)
G0H110567	SSAJ3-02-12BPC SSAJ3-02-16BPC SSAJ3-02-19BPC** SSAJ3-02-8BPC SSAJ3-02-5BPC EB-08072010	2,3,7,8-TCDF	None	P	Project Quantitation Limit (2nd column confirmation) (o)
G0H110567	SSAJ3-02-12BPC SSAJ3-02-15BPC SSAJ3-02-16BPC SSAJ3-02-19BPC** SSAJ3-02-8BPC_FD SSAJ3-02-8BPC SSAJ3-02-5BPC EB-08072010	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0H110567	SSAJ3-02-12BPC SSAJ3-02-15BPC SSAJ3-02-16BPC SSAJ3-02-19BPC** SSAJ3-02-8BPC_FD SSAJ3-02-8BPC SSAJ3-02-5BPC EB-08072010	All compounds reported by the lab as estimated maximum possible concentration (EMPC)	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H110567

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0H110567	SSAJ3-02-12BPC	1,2,3,7,8,9-HxCDD OCDD	0.20U pg/g 1.2U pg/g	A	bl
G0H110567	SSAJ3-02-15BPC	1,2,3,7,8,9-HxCDD OCDD	0.15U pg/g 1.4U pg/g	A	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0H110567	SSAJ3-02-16BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.28U pg/g 0.27U pg/g 1.3U pg/g	A	bl
G0H110567	SSAJ3-02-19BPC**	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	0.16U pg/g 0.83U pg/g 0.24U pg/g 0.78U pg/g 0.29U pg/g	A	bl
G0H110567	SSAJ3-02-8BPC_FD	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.15U pg/g 0.36U pg/g 0.93U pg/g	A	bl
G0H110567	SSAJ3-02-8BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.16U pg/g 0.24U pg/g 1.5U pg/g	A	bl
G0H110567	SSAJ3-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF	0.21U pg/g 1.5U pg/g 0.23U pg/g 1.0U pg/g	A	bl
G0H110567	EB-08072010	OCDD	7.6U pg/L	A	bl

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0H110567

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 24089B21
SDG #: G0H110567
Laboratory: Test America

Date: 10/12/10
Page: 1 of 1
Reviewer: F
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: 8/7 – 8/9/10
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	SSAJ3-03-5BPC MS/D
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	EB = 8

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

soil + water

1	SSAJ3-02-12BPC	11+	0228363	21		31	
2	SSAJ3-02-15BPC	12	0225283	22		32	
3	SSAJ3-02-16BPC	13		23		33	
4	SSAJ3-02-19BPC**	14		24		34	
5	SSAJ3-02-8BPC_FD	15		25		35	
6	SSAJ3-02-8BPC	16		26		36	
7	SSAJ3-02-5BPC	17		27		37	
8	EB-08072010	18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 24089 B2 1
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: EV
2nd Reviewer: CV

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 #: 24089B21
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

Reviewer:
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.	✓			
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 #: 24089 B2 |

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: B
2nd Reviewer: A

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

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

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?

Blank extraction date: 8/16/10 **Blank analysis date:** 8/20/10 **Associated samples:** All soils (bl)

Conc. units: pg/g

Compound	Blank ID	Sample Identification								
	0228363	5X	1	2	3	4	5	6	7	
E	0.12	0.6	0.20/U	0.15*/U	0.28/U	-	0.15/U	0.16/U	-	
F	0.096*	0.48	-	-	0.27/U	0.16*/U	0.36/U	0.24/U	0.21*/U	
G	0.80*	4	1.2*/U	1.4/U	1.3/U	0.83/U	0.93/U	1.5/U	1.5/U	
K	0.064*	0.32	-	-	-	0.24*/U	two -	-	0.23*/U	
B	0.26	1.3	-	-	-	0.78*/U	-	-	1.0/U	
P	0.087*	0.435	-	-	-	0.29/U	-	-	-	
Q	0.16*	0.80	-	-	-	-	-	-	-	

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 #: 24089B2 /

VALIDATION FINDINGS WORKSHEET
Blanks

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".

* EMPC

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?

Blank extraction date: 8/13/10 **Blank analysis date:** 8/18/10 **Associated samples:** all water (bl)

Conc. units: pg/L

Compound	Blank ID	Sample Identification								
	022528B	8								
G	3.9 *		7.6*/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 #: 24089B21

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: FZ
2nd Reviewer: Q

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

* EMPC

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 8/13/10
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: none

Compound	Blank ID	Sample Identification								
	8									
G	7.6 *									
H	1.5 *									
K	2.0 *									
L	1.0									
O	3.6 *									
P	9.5									
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 #: 24089B21

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: EZ
2nd Reviewer: CL

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
		3	I	32 (40-35)	J/UJ/P (i) and G,Q
				( )	
				( )	
		4	H	35 ( )	qual F
			I	30 ( )	G,Q
			G	36 ( )	Q,P
				( )	
				( )	
		5	I	29 ( )	G,Q
				( )	
				( )	
		7	H	35 ( )	F
			I	19 ( )	G,Q
			G	37 ( )	Q,P
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

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

LDC #: 24089B21

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

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~~ compd	Finding	Associated Samples	Qualifications
			All compounds reported below PQL	All	J/A detects (sp)
			All compounds reported as EMPC	All	JK detects (k)
		H	no 2nd column confirmation was performed	1, 3, 4, 6, 7, 8	none/p (o)

Comments: See sample calculation verification worksheet for recalculations

LDC#: 24089B21

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer:
2nd Reviewer:

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?

* EMPC

Compound	Concentration pg/g) 5	Concentration pg/g) 6	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
D	0.11 *	0.15 *	0.04	≤2.7	
E	0.15	0.16	0.01	≤2.7	
F	0.36	0.24 *	0.12	≤2.7	
G	0.93	1.5	0.57	≤5.3	
H	0.51U	0.37 *	0.14	≤0.51	
I	0.52 *	0.48	0.04	≤2.7	
J	0.30	0.24	0.06	≤2.7	
K	1.0	0.67	0.33	≤2.7	
L	0.73 *	0.68	0.05	≤2.7	
M	0.23 *	0.16	0.07	≤2.7	
N	0.29	0.26	0.03	≤2.7	
O	2.6	1.9	0.7	≤2.7	
P	0.98	0.75	0.23	≤2.7	
Q	5.3 *	4.4	0.9	≤5.3	

LDC #: 24089B21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: EV
2nd Reviewer: AV

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	7/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.002	1.002	1.1802	1.1802	4.19465	4.19465
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.166	1.166	1.0790	1.0790	8.10393	8.104
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.146	1.146	1.0831	1.0831	8.30657	8.306
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.086	1.086	1.0713	1.0713	6.01727	6.017
			OCDF (^{13}C-OCDD)	1.549	1.549	~~1.1802~~	1.4726	8.4155	8.415
2			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)			1.4726			
			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 #: 24089B21
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: EJ
2nd Reviewer: CL

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	CCV 21:35	8/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.002	1.002	0.90044	10.1	10.1
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.166	1.166	~~1.16617~~ 1.09631	6.0	6.0
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.146	1.146	1.16495	1.4	1.6
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.086	1.086	1.08079	0.5	0.5
			OCDF (^{13}C-OCDD)	1.549	1.549	1.44162	6.9	6.9
2			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					

Comments: Refer to 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 #: 24089B21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

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

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

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

% Recovery = 100 * (SSR - SR)/SA Where: SSR = Spiked sample result, SR = Sample result
SA = Spike added

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

MS/MSD samples: SSAI3-03-5BPC MS 1D

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	21.2	21.0	ND	18.2	18.7	86	86	89	89	2.7	2.7
1,2,3,7,8-PeCDD	106	105	ND	112	99.0	~~99~~ 105	105	94	94	12	12
1,2,3,4,7,8-HxCDD	↓	↓	↓	103	85.1	97	97	81	81	19	19
1,2,3,4,7,8,9-HpCDF	↓	↓	↓	~~106~~ 112	124	106	106	118	118	9.7	9.7
OCDF	212	210	0.62	253	259	119	119	123	123	23	23

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 #: 24089B21
SDG #: All Soils

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

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

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

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

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

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

LCS ID: 022 8363 LCS

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	17.1	NA	85	85				
1,2,3,7,8-PeCDD	100.0		86.6		87	87				
1,2,3,4,7,8-HxCDD	100.0		93.6		94	94				
1,2,3,4,7,8,9-HpCDF	100		78.9		79	79				
OCDF	200		169		84	84	NA			

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 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9338 375.8364 [354.9792]	M M+2 M M+2 M M+2 M M+2 M+2 LOCK	$C_{12}H_4{}^{35}Cl_4O$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10$ $^{13}C_{12}H_4{}^{35}Cl_4O$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$ $C_{12}H_4{}^{35}Cl_4O_2$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$ $^{13}C_{12}H_4{}^{35}Cl_4O_2$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$ $C_{12}H_4{}^{35}Cl_5{}^{37}ClO$ C_9F_{13}	TCDF TCDF TCDF (S) TCDF (S) TCDD TCDD TCDD (S) TCDD (S) HxCDPE PFK	4	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O$ $^{13}C_{12}H^{35}Cl_7O$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_6{}^{37}ClO_2$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$ $^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $C_{12}H^{35}Cl_7{}^{37}Cl_2O$ C_9F_{17}	HpCDF HpCDF HpCDF (S) HpCDF HpCDD HpCDD HpCDD (S) HpCDD (S) NCDPE PFK
2	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	M+2 M+4 M+2 M+4 M+2 M+4 M+2 M+4 M+2 LOCK	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $C_{12}H_3{}^{35}Cl_6{}^{37}ClO$ C_9F_{13}	PeCDF PeCDF PeCDF (S) PeCDF (S) PeCDD PeCDD PeCDD (S) PeCDD (S) HpCDPE PFK	5	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775 [422.9278]	M+2 M+4 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}{}^{35}Cl_7{}^{37}ClO$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O$ $C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $C_{12}{}^{35}Cl_8{}^{37}Cl_2O$ $C_{10}F_{17}$	OCDF OCDF OCDD OCDD OCDD (S) OCDD (S) DCDPE PFK
3	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$ $^{13}C_{12}H_2{}^{35}Cl_6O$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$ C_9F_{17}	HxCDF HxCDF HxCDF (S) HxCDF (S) HxCDD HxCDD HxCDD (S) HxCDD (S) OCDPE 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 #: 24089B21
SDG #: pc cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FJ
2nd reviewer: JV

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. 4 , OCDD :

Conc. = (596.79)(4000)( )
(263175.8)(1.197)(10.0)(0.916)

= 0.83 pg/g

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

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: August 7, 2010

LDC Report Date: October 15, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0H110575

Sample Identification

SSAI3-02-11BPC
SSAI3-02-14BPC
SSAI3-02-15BPC
SSAI3-02-19BPC**
SSAI3-02-25BPC
SSAI3-02-5BPC_FD
SSAI3-03-11BPC
SSAI3-03-14BPC
SSAI3-03-23BPC
SSAI3-03-25BPC**
SSAI3-04-11BPC
SSAI3-04-14BPC
SSAI3-04-14BPC_FD
SSAI3-04-15BPC
SSAI3-04-23BPC
SSAI3-04-25BPC
SSAI3-04-5BPC
SSAI3-02-8BPC
SSAI3-02-5BPC
SSAI3-03-8BPC
SSAI3-03-5BPC
SSAI3-04-8BPC
SSAI3-03-8BPCMS
SSAI3-03-8BPCMSD
SSAI3-03-5BPCMS
SSAI3-03-5BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 26 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.

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 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
0225295-MB	8/13/10	1,2,3,4,6,7,8-HpCDD OCDD	0.17 pg/g 0.66 pg/g	SSAI3-02-11BPC SSAI3-02-14BPC SSAI3-02-15BPC SSAI3-02-19BPC** SSAI3-02-25BPC SSAI3-02-5BPC_FD SSAI3-03-11BPC SSAI3-03-14BPC SSAI3-03-23BPC SSAI3-03-25BPC** SSAI3-04-11BPC SSAI3-04-14BPC SSAI3-04-14BPC_FD SSAI3-04-15BPC SSAI3-04-23BPC SSAI3-04-25BPC SSAI3-02-8BPC SSAI3-02-5BPC SSAI3-03-8BPC SSAI3-03-5BPC
0228363-MB	8/16/10	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	0.12 pg/g 0.096 pg/g 0.80 pg/g 0.064 pg/g 0.26 pg/g 0.087 pg/g 0.16 pg/g	SSAI3-04-5BPC SSAI3-04-8BPC

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
SSAI3-02-11BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.27 pg/g 1.0 pg/g	0.27U pg/g 1.0U pg/g
SSAI3-02-14BPC	1,2,3,4,6,7,8-HpCDD	0.61 pg/g	0.61U pg/g
SSAI3-02-15BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.18 pg/g 1.2 pg/g	0.18U pg/g 1.2U pg/g
SSAI3-02-19BPC**	OCDD	2.0 pg/g	2.0U pg/g
SSAI3-02-25BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.12 pg/g 1.6 pg/g	0.12U pg/g 1.6U pg/g
SSAI3-02-5BPC_FD	1,2,3,4,6,7,8-HpCDD OCDD	0016 pg/g 0.93 pg/g	0016U pg/g 0.93U pg/g

Sample	Compound	Reported Concentration	Modified Final Concentration
SSAI3-03-11BPC	OCDD	0.55 pg/g	0.55U pg/g
SSAI3-03-23BPC	OCDD	1.5 pg/g	1.5U pg/g
SSAI3-03-25BPC**	1,2,3,4,6,7,8-HpCDD OCDD	0.10 pg/g 1.0 pg/g	0.10U pg/g 1.0U pg/g
SSAI3-04-11BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.20 pg/g 1.0 pg/g	0.20U pg/g 1.0U pg/g
SSAI3-04-14BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.22 pg/g 1.7 pg/g	0.22U pg/g 1.7U pg/g
SSAI3-04-14BPC_FD	OCDD	0.55 pg/g	0.55U pg/g
SSAI3-04-15BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.20 pg/g 1.9 pg/g	0.20U pg/g 1.9U pg/g
SSAI3-04-23BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.18 pg/g 0.75 pg/g	0.18U pg/g 0.75U pg/g
SSAI3-04-25BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.086 pg/g 0.75 pg/g	0.086U pg/g 0.75U pg/g
SSAI3-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.28 pg/g 1.9 pg/g	0.28U pg/g 1.9U pg/g
SSAI3-02-8BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.36 pg/g 1.6 pg/g	0.36U pg/g 1.6U pg/g
SSAI3-03-5BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.35 pg/g 2.4 pg/g	0.35U pg/g 2.4U pg/g
SSAI3-03-8BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.16 pg/g 0.81 pg/g	0.16U pg/g 0.81U pg/g
SSAI3-04-5BPC	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 OCDF	0.18 pg/g 0.17 pg/g 1.2 pg/g 0.22 pg/g 0.27 pg/g 0.62 pg/g	0.18U pg/g 0.17U pg/g 1.2U pg/g 0.22U pg/g 0.27U pg/g 0.62U pg/g

Sample	Compound	Reported Concentration	Modified Final Concentration
SSAI3-04-8BPC	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	0.26 pg/g 0.20 pg/g 2.4 pg/g 0.21 pg/g 0.47 pg/g	0.26U pg/g 0.20U pg/g 2.4U pg/g 0.21U pg/g 0.47U pg/g

Sample EB-08072010 (from SDG G0H110567) 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-08072010	8/7/10	OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	7.6 pg/L 1.5 pg/L 2.0 pg/L 1.0 pg/L 3.6 pg/L 9.5 pg/L	All samples in SDG G0H110575

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. The percent recoveries (%R) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

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

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAI3-02-19BPC**	^{13}C-OCDD	35 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-03-23BPC	^{13}C-OCDD	21 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-03-25BPC**	^{13}C-OCDD	39 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-04-14BPC_FD	^{13}C-OCDD	25 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-04-15BPC	^{13}C-OCDD	38 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-04-23BPC	^{13}C-OCDD	34 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-03-5BPC	^{13}C-OCDD	38 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-04-5BPC	^{13}C-OCDD	27 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAI3-04-8BPC	^{13}C-OCDD	32 (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 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 PQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAI3-02-15BPC SSAI3-02-19BPC** SSAI3-02-25BPC SSAI3-02-5BPC_FD SSAI3-03-23BPC SSAI3-04-11BPC SSAI3-04-14BPC SSAI3-04-5BPC SSAI3-02-8BPC SSAI3-03-8BPC SSAI3-03-5BPC	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 G0H110575	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0H110575	All compounds reported by the lab 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 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 SSAI3-02-5BPC_FD and SSAI3-02-5BPC and samples SSAI3-04-14BPC and SSAI3-04-14BPC_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
	SSAI3-02-5BPC_FD	SSAI3-02-5BPC				
1,2,3,6,7,8-HxCDD	0.12	2.7U	-	2.58 (≤2.7)	-	-
1,2,3,7,8,9-HxCDD	0.13	0.10	-	0.03 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDD	2.7U	0.28	-	2.42 (≤2.7)	-	-
OCDD	0.16	1.9	-	1.74 (≤5.4)	-	-
2,3,7,8-TCDF	0.93	0.54U	-	0.39 (≤0.54)	-	-
1,2,3,7,8-PeCDF	0.055	2.7U	-	2.645 (≤2.7)	-	-
2,3,4,7,8-PeCDF	0.089	2.7U	-	2.611 (≤2.7)	-	-
1,2,3,4,7,8-HxCDF	2.7U	0.16	-	2.54 (≤2.7)	-	-
1,2,3,6,7,8-HxCDF	2.7U	0.092	-	2.608 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDF	0.30	0.29	-	0.01 (≤2.7)	-	-
1,2,3,4,7,8,9-HpCDF	0.15	0.097	-	0.053 (≤2.7)	-	-
OCDF	0.65	0.65	-	0 (≤5.4)	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAI3-04-14BPC	SSAI3-04-14BPC_FD				
1,2,3,6,7,8-HxCDD	0.16	0.25	-	0.09 (≤2.7)	-	-
1,2,3,7,8,9-HxCDD	0.17	0.14	-	0.03 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDD	0.22	2.5U	-	2.28 (≤2.5)	-	-
OCDD	1.7	0.55	-	1.15 (≤5.3)	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAI3-04-14BPC	SSAI3-04-14BPC_FD				
2,3,7,8-TCDF	0.086	0.50U	-	0.414 (≤0.50)	-	-
1,2,3,4,7,8-HxCDF	0.31	0.13	-	0.18 (≤2.7)	-	-
1,2,3,6,7,8-HxCDF	0.12	0.085	-	0.035 (≤2.7)	-	-
1,2,3,7,8,9-HxCDF	0.075	2.5U	-	2.425 (≤2.5)	-	-
1,2,3,4,6,7,8-HpCDF	0.56	0.32	-	0.24 (≤2.7)	-	-
1,2,3,4,7,8,9-HpCDF	0.095	2.5U	-	2.405 (≤2.5)	-	-
OCDF	0.98	0.73	-	0.25 (≤5.3)	-	-

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H110575

SDG	Sample	Compound	Flag	A or P	Reason
G0H110575	SSAI3-02-19BPC** SSAI3-03-23BPC SSAI3-03-25BPC** SSAI3-04-14BPC_FD SSAI3-04-15BPC SSAI3-04-23BPC SSAI3-03-5BPC SSAI3-04-5BPC SSAI3-04-8BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0H110575	SSAI3-02-15BPC SSAI3-02-19BPC** SSAI3-02-25BPC SSAI3-02-5BPC_FD SSAI3-03-23BPC SSAI3-04-11BPC SSAI3-04-14BPC SSAI3-04-5BPC SSAI3-02-8BPC SSAI3-03-8BPC SSAI3-03-5BPC	2,3,7,8-TCDF	None	P	Project Quantitation Limit (2nd column confirmation) (o)
G0H110575	SSAI3-02-11BPC SSAI3-02-14BPC SSAI3-02-15BPC SSAI3-02-19BPC** SSAI3-02-25BPC SSAI3-02-5BPC_FD SSAI3-03-11BPC SSAI3-03-14BPC SSAI3-03-23BPC SSAI3-03-25BPC** SSAI3-04-11BPC SSAI3-04-14BPC SSAI3-04-14BPC_FD SSAI3-04-15BPC SSAI3-04-23BPC SSAI3-04-25BPC SSAI3-04-5BPC SSAI3-02-8BPC SSAI3-02-5BPC SSAI3-03-8BPC SSAI3-03-5BPC SSAI3-04-8BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)

SDG	Sample	Compound	Flag	A or P	Reason
G0H110575	SSAI3-02-11BPC SSAI3-02-14BPC SSAI3-02-15BPC SSAI3-02-19BPC** SSAI3-02-25BPC SSAI3-02-5BPC_FD SSAI3-03-11BPC SSAI3-03-14BPC SSAI3-03-23BPC SSAI3-03-25BPC** SSAI3-04-11BPC SSAI3-04-14BPC SSAI3-04-14BPC_FD SSAI3-04-15BPC SSAI3-04-23BPC SSAI3-04-25BPC SSAI3-04-5BPC SSAI3-02-8BPC SSAI3-02-5BPC SSAI3-03-8BPC SSAI3-03-5BPC SSAI3-04-8BPC	All compounds reported by the lab as estimated maximum possible concentration (EMPC)	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H110575

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0H110575	SSAI3-02-11BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.27U pg/g 1.0U pg/g	A	bl
G0H110575	SSAI3-02-14BPC	1,2,3,4,6,7,8-HpCDD	0.61U pg/g	A	bl
G0H110575	SSAI3-02-15BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.18U pg/g 1.2U pg/g	A	bl
G0H110575	SSAI3-02-19BPC**	OCDD	2.0U pg/g	A	bl
G0H110575	SSAI3-02-25BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.12U pg/g 1.6U pg/g	A	bl
G0H110575	SSAI3-02-5BPC_FD	1,2,3,4,6,7,8-HpCDD OCDD	0016U pg/g 0.93U pg/g	A	bl
G0H110575	SSAI3-03-11BPC	OCDD	0.55U pg/g	A	bl
G0H110575	SSAI3-03-23BPC	OCDD	1.5U pg/g	A	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0H110575	SSAI3-03-25BPC**	1,2,3,4,6,7,8-HpCDD OCDD	0.10U pg/g 1.0U pg/g	A	bl
G0H110575	SSAI3-04-11BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.20U pg/g 1.0U pg/g	A	bl
G0H110575	SSAI3-04-14BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.22U pg/g 1.7U pg/g	A	bl
G0H110575	SSAI3-04-14BPC_FD	OCDD	0.55U pg/g	A	bl
G0H110575	SSAI3-04-15BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.20U pg/g 1.9U pg/g	A	bl
G0H110575	SSAI3-04-23BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.18U pg/g 0.75U pg/g	A	bl
G0H110575	SSAI3-04-25BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.086U pg/g 0.75U pg/g	A	bl
G0H110575	SSAI3-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.28U pg/g 1.9U pg/g	A	bl
G0H110575	SSAI3-02-8BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.36U pg/g 1.6U pg/g	A	bl
G0H110575	SSAI3-03-5BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.35U pg/g 2.4U pg/g	A	bl
G0H110575	SSAI3-03-8BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.16U pg/g 0.81U pg/g	A	bl
G0H110575	SSAI3-04-5BPC	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 OCDF	0.18U pg/g 0.17U pg/g 1.2U pg/g 0.22U pg/g 0.27U pg/g 0.62U pg/g	A	bl
G0H110575	SSAI3-04-8BPC	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	0.26U pg/g 0.20U pg/g 2.4U pg/g 0.21U pg/g 0.47U pg/g	A	bl

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0H110575

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 24089C21
SDG #: G0H110575
Laboratory: Test America

Date: 10/13/10
Page: 1 of 7
Reviewer:
2nd Reviewer:

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

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8/7/10
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 A	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= 6, 19 12, 13
XV.	Field blanks	SW	EB= EB-08072010 SDG# G0H110567

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

SOIL

1	SSAI3-02-11BPC	11	SSAI3-04-11BPC	21	SSAI3-03-5BPC ✓	31	1	0225295-MB
2	SSAI3-02-14BPC	12	SSAI3-04-14BPC D1	22	2 SSAI3-04-8BPC ✓	32	2	0228363-MB
3	SSAI3-02-15BPC	13	SSAI3-04-14BPC_FD D1	23	SSAI3-03-8BPCMS	33		
4	SSAI3-02-19BPC**	14	SSAI3-04-15BPC	24	SSAI3-03-8BPCMSD	34		
5	SSAI3-02-25BPC	15	SSAI3-04-23BPC	25	SSAI3-03-5BPCMS	35		
6	SSAI3-02-5BPC_FD D	16	SSAI3-04-25BPC ✓	26	SSAI3-03-5BPCMSD	36		
7	SSAI3-03-11BPC	17	2 SSAI3-04-5BPC ✓	27		37		
8	SSAI3-03-14BPC	18	SSAI3-02-8BPC ✓	28		38		
9	SSAI3-03-23BPC	19	SSAI3-02-5BPC D ✓	29		39		
10	SSAI3-03-25BPC**	20	SSAI3-03-8BPC ✓	30		40		

Notes:

LDC #: 24089C21
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: EV
2nd Reviewer: CV

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 #: 24089C21
SDG #: all cores

VALIDATION FINDINGS CHECKLIST

Reviewer:
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.		✓		
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 #: 24089C21

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 2
Reviewer: EJ
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".

* EMPC

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?

Blank extraction date: 8/13/10 **Blank analysis date:** 8/18/10 **Associated samples:** 1→16, 18→21 (bl)

Conc. units: pg/g

Compound	Blank ID	5X	Sample Identification							
	022529	5-MB	1	2	3	4	5	6	7	9
F	0.17*	0.85	0.27/4	0.61*/4	0.18*/4	-	0.12*/4	0.16*/4	-	-
G	0.66	3.3	1.0*/4	-	1.2/4	2.0/4	1.6/4	0.93/4	0.55*/4	1.5*/4
			10	11	12	13	14	15	16	19
↓	↓	↓	0.10*/4	0.20/4	0.22*/4	-	0.20/4	0.18/4	0.086*/4	0.28/4
↓	↓	↓	1.0/4	1.0/4	1.7/4	0.55*/4	1.9/4	0.75/4	0.81/4	1.9/4
			18	21	20					
↓	↓	↓	0.36/4	0.35*/4	0.16*/4					
↓	↓	↓	1.6/4	2.4/4	0.81/4					

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 #: 24089C21

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: FT
2nd Reviewer: [signature]

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

* EMPC

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?

Blank extraction date: 8/16/10 **Blank analysis date:** 8/20/10 **Associated samples:** 17, 22 (bl)

Conc. units: pg/g

Compound	Blank ID	5X	Sample Identification						
	0228363-MB		17	22					
E	0.12	0.6	0.18/4	0.26* 0.18/4					
F	0.096*	0.48	0.17*/4	0.20*/4					
G	0.80*	4.0	1.2/4	2.4*/4					
K	0.064*	0.32	0.22/4	0.21*/4					
O	0.26	1.3	0.27/4	0.47/4					
P	0.087*	0.43	-	-					
Q	0.16*	0.8	0.62/4	~~7.8~~ -					

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 #: 24089C2 /

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: EZ
2nd Reviewer: CF

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

EB = EB-080720ID
SDG# GOH110567

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 8/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: All (75%)

Compound	Blank ID	Sample Identification								
	EB	5X								
G	7.6*	38								
H	1.5*	7.5								
K	2.0*	10								
L	1.0	5								
O	3.6*	18								
Q	9.5	47.5								
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 #: 24089C21

VALIDATION FINDINGS WORKSHEET
Internal Standards

Reviewer: EF
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
		4	I	35 (40-135)	J/UJ/P (i) QUAL 6,8
				( )	
				( )	
		9	I	21 ( )	
				( )	
		10	I	39 ( )	
				( )	
		13	I	25 ( )	
				( )	
		14	I	38 ( )	
				( )	
		15	I	34 ( )	
				( )	
		~~20~~ 21	I	38 ( )	
				( )	
		~~22~~ 17	I	27 ( )	
				( )	
		22	I	32 (✓)	✓ ✓
				( )	
				( )	

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

LDC #: 24089C27

VALIDATION FINDINGS WORKSHEET
Internal Standards

Reviewer: FD
2nd Reviewer: Q

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
		26	H	37 (40-135)	no qual MSD
				( )	
				( )	
		25	I	30 ( )	MS
				( )	
		26	I	18 ( )	MSD
				( )	
				( )	
		26	G	35 ( )	MSD
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

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

LDC #: 24089C21

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

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

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

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

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

#	Date	Sample ID	Finding	Associated Samples	Qualifications
			All compounds reported below PQL	All	J/A detects (sp)
			All compounds reported as EMPC	All	JK detects (k)
		H	no 2nd column confirmation was performed	3, 4, 5, 6, 9, 11, 12, 17, 18, 20, 21	nme/p (o)

Comments: See sample calculation verification worksheet for recalculations

LDC#:24089C21 **VALIDATION FINDINGS WORKSHEET**
Field Duplicates

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

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?

*EMPC

Compound	Concentration pg/g) 6	Concentration pg/g) 19	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
D	0.12 *	2.7U	2.58	≤2.7	
E	0.13 *	0.10 *	0.03	≤2.7	
F	2.7U	0.28	2.42	≤2.7	
G	0.16 *	1.9	1.74	≤5.4	
H	0.93	0.54U	0.39	≤0.54	
I	0.055 *	2.7U	2.645	≤2.7	
J	0.089 *	2.7U	2.611	≤2.7	
K	2.7U	0.16	2.54	≤2.7	
L	2.7U	0.092	2.608	≤2.7	
O	0.30 *	0.29 *	0.01	≤2.7	
P	0.15 *	0.097	0.053	≤2.7	
Q	0.65 *	0.65	0	≤5.4	

LDC#: 24089C21

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: EJ
2nd Reviewer: VV

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

* EMPC

Compound	Concentration pg/g) 12	Concentration pg/g) 13	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
D	0.16 *	0.25 *	0.09	≤2.7	
E	0.17 *	0.14 *	0.03	≤2.7	
F	0.22 *	2.5U	2.28	≤2.5	
G	1.7	0.55 *	1.15	≤5.3	
H	0.086 *	0.50U	0.414	≤0.50	
K	0.31	0.13 *	0.18	≤2.7	
L	0.12	0.085	0.035	≤2.7	
N	0.075 *	2.5U	2.425	≤2.5	
O	0.56	0.32 *	0.24	≤2.7	
P	0.095 *	2.5U	2.405	≤2.5	
Q	0.98	0.73 *	0.25	≤5.3	

V:\FIELD DUPLICATES\24089C21.wpd

LDC #: 24089C21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (RRF3std)	Recalculated RRF (RRF3std)	Reported %RSD	Recalculated %RSD
1	ICAL	7/27/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.875	0.875	0.87	0.87	14.2	14.2
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.957	0.957	0.93	0.93	13.5	13.5
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.107	1.107	1.13	1.13	12.5	12.5
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.026	1.026	1.07	1.07	13.6	13.6
			OCDF (^{13}C-OCDD)	1.445	1.445	1.55	1.55	18.1	18.1
2	ICAL	8/16/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.00187	1.00187	1.00395	1.00395	4.19465	4.195
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.16617	1.16617	1.15763	1.15763	8.10393	8.104
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.14627	1.14627	1.16196	1.16196	8.30657	8.306
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.08646	1.08646	1.44726	1.44726	6.01727	6.017
			OCDF (^{13}C-OCDD)	1.54850	1.54850	1.58313	1.58313	5.88055	5.88
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 #: 24089C21
SDG #: per conv

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	CCV-55	8/18/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.875	0.78	0.78	10.6	10.6
	7:45		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.957	0.97	0.91	4.7	4.7
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.107	1.09	1.09	1.8	1.8
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.026	1.05	1.05	2.6	2.6
			OCDF (^{13}C-OCDD)	1.445	1.69	1.69	17.3	17.3
2	CCV-27	8/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.00187	~~1.00187~~	0.91896	8.3	8.3
	11:16		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.16617	~~1.16617~~	1.16555	0.1	0.1
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.14627	~~1.14627~~	1.13316	1.1	1.1
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.08646	~~1.08646~~	1.05840	2.6	2.6
			OCDF (^{13}C-OCDD)	1.54852	~~1.54852~~	1.39611	9.8	9.8
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)		0.91896			
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)		1.16555			
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)		1.13316			
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)		1.05840			
			OCDF (^{13}C-OCDD)		1.39611			

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 #: 24089C21
SDG #: [illegible]

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: EJ
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: 23 & 24

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	20.4	21.1	ND	17.9	19.5	88	88	92	92	8.3	8.3
1,2,3,7,8-PeCDD	102	106	ND	91.2	95.4	90	90	90	90	4.5	4.5
1,2,3,4,7,8-HxCDD	102	106	ND	103	114	101	101	108	108	9.7	9.7
1,2,3,4,7,8,9-HpCDF	94.3	94.3	0.14	94.3	94.3	92	92	89	89	0	0
OCDF	204	211	0.82	198	200	97	97	94	94	0.66	0.66

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 #: 24089C21
SDG #: per county

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FZ
2nd Reviewer: [signature]

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

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

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

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

LCS ID: 022595 LCS

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	17.9	NA	90	90				
1,2,3,7,8-PeCDD	100	↓	105	↓	105	105				
1,2,3,4,7,8-HxCDD	100		93.4		93	93				
1,2,3,4,7,8,9-HpCDF	100		95.8		96	96				
OCDF	200	↓	184	↓	92	92	NA			

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 #: 24089C2)
SDG #: pc cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: N

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. #4 . OCDD :

Conc. = (154343)(4000)( ) / (3/535/100)(1.09)(10.18)(0.912)

=

1.956 pg/g

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

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: August 10, 2010

LDC Report Date: October 15, 2010

Matrix: Soil/Water

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0H120594

Sample Identification

SSAJ2-06-3BPC
SSAJ2-06-5BPC
SSAJ3-05-12BPC
SSAJ3-05-16BPC
SSAJ3-05-1BPC
SSAJ3-05-5BPC
SSAJ3-05-8BPC
SSAJ3-07-12BPC
SSAJ3-07-17BPC
SSAJ3-07-1BPC
SSAJ3-07-5BPC
SSAJ3-07-8BPC**
EB-08102010
SSAJ3-05-12BPCMS
SSAJ3-05-12BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 14 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.

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 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
0228254-MB	8/16/10	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-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	2.5 pg/L 2.0 pg/L 2.6 pg/L 7.7 pg/L 2.5 pg/L 1.9 pg/L 1.9 pg/L 1.5 pg/L 2.6 pg/L 2.7 pg/L 2.0 pg/L 3.7 pg/L	All water samples in SDG G0H120594
0228379-MB	8/16/10	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	0.14 pg/g 0.55 pg/g 0.061 pg/g 0.083 pg/g 0.045 pg/g 0.073 pg/g 0.14 pg/g 0.086 pg/g 0.31 pg/g	All soil samples in SDG G0H120594

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
EB-08102010	OCDD 1,2,3,7,8-PeCDF 1,2,3,6,7,8-HxCDF	4.4 pg/L 5.2 pg/L 8.4 pg/L	4.4U pg/L 5.2U pg/L 8.4U pg/L
SSAJ3-05-16BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	0.42 pg/g 1.3 pg/g 0.20 pg/g 0.17 pg/g	0.42U pg/g 1.3U pg/g 0.20U pg/g 0.17U pg/g
SSAJ3-07-17BPC	2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	0.22 pg/g 0.30 pg/g	0.22U pg/g 0.30U pg/g

Sample EB-08102010 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-08102010	8/10/10	OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.4 pg/L 7.8 pg/L 5.2 pg/L 12 pg/L 8.4 pg/L 19 pg/L 11 pg/L 55 pg/L	All soil samples in SDG G0H120594

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 percent recovery (%R) was not within QC limits for one compound, the LCS percent recovery (%R) was within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the 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
SSAJ2-06-5BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	23 (40-135) 15 (40-135) 22 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ3-05-12BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	35 (40-135) 21 (40-135) 34 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAJ3-05-16BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	28 (40-135) 16 (40-135) 25 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ3-05-1BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	39 (40-135) 19 (40-135) 37 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ3-05-5BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	39 (40-135) 18 (40-135) 37 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ3-05-8BPC	^{13}C-OCDD	33 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAJ3-07-12BPC	^{13}C-OCDD	24 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAJ3-07-17BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	23 (40-135) 12 (40-135) 20 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P
SSAJ3-07-1BPC	^{13}C-OCDD	29 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAJ3-07-5BPC	^{13}C-OCDD	22 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAJ3-07-8BPC**	^{13}C-OCDD	23 (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 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 PQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAJ3-07-1BPC	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 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
SSAJ3-05-5BPC	1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0H120594	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0H120594	All compounds reported by the lab 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 Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H120594

SDG	Sample	Compound	Flag	A or P	Reason
G0H120594	SSAJ2-06-5BPC SSAJ3-05-12BPC SSAJ3-05-16BPC SSAJ3-05-1BPC SSAJ3-05-5BPC SSAJ3-07-17BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF 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)
G0H120594	SSAJ3-05-8BPC SSAJ3-07-12BPC SSAJ3-07-1BPC SSAJ3-07-5BPC SSAJ3-07-8BPC**	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0H120594	SSAJ3-07-1BPC	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 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 (exceeded range) (e)
G0H120594	SSAJ3-05-5BPC	1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (exceeded range) (e)
G0H120594	SSAJ2-06-3BPC SSAJ2-06-5BPC SSAJ3-05-12BPC SSAJ3-05-16BPC SSAJ3-05-1BPC SSAJ3-05-5BPC SSAJ3-05-8BPC SSAJ3-07-12BPC SSAJ3-07-17BPC SSAJ3-07-1BPC SSAJ3-07-5BPC SSAJ3-07-8BPC** EB-08102010	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0H120594	SSAJ2-06-3BPC SSAJ2-06-5BPC SSAJ3-05-12BPC SSAJ3-05-16BPC SSAJ3-05-1BPC SSAJ3-05-5BPC SSAJ3-05-8BPC SSAJ3-07-12BPC SSAJ3-07-17BPC SSAJ3-07-1BPC SSAJ3-07-5BPC SSAJ3-07-8BPC** EB-08102010	All compounds reported by the lab as estimated maximum possible concentration (EMPC)	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H120594

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0H120594	EB-08102010	OCDD 1,2,3,7,8-PeCDF 1,2,3,6,7,8-HxCDF	4.4U pg/L 5.2U pg/L 8.4U pg/L	A	bl
G0H120594	SSAJ3-05-16BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	0.42U pg/g 1.3U pg/g 0.20U pg/g 0.17U pg/g	A	bl
G0H120594	SSAJ3-07-17BPC	2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	0.22U pg/g 0.30U pg/g	A	bl

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0H120594

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 24089DC21
SDG #: G0H120594
Laboratory: Test America

Date: 10/14/10
Page: 1 of 1
Reviewer: EF
2nd Reviewer: CF

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: 8/10/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration ~~ICV~~	A	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	EB = 13

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

Soil + water

1	SSAJ2-06-3BPC	11	SSAJ3-07-5BPC	+ 21	0228379-MB	31	
2	SSAJ2-06-5BPC	12	SSAJ3-07-8BPC**	+ 22	0228294-MB	32	
3	SSAJ3-05-12BPC	13	EB-08102010 W	23		33	
4	SSAJ3-05-16BPC	14	SSAJ3-05-12BPCMS	24		34	
5	SSAJ3-05-1BPC	15	SSAJ3-05-12BPCMSD	25		35	
6	SSAJ3-05-5BPC	16		26		36	
7	SSAJ3-05-8BPC	17		27		37	
8	SSAJ3-07-12BPC	18		28		38	
9	SSAJ3-07-17BPC	19		29		39	
10	SSAJ3-07-1BPC	20		30		40	

Notes: _____

LDC #: 24089pc21
SDG #: pc cover

VALIDATION FINDINGS CHECKLIST

Reviewer: EP
2nd Reviewer: CP

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 #: 24089DC21
SDG #: pw cover

VALIDATION FINDINGS CHECKLIST

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

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

VALIDATION FINDINGS WORKSHEET

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

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

Notes:

LDC #: 24089DC2/

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer:
2nd Reviewer:

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

Y N N/A Were 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?

* EMPC

Blank extraction date: 8/16/10 **Blank analysis date:** 8/10/10 **Associated samples:** all water (bl)
Conc. units: pg/L

Compound	Blank ID	5X		Sample Identification						
	0228254-MB			13						
D	2.5	12.5								
E	2.0 *	10.0								
F	2.6 *	13								
G	7.7	38.5		4.4*/U						
I	2.5	12.5		5.2/U						
K	1.9 *	9.5		-						
L	1.9	9.5		8.4/U						
M	1.5 *	7.5		-						
N	2.6	13		-						
O	2.7 *	13.5		-						
P	2.0	10		-						
Q	3.7 *	18.5		-						

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 #: 24089DC21

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: EJ
2nd Reviewer: CL

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 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?

* EMPC

Blank extraction date: 8/16/10 **Blank analysis date:** 8/21/10 **Associated samples:** All soils (bl)
Conc. units: pg/g

Compound	Blank ID	5X	Sample Identification							
	022837B-MB	4	9							
F	0.14	0.7	0.42/U							
G	0.55 *	2.75	1.3*/U							
K	0.061	0.305	-							
L	0.083	0.415	-							
M	0.045*	0.225	0.20/U	0.22*/U						
N	0.073	0.365	0.17/U	0.30/U						
O	0.14	0.7	-							
P	0.086	0.43	-							
Q	0.31	1.55	-							

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 #: 24089DC21

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: EJ
2nd Reviewer: CV

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

* EMPC

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 8/10/10
Field blank type: (circle one) Field Blank / Rinsate / Other: 13 Associated Samples: All soils (75X)

Compound	Blank ID	Sample Identification								
	13									
G	4.4 *									
H	7.8 *									
I	5.2									
K	12									
L	8.4									
O	19									
P	11									
Q	55									
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 #: 24089DC21

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: FT
2nd Reviewer: q

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
		14+15	Q	( )	150 (75-141)	( )	3	no qual resin
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 24049DC21

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
		2	H	23 (40 - 135)	J/UJ/P (i) QUAL F
			I	15 ( )	G, Q
			G	22 ( )	B, P
				( )	
		3	H	35 ( )	
			I	21 ( )	
			G	34 ( )	
				( )	
		4	H	28 ( )	
			I	16 ( )	
			G	25 ( )	
				( )	
		5	H	39 ( )	
			I	19 ( )	
			G	37 ( )	
				( )	
		6	H	39 ( )	
			I	18 ( )	
			G	37 ( )	
				( )	

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

	Recovery Standards	Check Standard Used
K	^{13}C-1,2,3,4-TCDD	
L	^{13}C-1,2,3,7,8,9-HxCDD	
M		
N		
O		
P		
Q		
R		
T		

LDC #: 24089D21

VALIDATION FINDINGS WORKSHEET
Internal Standards

Reviewer: B
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
		7	I	33 (40-135)	J/UJ/P (e) qual G, Q
				( )	
				( )	
		8	I	24 ( )	↓
				( )	
				( )	
		9	H	23 ( )	(e) qual F
			I	12 ( )	G, Q
			G	20 ( )	O, P
				( )	
		10	I	29 ( )	(e) qual G, Q
				( )	
		11	I	22 ( )	
				( )	
		12	I	23 ( )	↓ ↓
				( )	
				( )	
				( )	
				( )	
				( )	

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

LDC #: 24689DC2 1

VALIDATION FINDINGS WORKSHEET
Internal Standards

Reviewer: [signature]
2nd Reviewer: [signature]

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
		14	H	35 (40-135)	no qual MS
			I	18 ( )	
			G	34 ( )	
				( )	
				( )	
		15	I	22 ( )	no qual MSD
			G	39 ( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

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

	Recovery Standards	Check Standard Used
K	^{13}C-1,2,3,4-TCDD	
L	^{13}C-1,2,3,7,8,9-HxCDD	
M		
N		
O		
P		
Q		
R		
T		

LDC #: 24089DC21

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

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~~ compd	Finding	Associated Samples	Qualifications
			All compounds reported below PQL	All	J/A detects (sp)
			All compounds reported as EMPC	All	JK detects (k)
		H, I, K, L, O, P, Q	x'd cal Range	10	J/P det (e)
		O, P	↓	6	J/P det (e)

Comments: See sample calculation verification worksheet for recalculations

LDC #: 24089 DC21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (RRF3 std)	Recalculated RRF (RRF3 std)	Reported %RSD	Recalculated %RSD
1	~~CAL-S2~~	~~8/23/10~~	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.995	0.995	0.98	0.98	3.68	3.68
	ICAL	7/21/10	2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.983	0.983	0.97	0.97	3.24	3.24
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.163	1.10	1.10	5.17	5.17
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.072	1.07	1.07	2.61	2.61
			OCDF (^{13}C-OCDD)	1.370	1.370	1.35	1.35	1.98	1.98
2	ICAL	7/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.056	1.056	1.02	1.02	3.32	3.32
	PB225		~~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 #: 24089 DC21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	CCV-2	8/23/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.995	0.96	0.96	3.0	3.0
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.983	0.94	0.94	4.9	4.9
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.163	1.17	1.17	0.7	0.7
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.04	1.04	2.6	2.6
			OCDF (^{13}C-OCDD)	1.370	1.42	1.42	3.4	3.4
2	CCV-2	8/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)		0.99	0.99	0.9	0.9
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)		0.97	0.97	1.1	1.1
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)		1.13	1.13	2.6	2.6
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)		1.06	1.06	0.9	0.9
			OCDF (^{13}C-OCDD)		1.46	1.46	6.3	6.3
3	CCV-2	8/29/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.056	1.05	1.05	0.9	0.9
	PB225		~~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 #: 24089DC21
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

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

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

% Recovery = 100 * (SSR - SR)/SA Where: SSR = Spiked sample result, SR = Sample result; SA = Spike added

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

MS/MSD samples: 14 & 15

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	21.1	20.9	0.53	23.3	22.7	108	108	106	106	2.3	2.3
1,2,3,7,8-PeCDD	105	104	1.8	117	113	109	109	107	107	3.1	3.1
1,2,3,4,7,8-HxCDD	↓	↓	1.4	124	114	116	116	108	108	7.9	7.9
1,2,3,4,7,8,9-HpCDF	↓	↓	58	205	200	139	139	136	136	2.5	2.5
OCDF	~~306~~ 211	209	300	569	612	128	128	150	150	7.2	7.2

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 #: 24089DC21
SDG #: per copy

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FZ
2nd Reviewer: [illegible]

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

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

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

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

LCS ID: 0228379-LCS

Compound	Spike Added (pg/g)		Spiked Sample Concentration (pg/g)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	21.6	NA	108	108				
1,2,3,7,8-PeCDD	100.0	↓	109	↓	109	109				
1,2,3,4,7,8-HxCDD	100.0	↓	115	↓	115	115				
1,2,3,4,7,8,9-HpCDF	100.0	↓	113	↓	113	113				
OCDF	200.0	↓	231	↓	116	116	NA			

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 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9338 375.8364 [354.9792]	M M+2 M M+2 M M+2 M M+2 M+2 LOCK	$C_{12}H_4{}^{35}Cl_4O$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10$ $^{13}C_{12}H_4{}^{35}Cl_4O$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$ $C_{12}H_4{}^{35}Cl_4O_2$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$ $^{13}C_{12}H_4{}^{35}Cl_4O_2$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$ $C_{12}H_4{}^{35}Cl_5{}^{37}ClO$ C_9F_{13}	TCDF TCDF TCDF (S) TCDF (S) TCDD TCDD TCDD (S) TCDD (S) HxCDPE PFK	4	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O$ $^{13}C_{12}H^{35}Cl_7O$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_6{}^{37}ClO_2$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$ $^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $C_{12}H^{35}Cl_7{}^{37}Cl_2O$ C_9F_{17}	HpCDF HpCDF HpCDF (S) HpCDF HpCDD HpCDD HpCDD (S) HpCDD (S) NCDPE PFK
2	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	M+2 M+4 M+2 M+4 M+2 M+4 M+2 M+4 M+2 LOCK	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $C_{12}H_3{}^{35}Cl_6{}^{37}ClO$ C_9F_{13}	PeCDF PeCDF PeCDF (S) PeCDF (S) PeCDD PeCDD PeCDD (S) PeCDD (S) HpCDPE PFK	5	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775 [422.9278]	M+2 M+4 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}{}^{35}Cl_7{}^{37}ClO$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O$ $C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $C_{12}{}^{35}Cl_8{}^{37}Cl_2O$ $C_{10}F_{17}$	OCDF OCDF OCDD OCDD OCDD (S) OCDD (S) DCDPE PFK
3	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$ $^{13}C_{12}H_2{}^{35}Cl_6O$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$ C_9F_{17}	HxCDF HxCDF HxCDF (S) HxCDF (S) HxCDD HxCDD HxCDD (S) HxCDD (S) OCDPE 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 #: 24089DC21 / SDG #: pw cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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

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

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. #12 . OCPD :

Conc. = $\frac{(1894618)(4000)(\quad)}{(4131090)(1.20)(10.02)(0.939)}$

= 16.248 pg/g

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Collection Date:	August 9 through August 10, 2010
LDC Report Date:	October 15, 2010
Matrix:	Soil
Parameters:	Dioxins/Dibenzofurans
Validation Level:	Stage 2B & 4
Laboratory:	TestAmerica, Inc.

Sample Delivery Group (SDG): G0H180547

Sample Identification

SB03-24BPC
SB01-24BPC**
SB02-24BPC
SB03-24BPCMS
SB03-24BPCMSD

**Indicates sample underwent Stage 4 review

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.

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 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
0235250-MB	8/23/10	OCDD 1,2,3,4,6,7,8-HpCDF	1.1 pg/g 0.22 pg/g	All samples in SDG G0H180547

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

Sample EB-08102010 (from SDG H0H120594) 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-08102010	8/10/10	OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.4 pg/L 7.8 pg/L 5.2 pg/L 12 pg/L 8.4 pg/L 19 pg/L 11 pg/L 55 pg/L	SB01-24BPC** SB02-24BPC

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 for several compounds. Since the sample concentration was greater than the spiked concentration, no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
0235250-LCS	1,2,3,7,8,9-HxCDD	79 (80-143)	All samples in SDG G0H180547	J- (all detects) UJ (all non-detects)	P

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which 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 PQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SB03-24BPC SB02-24BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
0235250-MB	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
0235250-MB	All compounds reported by the lab 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 Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H180547

SDG	Sample	Compound	Flag	A or P	Reason
G0H180547	SB03-24BPC SB01-24BPC** SB02-24BPC	1,2,3,7,8,9-HxCDD	J- (all detects) UJ (all non-detects)	P	Laboratory control samples (%R) (l)
G0H180547	SB03-24BPC SB02-24BPC	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 (exceeded range) (e)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H180547

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0H180547

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 24089E21
SDG #: G0H180547
Laboratory: Test America

Date: 10/13/10
Page: 1 of 1
Reviewer: EJ
2nd Reviewer: [signature]

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: 8/9 - 8/10/10
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	SW	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	EB = EB-08102010 SDG # G0H120594

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

SOIL

1	SB03-24BPC	11	023525D-MB	21		31	
2	SB01-24BPC**	12		22		32	
3	SB02-24BPC	13		23		33	
4	SB03-24BPCMS	14		24		34	
5	SB03-24BPCMSD	15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 24089E21
SDG #: pw cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: EV
2nd Reviewer: CV

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 #: 24089E2
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

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

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

VALIDATION FINDINGS WORKSHEET

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

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

Notes:

LDC #: 24089E21

VALIDATION FINDINGS WORKSHEET
Blanks

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

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

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

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?

Blank extraction date: 8/23/10 **Blank analysis date:** 8/27/10 **Associated samples:** All 75X

Conc. units: pg/g

Compound	Blank ID	Sample Identification								
	023525	50 SY								
G	1.1	5.5								
D	0.22	1.1								

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

LDC #: 24089E2 /

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: EJ
2nd Reviewer: CL

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

* EMPC

Y N N/A Were field blanks identified in this SDG?
EB = EB-08102010
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 8/10/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2, 3 75%

Compound	Blank ID	Sample Identification								
	EB									
G	4.4 *									
H	7.8 *									
I	5.2									
K	12									
L	8.4									
O	19									
P	11									
Q	55									
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 #: 24089E21

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

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

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	several	% Recovery	or ( )	( )	2	no qual
				% RPD	were outside	limit)		percent 74x
				( )	( )	( )		spike Amt.
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 24089E21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

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

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 LCS required?
Y N N/A Was a LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?
Y/N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	Lab ID/Reference	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		0235250-LCS	E	79 (80-143)	( )	( )	all	J/UJ/P MS/Dout
				( )	( )	( )		(l)
				( )	( )	( )		(no LCSD)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 24089E21
SDG #: pre cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: EJ
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	compd ~~Sample ID~~	Finding	Associated Samples	Qualifications
		H, O, Q	x'd cal Range	1, 3	J/Pdet (c)
			Compd. reported b/lw PQL	0235250-MB	J/Adet. (sp)
			Compd reported as EMPC	↓	J K det (k)

Comments: See sample calculation verification worksheet for recalculations

LDC #: 24089E2 /

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: EJ
2nd Reviewer:

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (RRF3std)	Recalculated RRF (RRF3std)	Reported %RSD	Recalculated %RSD
1	ICAL	8/30/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.2609	1.2609	5.52	5.52
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.252	1.2587	1.2587	4.00	4.00
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.165	1.2152	1.2152	6.20	6.20
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.180	1.2654	1.2654	5.62	5.62
			OCDF (^{13}C-OCDD)	1.892	1.892	1.9979	1.9979	6.95	6.91
2	ICAL DB225	8/31/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.879	0.879	0.92	0.92	11.3	11.3
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						

Comments: Refer to 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 #: 24089E21
SDG #: all cores

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: CL

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	CCV-50	9/1/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.17	0.3	0.3
	9:51 38		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.15	1.15	8.2	8.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.18	1.18	1.7	1.7
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.20	1.20	1.6	1.6
			OCDF (^{13}C-OCDD)	1.892	1.36	1.36	5.1	5.1
2	CCV-15	8/31/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.16	0.7	0.7
	8:17:01		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.252	1.14	8.9	8.9
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.165	1.23	5.8	5.8
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.180	1.21	2.7	2.7
			OCDF (^{13}C-OCDD)	1.892	1.892	1.81	4.5	4.5
3	CCV	9/1/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.879	1.0	1.0	13.4	13.4
	DB225		~~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 #: 24089E1
SDG #: all cores

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

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

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

% Recovery = 100 * (SSR - SR)/SA Where: SSR = Spiked sample result, SR = Sample result
SA = Spike added

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

MS/MSD samples: 4 & 5

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											
1,2,3,7,8-PeCDD											
1,2,3,4,7,8-HxCDD	103	105	240	334 / 40	288	90	90	44	44	15	15
1,2,3,4,7,8,9-HpCDF											
OCDF											

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. several compound %R & RPD outside limit. Parent 7HX spike Amt

LDC #: 24089E21
SDG #: per copy

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

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

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

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

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

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

LCS ID: 0235250 - LCS

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	NA	18.9	NA	95	95				
1,2,3,7,8-PeCDD	100	↓	106	↓	106	106				
1,2,3,4,7,8-HxCDD	100	↓	98.5	↓	99	99				
1,2,3,4,7,8,9-HpCDF	100	↓	95.5	↓	95	95				
OCDF	200	↓	217	↓	108	108	NA	↓	↓	↓

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 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9338 375.8364 [354.9792]	M M+2 M M+2 M M+2 M M+2 M+2 LOCK	$C_{12}H_4{}^{35}Cl_4O$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10$ $^{13}C_{12}H_4{}^{35}Cl_4O$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$ $C_{12}H_4{}^{35}Cl_4O_2$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$ $^{13}C_{12}H_4{}^{35}Cl_4O_2$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$ $C_{12}H_4{}^{35}Cl_5{}^{37}ClO$ C_9F_{13}	TCDF TCDF TCDF (S) TCDF (S) TCDD TCDD TCDD (S) TCDD (S) HxCDPE PFK	4	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O$ $^{13}C_{12}H^{35}Cl_7O$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_6{}^{37}ClO_2$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$ $^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $C_{12}H^{35}Cl_7{}^{37}Cl_2O$ C_9F_{17}	HpCDF HpCDF HpCDF (S) HpCDF HpCDD HpCDD HpCDD (S) HpCDD (S) NCDPE PFK
2	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	M+2 M+4 M+2 M+4 M+2 M+4 M+2 M+4 M+2 LOCK	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $C_{12}H_3{}^{35}Cl_6{}^{37}ClO$ C_9F_{13}	PeCDF PeCDF PeCDF (S) PeCDF (S) PeCDD PeCDD PeCDD (S) PeCDD (S) HpCDPE PFK	5	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775 [422.9278]	M+2 M+4 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}{}^{35}Cl_7{}^{37}ClO$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O$ $C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $C_{12}{}^{35}Cl_8{}^{37}Cl_2O$ $C_{10}F_{17}$	OCDF OCDF OCDD OCDD OCDD (S) OCDD (S) DCDPE PFK
3	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$ $^{13}C_{12}H_2{}^{35}Cl_6O$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$ C_9F_{17}	HxCDF HxCDF HxCDF (S) HxCDF (S) HxCDD HxCDD HxCDD (S) HxCDD (S) OCDPE 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 #: 24089E2/
SDG #: pc cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
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. #2 . OCPD :

$$\text{Conc.} = \frac{(10465959)(4000)(\quad)}{(4300210)(1.29)(10.50)(0.948)}$$

$$= 758 \text{ pg/g}$$

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

Laboratory Data Consultants, Inc.
Data Validation Report

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

Collection Date: August 13, 2010

LDC Report Date: October 19, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0H190584

Sample Identification

SSAK3-08-0BPC
SSAL4-04-0BPC
SSAL4-05-0BPC
SSAN6-09-0BPC
SSAN6-08-0BPC
SSAN5-04-0BPC
SSAO3-05-0BPC**
SSAO3-04-0BPC
SSAO4-06-0BPC

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 9 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

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

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

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 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
0235250-MB	8/23/10	OCDD 1,2,3,4,6,7,8-HpCDF	1.1 pg/g 0.22 pg/g	All soil samples in SDG G0H190584

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

No field blanks were identified in this SDG.

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 for several compounds. Since the sample concentration was greater than the spiked concentration, no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
0235250LCS	1,2,3,7,8,9-HxCDD	79 (80-143)	All samples in SDG G0H190584	J- (all detects) UJ (all non-detects)	P

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which 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 PQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAL4-04-0BPC SSAL4-05-0BPC SSAN6-09-0BPC SSAN6-08-0BPC SSAO3-04-0BPC	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
SSAN5-04-0BPC	OCDD	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P
SSAO4-06-0BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0H190584	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0H190584	All compounds reported by the lab 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 Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H190584

SDG	Sample	Compound	Flag	A or P	Reason
G0H190584	SSAK3-08-0BPC SSAL4-04-0BPC SSAL4-05-0BPC SSAN6-09-0BPC SSAN6-08-0BPC SSAN5-04-0BPC SSAO3-05-0BPC** SSAO3-04-0BPC SSAO4-06-0BPC	1,2,3,7,8,9-HxCDD	J- (all detects) UJ (all non-detects)	P	Laboratory control samples (%R) (l)
G0H190584	SSAL4-04-0BPC SSAL4-05-0BPC SSAN6-09-0BPC SSAN6-08-0BPC SSAO3-04-0BPC	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 (exceeded range) (e)
G0H190584	SSAN5-04-0BPC	OCDD	J (all detects)	P	Project Quantitation Limit (exceeded range) (e)
G0H190584	SSAO4-06-0BPC	OCDF	J (all detects)	P	Project Quantitation Limit (exceeded range) (e)
G0H190584	SSAK3-08-0BPC SSAL4-04-0BPC SSAL4-05-0BPC SSAN6-09-0BPC SSAN6-08-0BPC SSAN5-04-0BPC SSAO3-05-0BPC** SSAO3-04-0BPC SSAO4-06-0BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0H190584	SSAK3-08-0BPC SSAL4-04-0BPC SSAL4-05-0BPC SSAN6-09-0BPC SSAN6-08-0BPC SSAN5-04-0BPC SSAO3-05-0BPC** SSAO3-04-0BPC SSAO4-06-0BPC	All compounds reported by the lab as estimated maximum possible concentration (EMPC)	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H190584

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0H190584

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 24089F21
SDG #: G0H190584
Laboratory: Test America

Date: 10/14/10
Page: 1 of 1
Reviewer: PT
2nd Reviewer: Q

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: 8/13/10
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	SB03-24BPC MS/D
VII.	Laboratory control samples	SW	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

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

Validated Samples: ** Indicates sample underwent Stage 4 validation

SOIL

1	1	SSAK3-08-0BPC	11	1	023525D	21		31
3	2	SSAL4-04-0BPC	12			22		32
5	3	SSAL4-05-0BPC	13			23		33
7	4	SSAN6-09-0BPC	14			24		34
8	5	SSAN6-08-0BPC	15			25		35
9	6	SSAN5-04-0BPC	16			26		36
10	7	SSAO3-05-0BPC**	17			27		37
11	8	SSAO3-04-0BPC	18			28		38
12	9	SSAO4-06-0BPC	19			29		39
	10		20			30		40

Notes:

LDC #: 24089F21
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

Reviewer: EJ
2nd Reviewer: CK

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 #: 24089F21
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

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

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

VALIDATION FINDINGS WORKSHEET

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

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

Notes:

LDC #: 24089F2/

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: F2
2nd Reviewer: 4

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".

* EMPC

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?

Blank extraction date: 8/23/10 **Blank analysis date:** 8/27/10 **Associated samples:** All soils 75%

Conc. units: pg/g

Compound	Blank ID	5X	Sample Identification							
	023525O-MB									
G	1.1	5.5								
O	0.22 *	1.1								

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

LDC #: 24089F21

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: FT
2nd Reviewer: Q

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
		SB03-24BPC	several	compds	were outside	( )	none	no qual
		MS/D		( )	%R + RPD limits	( )		(parent >4X spike Amt)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
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				( )	( )	( )		
				( )	( )	( )		

LDC #: 24089F21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: E7
2nd Reviewer: Q

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 LCS required?
(Y) N N/A Was a LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?
Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	Lab ID/Reference	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		0235250LCS	E	79 (80-143)	( )	( )	All	J-/UJ/P (l)
				( )	( )	( )		MS/D out, no
				( )	( )	( )		LCSD
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
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				( )	( )	( )		

LDC #: 24089F21

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: FT
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	compd ~~Sample ID~~	Finding	Associated Samples	Qualifications
			All compounds reported below PQL	All	J/A detects (sp)
			All compounds reported as EMPC	All	JK detects (k)
		H, O, Q	x1d cal range	2, 3, 4, 5, 8	J/Pdet (e)
		G	↓	6	J/Pdet (e)
		Q	↓	9	J/Pdet (e)

Comments: See sample calculation verification worksheet for recalculations

LDC #: 24089F21
SDG #: per copy

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: F7
2nd Reviewer: 9

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (RRF3 std)	Recalculated RRF (RRF3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	7/27/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.875	0.875	0.87	0.87	14.2	14.2
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.957	0.957	0.93	0.93	13.5	13.5
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.242	1.242	1.27	1.27	12.6	12.6
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.026	1.026	1.07	1.07	13.6	13.6
			OCDF (^{13}C-OCDD)	1.445	1.445	1.55	1.55	18.1	18.1
2	ICAL DB225	7/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.056	1.056	1.02	1.02	3.32	3.32
			~~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 #: 24089E21

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (RRF3std)	Recalculated RRF (RRF3std)	Reported %RSD	Recalculated %RSD
1	ICAL	8/30/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.2609	1.2609	5.52	5.52
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.252	1.2587	1.2587	4.00	4.00
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.165	1.2152	1.2152	6.20	6.20
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.180	1.2654	1.2654	5.62	5.62
			OCDF (^{13}C-OCDD)	1.892	1.892	1.9979	1.9979	6.95	6.95
2	ICAL DB225	8/31/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.879	0.879	0.92	0.92	11.3	11.3
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						

Comments: Refer to 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 #: 24089F21
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: EJ
2nd Reviewer: [illegible]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	ccv-14	8/27/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.875	0.97	0.97	11.4	11.4
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.957	0.96	0.96	0.2	0.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.107	1.17	1.17	5.7	5.7
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.026	1.12	1.12	9.6	9.6
			OCDF (^{13}C-OCDD)	1.445	1.72	1.72	19.4	19.4
2	ccv-2	9/9/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.056	1.01	1.01	4.8	4.8
	DB225		~~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 #: 24089E21
SDG #: pu conv

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	CCV-50	9/1/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.17	0.3	0.3
	9:51 38		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.15	1.15	8.2	8.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.18	1.18	1.7	1.7
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.20	1.20	1.6	1.6
			OCDF (^{13}C-OCDD)	1.892	1.36	1.36	5.1	5.1
2	CCV-15	8/31/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.16	0.7	0.7
	8:17:01		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.252	1.14	8.9	8.9
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.165	1.23	5.8	5.8
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.180	1.21	2.7	2.7
			OCDF (^{13}C-OCDD)	1.892	1.892	1.81	4.5	4.5
3	CCV	9/1/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.879	1.0	1.0	13.4	13.4
	DB225		~~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 #: 24089E21
SDG #: per copy

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

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

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

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

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

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

LCS ID: 0235250 - LCS

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	NA	18.9	NA	95	95				
1,2,3,7,8-PeCDD	100	↓	106	↓	106	106				
1,2,3,4,7,8-HxCDD	100		98.5		99	99				
1,2,3,4,7,8,9-HpCDF	100		95.5		95	95				
OCDF	200	↓	217	↓	108	108	NA			

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 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9338 375.8364 [354.9792]	M M+2 M M+2 M M+2 M M+2 M+2 LOCK	$C_{12}H_4{}^{35}Cl_4O$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10$ $^{13}C_{12}H_4{}^{35}Cl_4O$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$ $C_{12}H_4{}^{35}Cl_4O_2$ $C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$ $^{13}C_{12}H_4{}^{35}Cl_4O_2$ $^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$ $C_{12}H_4{}^{35}Cl_5{}^{37}ClO$ C_9F_{13}	TCDF TCDF TCDF (S) TCDF (S) TCDD TCDD TCDD (S) TCDD (S) HxCDPE PFK	4	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O$ $^{13}C_{12}H^{35}Cl_7O$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO$ $C_{12}H^{35}Cl_6{}^{37}ClO_2$ $C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$ $^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$ $C_{12}H^{35}Cl_7{}^{37}Cl_2O$ C_9F_{17}	HpCDF HpCDF HpCDF (S) HpCDF HpCDD HpCDD HpCDD (S) HpCDD (S) NCDPE PFK
2	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	M+2 M+4 M+2 M+4 M+2 M+4 M+2 M+4 M+2 LOCK	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$ $C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$ $^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$ $C_{12}H_3{}^{35}Cl_6{}^{37}ClO$ C_9F_{13}	PeCDF PeCDF PeCDF (S) PeCDF (S) PeCDD PeCDD PeCDD (S) PeCDD (S) HpCDPE PFK	5	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775 [422.9278]	M+2 M+4 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}{}^{35}Cl_7{}^{37}ClO$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O$ $C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$ $^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$ $C_{12}{}^{35}Cl_8{}^{37}Cl_2O$ $C_{10}F_{17}$	OCDF OCDF OCDD OCDD OCDD (S) OCDD (S) DCDPE PFK
3	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555 [430.9728]	M+2 M+4 M M+2 M+2 M+4 M+2 M+4 M+4 LOCK	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$ $^{13}C_{12}H_2{}^{35}Cl_6O$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$ $C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$ $^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$ $C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$ C_9F_{17}	HxCDF HxCDF HxCDF (S) HxCDF (S) HxCDD HxCDD HxCDD (S) HxCDD (S) OCDPE 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 #: 24089F27
SDG #: pc cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

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

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

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

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

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. #10, OCDF:

Conc. = $\frac{(19228440004000)(\quad)}{(3040570000)(1.44)(10.06)(0.9956)}$

= 1754 pg/g

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Collection Date:	August 13, 2010
LDC Report Date:	October 15, 2010
Matrix:	Soil
Parameters:	Dioxins/Dibenzofurans
Validation Level:	Stage 2B & 4
Laboratory:	TestAmerica, Inc.
Sample Delivery Group (SDG):	G0H190600

Sample Identification

SSAL3-07-0BPC
SSAK8-10-0BPC**
SSAK8-09-0BPC
SSAK8-07-0BPC
SSAN6-03-0BPC
RSAN7-0BPC
SSAO7-03-0BPC
SA44-0BPC
SSAP3-01-0BPC
SSAO4-01-0BPC**
SSAK3-05-0BPC
SSAK3-07-0BPC
SSAK8-07-0BPCMS
SSAK8-07-0BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 14 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.

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 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
0237235-MB	8/25/10	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	0.23 pg/g 0.13 pg/g 0.10 pg/g 0.39 pg/g 0.11 pg/g 0.70 pg/g	All samples in SDG G0H190600

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

No field blanks were identified in this SDG.

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 for several compounds. Since the sample concentration was greater than the spiked concentration, no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the 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
SSAK8-10-0BPC**	^{13}C-OCDD	35 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAK8-09-0BPC	^{13}C-OCDD	34 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK8-07-0BPC	^{13}C-OCDD	27 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAO7-03-0BPC	^{13}C-OCDD	38 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAK3-05-0BPC	^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD ^{13}C-1,2,3,4,6,7,8-HpCDF	32 (40-135) 27 (40-135) 34 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD OCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which 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 PQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAL3-07-0BPC SSAK8-09-0BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects) J (all detects)	P
SSAK8-10-0BPC** SSAK8-07-0BPC	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
RSAN7-0BPC SA44-0BPC	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
SSAO4-01-0BPC**	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK3-05-0BPC SSAK3-07-0BPC	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 G0H190600	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0H190600	All compounds reported by the lab 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 Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H190600

SDG	Sample	Compound	Flag	A or P	Reason
G0H190600	SSAK8-10-0BPC** SSAK8-09-0BPC SSAK8-07-0BPC SSAO7-03-0BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0H190600	SSAK3-05-0BPC	1,2,3,4,6,7,8-HpCDD OCDD OCDF 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)
G0H190600	SSAL3-07-0BPC SSAK8-09-0BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) J (all detects) J (all detects) J (all detects)	P	Project Quantitation Limit (exceeded range) (e)
G0H190600	SSAK8-10-0BPC** SSAK8-07-0BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	P	Project Quantitation Limit (exceeded range) (e)
G0H190600	RSAN7-0BPC SA44-0BPC	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 (exceeded range) (e)
G0H190600	SSAO4-01-0BPC**	OCDF	J (all detects)	P	Project Quantitation Limit (exceeded range) (e)
G0H190600	SSAK3-05-0BPC SSAK3-07-0BPC	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 (exceeded range) (e)
G0H190600	SSAL3-07-0BPC SSAK8-10-0BPC** SSAK8-09-0BPC SSAK8-07-0BPC SSAN6-03-0BPC RSAN7-0BPC SSAO7-03-0BPC SA44-0BPC SSAP3-01-0BPC SSAO4-01-0BPC** SSAK3-05-0BPC SSAK3-07-0BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)

SDG	Sample	Compound	Flag	A or P	Reason
G0H190600	SSAL3-07-0BPC SSAK8-10-0BPC** SSAK8-09-0BPC SSAK8-07-0BPC SSAN6-03-0BPC RSAN7-0BPC SSAO7-03-0BPC SA44-0BPC SSAP3-01-0BPC SSAO4-01-0BPC** SSAK3-05-0BPC SSAK3-07-0BPC	All compounds reported by the lab as estimated maximum possible concentration (EMPC)	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H190600

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0H190600

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 24089G21
SDG #: G0H190600
Laboratory: Test America

Date: 10/14/10
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: 8/13/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/~~ICV~~	A	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	SW	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

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

Validated Samples: ** Indicates sample underwent Stage 4 validation

soil

1	1	SSAL3-07-0BPC	16 11	SSAK3-05-0BPC	21	02 37235-MB	31	
4	2	SSAK8-10-0BPC**	17 12	SSAK3-07-0BPC	22		32	
6	3	SSAK8-09-0BPC	13	SSAK8-07-0BPCMS	23		33	
8	4	SSAK8-07-0BPC	14	SSAK8-07-0BPCMSD	24		34	
10	5	SSAN6-03-0BPC	15		25		35	
11	6	RSAN7-0BPC	16		26		36	
12	7	SSAO7-03-0BPC	17		27		37	
13	8	SA44-0BPC	18		28		38	
14	9	SSAP3-01-0BPC	19		29		39	
15	10	SSAO4-01-0BPC**	20		30		40	

Notes: _____

LDC #: 24089G2|
SDG #: pr cover

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer:

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

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	✓			
Were the retention time windows established for all homologues?	✓			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	✓			
Is the static resolving power at least 10,000 (10% valley definition)?	✓			
Was the mass resolution adequately check with PFK?	✓			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?	✓			
Did all calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all percent differences (%D) ≤ 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 #: 24089G2\
SDG #: per cover

VALIDATION FINDINGS CHECKLIST

Reviewer:
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.		✓		
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 #: 24089G21

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: F7
2nd Reviewer: Q

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".

* EMPC

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?

Blank extraction date: 8/25/10 **Blank analysis date:** 9/3/10 **Associated samples:** All (75X)

Conc. units: pg/g

Compound	Blank ID	5X	Sample Identification							
	0237235-MB									
G	0.23 *	1.15								
K	0.13	0.65								
L	0.10 *	0.5								
O	0.39	1.95								
P	0.11 *	0.55								
Q	0.70	3.5								

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 #: 24089G2/

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: FT
2nd Reviewer: Q

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
		13 + 14	general	compounds	%R +	%RSD)	4	no qual LCS in
			were	outside)	limit)	( )		(parent > 4X
				( )	( )	( )		spike Amt)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 24089G21

VALIDATION FINDINGS WORKSHEET
Internal Standards

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

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	35 (40-135)	J|NJ|P (i) QUAL G,Q
				( )	
		3	↓	34 ( )	
				( )	
		4	↓	27 ( )	
				( )	
		7	↓	38 ( )	
				( )	
		11	H	32 ( )	(i) QUAL F
			I	27 ( )	G,Q
			G	34 (↓)	↓ O,P
				( )	
		13	H	33 ( )	no qual M>
			I	32 ( )	
			E	39 ( )	
			G	33 ( )	
				( )	
		14	I	37 (↓)	no qual MSD
				( )	
				( )	

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

LDC #: 24089Q21

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

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

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~~ compds	Finding	Associated Samples	Qualifications
			All compounds reported below PQL	All	J/A detects (sp)
			All compounds reported as EMPC	All	JK detects (k)
		H, O, P, Q	x'd cal range	1, 3, ~~8~~	J/P dut (e)
		O, Q	↓	2, 4	
		H, O, Q	↓	6, 8	
		Q	↓	10	
		H, K, O, P, Q	↓	~~the~~ 11, 12	↓

Comments: See sample calculation verification worksheet for recalculations

LDC #: 24089G2 /

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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

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

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

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

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

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (RRF3 std)	Recalculated RRF (RRF3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	7/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.056	1.056	1.02	1.02	3.32	3.32
	DB225		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)						
			OCDF (^{13}C-OCDD)						
2	ICAL	8/30/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.169	1.2609	1.2609	5.52	5.52
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.252	1.2887	1.2887	4.0	4.0
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.165	1.2152	1.2152	6.20	6.20
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.180	1.2654	1.2654	5.62	5.62
			OCDF (^{13}C-OCDD)	1.892	1.892	1.9979	1.9979	6.95	6.95
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 #: 24089Q2/
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

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

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method TO-9A)

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	CCV-19	9/4/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.056	1.12	1.12	6.3	6.3
	DB225		~~2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)~~					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			~~OCDF (^{13}C-OCDD)~~					
2	CCV-31	9/3/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.169	1.08	1.08	7.8	7.8
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.252	1.19	1.19	5.1	5.1
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.165	1.12	1.12	3.7	3.7
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.180	1.18	1.18	0.3	0.3
			OCDF (^{13}C-OCDD)	1.892	1.62	1.62	14.3	14.3
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 #: 24089G21
SDG #: per cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

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: 13 & 14

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	20.0	20.1	61	6939	117	163	163	277	277	22	22
1,2,3,7,8-PeCDD	99.8	100	240	311	346	70	70	104	104	11	11
1,2,3,4,7,8-HxCDD	↓	↓	120	237	311	114	114	187	187	27	27
1,2,3,4,7,8,9-HpCDF	↓	↓	7700	8310	10300	626	626	2630	2630	22	22
OCDF	200	201	40000	26400	51000	0	0	5290	5290	0	9

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 #: 24089G2/
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: EF
2nd Reviewer: [signature]

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

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

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

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

LCS ID: 0237235-LCS

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	18.9	NA	95	95				
1,2,3,7,8-PeCDD	100		92.9		93	93				
1,2,3,4,7,8-HxCDD	100		94.7		95	95				
1,2,3,4,7,8,9-HpCDF	100		100		100	100				
OCDF	200		168		84	84	NA			

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

(a) The following nuclidic masses were used:

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

S = internal/recovery standard

LDC #: 24089G2 /
SDG #: pc cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer:
2nd reviewer:

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

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

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

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. 2 . OCDD :

Conc. = $\frac{(920173)(4000)(\quad)}{(185223)(1.29)(10.153)(0.9979)}$

= ~~1517.66~~ 1520.85 pg/g

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

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada
Collection Date:	August 23, 2010
LDC Report Date:	October 15, 2010
Matrix:	Water
Parameters:	Dioxins/Dibenzofurans
Validation Level:	Stage 2B
Laboratory:	TestAmerica, Inc.
Sample Delivery Group (SDG):	G0H250498

Sample Identification

EB-08232010

Introduction

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

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

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

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
0260402	9/2/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-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	1.6 pg/L 1.1 pg/L 1.0 pg/L 8.0 pg/L 29 pg/L 1.7 pg/L 2.0 pg/L 1.7 pg/L 1.6 pg/L 2.2 pg/L 1.8 pg/L 4.0 pg/L	All samples in SDG G0H250498

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
EB-08232010	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.97 pg/L 0.67 pg/L 1.3 pg/L 4.4 pg/L 2.9 pg/L 1.7 pg/L 1.6 pg/L 3.2 pg/L 2.0 pg/L 8.1 pg/L	0.97U pg/L 0.67U pg/L 1.3U pg/L 4.4U pg/L 2.9U pg/L 1.7U pg/L 1.6U pg/L 3.2U pg/L 2.0U pg/L 8.1U pg/L

Sample EB-08232010 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-08232010	8/23/10	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.97 pg/L 0.67 pg/L 1.3 pg/L 4.4 pg/L 2.9 pg/L 1.7 pg/L 1.6 pg/L 3.2 pg/L 2.0 pg/L 8.1 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable.

VII. Laboratory Control Samples (LCS)

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

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
0260402	1,2,3,6,7,8-HxCDF	136 (76-133)	All samples in SDG G0H250498	J+ (all detects)	P

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.

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0H250498	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Compound	Flag	A or P
All samples in SDG G0H250498	All compounds reported by the lab 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 Additional Sampling, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0H250498

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0H250498	EB-08232010	1,2,3,6,7,8-HxCDF	J+ (all detects)	P	Laboratory control samples (%R) (l)
G0H250498	EB-08232010	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0H250498	EB-08232010	All compounds reported by the lab as estimated maximum possible concentration (EMPC)	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0H250498

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0H250498	EB-08232010	1,2,3,6,7,8-HxCDD	0.97U pg/L	A	bl
		1,2,3,7,8,9-HxCDD	0.67U pg/L		
		1,2,3,4,6,7,8-HpCDD	1.3U pg/L		
		OCDD	4.4U pg/L		
		1,2,3,4,7,8-HxCDF	2.9U pg/L		
		1,2,3,6,7,8-HxCDF	1.7U pg/L		
		1,2,3,7,8,9-HxCDF	1.6U pg/L		
		1,2,3,4,6,7,8-HpCDF	3.2U pg/L		
		1,2,3,4,7,8,9-HpCDF	2.0U pg/L		
		OCDF	8.1U pg/L		

Tronox LLC Facility, PCS Additional Sampling, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0H250498

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 24089H21
SDG #: G0H250498
Laboratory: Test America

Date: 10/12/10
Page: 1 of 1
Reviewer: EJ
2nd Reviewer: [signature]

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: 8/23/10
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	N	6C Sample
VII.	Laboratory control samples	SW	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	EB = 1

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: Water

1	EB-08232010	11	02G0402	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

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

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

Notes:

LDC #: 24089A2/

VALIDATION FINDINGS WORKSHEET
Blanks

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

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 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?

* EMPC

Blank extraction date: 9/2/10 **Blank analysis date:** 9/10/10 **Associated samples:** All (bl)
Conc. units: pg/L

Compound	Blank ID	Sample Identification								
	0260402	5X		1						
C	1.6	8.0		-						
D	1.1 *	5.5		0.97*/U						
E	1.0*	5.0		0.67*/U						
F	8.0	40.0		1.3*/U						
G	29	145		4.4*/U						
K	1.7	8.5		2.9/U						
L	2.0	10.0		1.7/U						
M	1.7	8.5		-						
N	1.6*	8.0		1.6*/U						
O	2.2	11		3.2*/U						
P	1.8 *	9.0		2.0/U						
Q	4.0	20		8.1*/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 #: 24089#21

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: FJ
2nd Reviewer: Q

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

* EMPC

(Y) N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/L
Sampling date: 08/23/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: none

Compound	Blank ID	Sample Identification								
	1									
D	0.97*									
E	0.67*									
F	1.3*									
G	4.4*									
K	2.9									
L	1.7									
N	1.6*									
O	3.2*									
~~R~~ P	~~8.4~~ 2.0									
Q	8.1*									
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 #: 24089H21
SDG #: precover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: F7
2nd Reviewer: Q

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 LCS required?
(Y) N N/A Was a LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?
Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	Lab ID/Reference	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	9/10/10	0260402	L	136 (76-132)	( )	( )	All	J+/P det (1)
				( )	( )	( )		(no LCSD)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 24089H21
SDG #: Recovery

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Reviewer: EZ
2nd Reviewer: CV

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~~ compds	Finding	Associated Samples	Qualifications
			All compounds reported below the PQL	All	J/Adit (sp)
			All compounds reported as EMPC	All	JK dit (K)

Comments: See sample calculation verification worksheet for recalculations