

US EPA ARCHIVE DOCUMENT

**DIOXIN DATA VALIDATION REPORT
USEPA REGION I - TIER III**

SDG No.: G2G190281
Laboratory: Severn Trent Laboratories, Inc., West Sacramento, CA
Site: Centredale Manor
Date: September 12, 2002
Samples:
Dioxin: 10/Soil/2108282, 2108283, 2108284, 2108286, 2108287, 2108288, 2108289,
2108290, 2108292, 2108293
1/Aqueous/2108291
1/Aqueous PE/2108401

A Tier III validation was performed on the dioxin/furan analytical data for ten soil samples, one aqueous blank sample and one aqueous PE sample collected by Loureiro Engineering Associates at the Centredale Manor Site in North Providence, Rhode Island. The samples were analyzed under EPA Method 8290 for high resolution dioxin/furans. The data were evaluated as a Tier III level in accordance with the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Dioxin/Furan Analyses", dated November 1998 and the "Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses" dated December 1996 and were based on the following parameters:

- * Overall Evaluation of Data and Potential Usability Issues.
 - * Data Completeness.
 - * Preservation and Technical Holding Times.
 - * PE Samples/Accuracy Check.
 - * Window Defining Solution.
 - * Initial & Continuing Calibrations.
 - * Chromatographic Resolution.
 - * Instrument Sensitivity Check.
 - * Blanks.
 - * Matrix Spike Analysis.
 - * Laboratory & Field Duplicate Analysis.
 - * Internal/Clean-up/Recovery Standards.
 - * Sample Analysis & Identification.
 - * Sample Quantitation & Total Homologues.
 - * Estimated Detection Limits (EDL) & Estimated Maximum Possible Concentration (EMPC).
 - * Toxicity Equivalency (TEF) and Isomer Specificity.
 - * Required Sample Reruns & Second Column Confirmation.
 - * Dilutions.
- * = All criteria were met for this parameter.
NA = Not Applicable.

Overall Evaluation of Data and Potential Usability Issues**Dioxin/Furans:**

Dioxin/furan sample results were qualified as follows:

- 23478-PeCDF has been qualified as estimated (UJ) in sample 2108291 due to a low LCS recovery.

Accuracy Check

Laboratory control sample recoveries outside of QC criteria that resulted in qualifications are summarized below.

LCS ID	Compound	%R	Samples Affected	Action
E47801AC	23478-PeCDF	46%	2108291	J/UJ

- 23478-PeCDF has been qualified as estimated (UJ) in sample 2108291.

Additional Comments

- Three compounds in sample 2108283 were reported with a (D) by the laboratory indicating dilution. These results are non-detect but required dilutions due to matrix interferences at the lower levels. No action was taken on this basis.
- The samples were received at 0°C and were nearly frozen.
- An aqueous PE sample (2108401) and two soil PE samples (2108342/2108402) were analyzed with this project. According to the client, Cambridge Analytical Isotopes did not provide a range of values for the aqueous PE sample. A range of expected values was provided for the soil PE samples and all results were acceptable and within the range. No action was taken by the reviewer on the basis of the PE samples. A copy of the Form Is for all PE samples, as well as Table 1 - Summary of Quality Assurance/Quality Control Sample Results is attached to this report.

Please contact the undersigned at (603) 226-0118 if you have any questions or need further information.

Very truly yours,
Environmental Data Services, Inc.


Nancy Weaver
Senior Chemist

Attachments: Data Validation Worksheets
Annotated Form Is

DATA SUMMARY KEY
ORGANIC DATA VALIDATION

- J = The associated numerical value is an estimated quantity.
- R = The data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification. The R replaces the numerical value or sample quantitation limit.
- U = The compound was analyzed for, but not detected. The associated numerical value is the sample quantitation limit or the adjusted sample quantitation limit.
- UJ = The compound was analyzed for, but not detected. The associated numerical value is the estimated sample quantitation limit.
- EB = The compound was detected in aqueous equipment blank associated soil/sediment samples.

DIOXIN DATA REVIEW WORKSHEET
(LOW or HIGH RESOLUTION)

The following data package has been validated:

Lab Name Sewer Treat West Sacramento, CA
DAS/Project No. Centredale Manor
SDG No. 626190281
No. of Samples/Matrix 105011/2ag

Tech. Spec./Method No. 8290-High Res dioxin
Sampling Date(s) 7/16/02, 7/17/02
Shipping Date(s) 7/18/02
Date(s) Rec'd by Lab 7/19/02

Traffic Report Sample Nos. 2108282, 2108283, 2108284, 2108286, 2108287
2108288, 2108289, 2108290, 2108292, 2108293
2108291, 2108401
Equipment Blank Nos. 2108291
Field Duplicate Nos. NA
PES Nos. 2108401 (ag)

The Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Dioxin/Furan Analyses, November 1998 and Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses, December 1996 were used to evaluate the data and/or approved modifications to the Functional Guidelines were used to evaluate the data. (Attach modified criteria from EPA approved QAPjP or amendment to QAPjP).

The general criteria used to determine the performance were based on an examination of:

- | | |
|--|---|
| • Overall Evaluation of Data | • Laboratory & Field Duplicate Analysis |
| • Data Completeness | • Internal/Clean-up/Recovery Standards |
| • Preservation/Technical Holding Times | • Sample Analysis & Identification |
| • PE Samples/Accuracy Check | • Sample Quantitation & Total Homologues |
| • Window Defining Mix | • Estimated Detection Limit (EDL) & Estimated Maximum Possible Concentration (EMPC) |
| • Initial & Continuing Calibrations | • Toxicity Equivalency Factor (TEF) & Isomer Specificity |
| • Chromatographic Resolution | • Required Sample Reruns & Second Column Confirmation |
| • Instrument Sensitivity Check | • Dilutions |
| • Blanks | |
| • Matrix Spike Analysis | |

Definition of Qualifiers:

- A - Acceptable data
J - Approximate data due to quality control criteria
R - Reject data due to quality control criteria
U - Result not detected
EB - Compound detected in aqueous equipment blank associated with soil/sediment samples

Validator: Laurel Leaver

Date: 9/12/02

I. DATA COMPLETENESS

MISSING INFORMATION

DATE LAB CONTACTED

DATE RECEIVED

All criteria were met.

Addl. comments: The samples were received heavily frozen at 0°C and 1°C.

Three compounds in sample 2108283 were flagged with a (D) by the laboratory indicating "dilutions". These results are non-detected but required dilutions due to matrix interferences at the lower levels.

Reviewer:

McLeaver

Date:

9/12/02

Region I
Data Review Worksheet - (Low and High Resolution)

II. PRESERVATION AND HOLDING TIMES

Sampler: JM Company: Laureiro Eng. Contacted Yes No Date: _____

I. Circle sample numbers with exceeded contract holding times or omitted preservation.

Sample Number	Matrix	Preserved Y/N	Date Sampled	Date Extracted	Date Analyzed	Action
2108282	Soil	N	7/17/02	8/6/02	8/15/02	None
2108283						
2108284						
2108286						
2108287						
2108288						
2108289						
2108290						
2108292						
2108293						
ER 210891	Water	N	7/17/02	7/24/02	7/27/02	
PE 2108401	"	"	7/16/02	"	"	

Validator: Laureiro

Date: 9/12/02

Region I
Data Review Worksheet - (Low and High Resolution)

III. ACCURACY CHECK (Performance Evaluation Results) - List all analytes that are outside criteria.

SDG No: 626190281 CASE/PROJECT No: Centredale Manor

Are more than one-half of the PES analytes within criteria for each parameter.

(Y) N

P/E Sample Number	Ampule Number	Type of PES	Matrix	Analyte	Conc	Region I EPA PES Scores*	Non-EPA PES Scores**	Samples Affected	Action
E51LGIAC	-	LCS	Soil	all analytes	all	(60-140)	-	all soils	None
E47801AC	-	LCS	water	123789-HxCDF	195%	(60-140)	-	all waters	(J) - N
				23418-PCDF	46%	(60-140)	-	(2108291, 2108401)	(J/UT)
				234678-HxCDF	224%		-	PE	(J) - N
				123789-HxCDF	237%		-	↓*	(J) - N
				123789-HxCDF	186%		-		(J) - N

- * For Region I PESs indicate the Region I PES Score Report Results: Action Low; Action High; TCL MISS; TCL CONTAMINANT
- ** For Non-EPA PESs indicate the Non-EPA PES Score: PES COMPOUND MISS; PES COMPOUND CONTAMINANT; PES COMPOUND HIT (% Recovery Limits)

* NO qualifiers
for PE samples
per Region I.

Validator: D. Wheeler

Date: 9/12/02

Region I

Data Review Worksheets - (Low or High Resolution)

V. INITIAL AND CONTINUING CALIBRATIONS

Va. INITIAL CALIBRATION

Date of ICAL	Instrument File Name	Compound	%RSD	Ion Ratio	S/N	RT	Resolution	Samples Affected	Action
8/15/02	06AU02102	all analytes	all	all				all samples	None
8/14/02	12-AU02605		PASS	PASS					
8/15/02	14AU02605								
8/6/02	06AU02102								
8/8/02	07AU02605								
7/27/02	05MR02102								
7/26/02	26JL02605								
3/6/02	05MR02102								
7/24/02	24JL02605								

Comments:

All criteria were met.

Validator:

mlbauer

Date:

9/12/02

11/98

VI. COLUMN PERFORMANCE RESOLUTION CHECK

Date: _____ ID: _____

Was the chromatographic resolution of the TCDD/TCDF isomers and the _____ in the CC3 solution for DB-5 columns calculated for each 12 hour period?

% Valley _____ -TCDD/ _____ -TCDD _____

(QC Limit $\leq$ 25%)

% Valley _____ -TCDF/ _____ -TCDF _____

(QC Limit $\leq$ 50%)

For DB-225 columns:

% Valley _____ -TCDD/ _____ -TCDD _____

(QC Limit $\leq$ 25%)

% Valley _____ -TCDF/ _____ -TCDF _____

(QC Limit $\leq$ 50%)

ACTIONS:

- A. If the GC resolution criteria do not meet specifications, the positive hits will be qualified as "J". All tetras and hexas (for both dio and furans) will be qualified. The heptas are not believed to be affected. OCDD and OCDF are not affected as there is only one isomer in each group. No action is taken for non-detects.
- B. The criteria for chromatographic resolution must be met for all standards and the reviewer must use professional judgement on the severity of the problem and its effect on the final results.

Validator: _____

Daney Weaver

Date: _____

9/12/02

Region I
Data Review Worksheets - (Low and High Resolution)

VIIa. BLANKS ANALYSIS

Was a method blank prepared and analyzed for each matrix prior to analysis of sample?

Yes ☒ No ☐

List the blank contamination below.

Sampler: JM Company: Lowreio Eng.

Contacted: Yes ☐ No ☐ Date: _____

1. Laboratory: Method and Instrument Blanks

Date Extracted	Date Analyzed	Matrix	Sample No. (Blank Type)	Instrument	Compound	Conc. (units)
8/6/02	8/14/02	Soil	E51LG1AA	HRGC/HRMS	All ND	—
7/24/02	7/26/02	Water	E47801AA	" "	all ND	—

2. Field: Equipment (Rinsate) Blanks

Date Extracted	Date Analyzed	Matrix	Sample No. (Blank Type)	Instrument	Compound	Conc. (units)
7/24/02	7/27/02	Water	2108291 ER	HRGC/HRMS	all ND	—

Validator: Miller

Date: 9/12/02
11/98

Validator: Perkover

Date: 9/12/02

A. If no blank is run with a particular matrix, the non-detected results should be accepted without qualifying the data and the positive hits should be flagged "J". If all samples have the same hits with similar concentrations and no blank is run, professional judgment should be used to determine if all results should be rejected "R".

B. If a blank is contaminated above the specified limits, any sample hits reported as below the action level are to be reported as non-detected, and not included in the TEF calculations. All data that are not greater than 10 times the blank action level are to be reported as non-detected. If the detected analyte is OCDD/OCDF or a Total Homologue all data that are not greater than 10 times the blank are to be reported as non-detected.

C. If positive results are detected in aqueous equipment (rinse) blanks and the associated non-aqueous samples, then the validator should flag (ED) those detected compounds in the associated non-aqueous sample: indicate an indeterminate amount of sampling error has potentially affected the sample results.

Validator

Date:

Region I
Data Review Worksheet - (Low and High Resolution)

VIII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

List all MS/MSD analytes that are outside method QC acceptance criteria.

2108287

(G26190281-006)

Compound	MS % Rec	MSD % Rec	RPD	Method QC Limits		Concentration			%RSD	Action
				% Rec	RPD	Unspiked Sample	MS	MSD		
2378-TCDD										
2378-TCDF										
12378-PeCDF										
12378-PeCDD										
23473-PeCDF										
123473-HxCDF										
123673-HxCDF										
123473-HxCDD										
123673-HxCDD										
123789-HxCDD	148*	144*	ok	60-140	0-30					(J) ND
234673-HxCDF										
123789-HxCDF	149*	151*	ok	60-140	0-30					(J) NP
1234673-HpCDF										
1234673-HpCDD										
1234739-HpCDF	152*	ok	ok	60-140	0-30					(J) ND
OCDD										
OCDF										

Default Limits: % Recovery (50-150%), RPD (50%)

ACTIONS:

If recoveries are beyond 50-150%, recheck all calculations. Professional judgment should be used to flag sample data.

* outside of QC limits

Idator:

W. Leaver

Date:

9/12/02

Region I
Data Review Worksheets - (High Resolution)

Xb. INTERNAL STANDARD RECOVERY

Recovery Acceptance Criteria per Table 10 in Dioxin Validation SOP:

Sample Nos.												
Internal Standard	% Rec.	S/N	QC Range (%)	Action	% Rec.	S/N	QC Range (%)	Action	% Rec.	S/N	QC Range (%)	Action
¹² C ₁₂ -2378-TCDD												
¹² C ₁₂ -2378-TCDF												
¹² C ₁₂ -12378-PeCDD												
¹² C ₁₂ -12378-PeCDF												
¹² C ₁₂ -23478-PeCDF												
¹² C ₁₂ -123478-HxCDD												
¹² C ₁₂ -123678-HxCDD												
¹² C ₁₂ -123789-HxCDD												
¹² C ₁₂ -123478-HxCDF												
¹² C ₁₂ -123678-HxCDF												
¹² C ₁₂ -123789-HxCDF												
¹² C ₁₂ -234678-HxCDF												
¹² C ₁₂ -1234678-HpCDD												
¹² C ₁₂ -1234678-HpCDF												
¹² C ₁₂ -1234789-HpCDF												
¹² C ₁₂ -OCDD												
¹² C ₁₂ -2378-TCDD												

all PASS

Validator: mlleaver

Date: 9/12/02

List any sample and analytes which did not meet identification criteria:

all PAGES

W Weaver

9/12/02

XII. SAMPLE CALCULATION

2108284

$$12378\text{-}peCDF = \frac{18924220 \times 2000}{370744000 \times 10 \times 1.07 \times 0.42} \approx 23 \text{ pg/g}$$

$$123478\text{-}HxCDF = \frac{37774200 \times 2000}{262748000 \times 10 \times 1.29 \times 0.42} \approx 53 \text{ pg/g}$$

$$\text{Concentration (ng/g)} = \frac{Q_{is} \times (A_{x1} + A_{x2}) \times D}{(W \text{ or } V) \times (A_{is1} + A_{is2}) \times RRF_x}$$

$$EDL = \frac{2.5 \times Q_{is} \times (H_{x1} + H_{x2}) \times D}{(W \text{ or } V) \times (H_{is1} + H_{is2}) \times RRF_x}$$

$$EMPC = \frac{Q_{is} \times (A_{x1} + A_{x2}) \times D}{(W \text{ or } V) \times (A_{is1} + A_{is2}) \times RRF_x}$$

where:

Q_{is}	=	Quantity (ng) of appropriate internal standard added to sample before extraction.
A_{x1}/A_{x2}	=	Integrated areas of the two quantitation ions.
A_{is1}/A_{is2}	=	Integrated areas of the internal standard quantitation ions
W	=	Weight (g) of sample extracted.
V	=	Volume (L) of sample extracted.
RRF_x	=	Calculated relative response factor from the continuing calibration.
$H_{x1} + H_{x2}$	=	Peak heights of the noise for the quantitation ions.
$H_{is1} + H_{is2}$	=	Peak heights of the internal standard quantitation ions.
D	=	Dilution.

Validator:

M. Weaver

Date:

9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108282

Lot-Sample #...: G2G190281 - 001
 Date Sampled...: 07/17/02
 Prep Date...: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42HQ2AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix...: SOLID
 Instrument: 6D5
 Units...: pg/g
 % Moisture: 59

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	800	2.4	1	800.000000
Total TCDD	860	2.4		
1,2,3,7,8-PeCDD	7.9 J	12	1	7.900000
Total PeCDD	16	12		
1,2,3,4,7,8-HxCDD	ND	5.8	0.1	0
1,2,3,6,7,8-HxCDD	16	12	0.1	1.600000
1,2,3,7,8,9-HxCDD	20	12	0.1	2.000000
Total HxCDD	110	12		
1,2,3,4,6,7,8-HpCDD	210	12	0.01	2.100000
Total HpCDD	390	12		
OCDD	1100	24	0.0001	0.110000
2,3,7,8-TCDF	10 CON	2.4	0.1	1.000000
Total TCDF	110	2.4		
1,2,3,7,8-PeCDF	ND	3.9	0.05	0
2,3,4,7,8-PeCDF	6.1 J	12	0.5	3.100000
Total PeCDF	62	12		
1,2,3,4,7,8-HxCDF	6.5 J	12	0.1	0.650000
1,2,3,6,7,8-HxCDF	6.7 J	12	0.1	0.670000
2,3,4,6,7,8-HxCDF	ND	3.9	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.73	0.1	0
Total HxCDF	110	12		
1,2,3,4,6,7,8-HpCDF	64	12	0.01	0.640000
1,2,3,4,7,8,9-HpCDF	ND	4.2	0.01	0
Total HpCDF	120	12		
OCDF	78	24	0.0001	0.007800
Total TEQ Concentration				819.777800

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	77	40 - 135
13C-1,2,3,7,8-PeCDD	72	40 - 135
13C-1,2,3,6,7,8-HxCDD	72	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	92	40 - 135
13C-OCDD	91	40 - 135
13C-2,3,7,8-TCDF	68	40 - 135
13C-1,2,3,7,8-PeCDF	74	40 - 135
13C-1,2,3,4,7,8-HxCDF	73	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	82	40 - 135

luw
9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108282

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

AW
9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108283

Lot-Sample #...: G2G190281 - 002
 Date Sampled...: 07/17/02
 Prep Date...: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42HV2AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix...: SOLID
 Instrument: 6D5
 Units...: pg/g
 % Moisture: 18

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	8.1	1.2	1	8.100000
Total TCDD	16	1.2		
1,2,3,7,8-PeCDD	ND	2.4	1	0
Total PeCDD	3.3	6.1		
1,2,3,4,7,8-HxCDD	ND D	2.3	0.1	0
1,2,3,6,7,8-HxCDD	ND D	3.3	0.1	0
1,2,3,7,8,9-HxCDD	ND D	3.7	0.1	0
Total HxCDD	ND	11		0
1,2,3,4,6,7,8-HpCDD	27	6.1	0.01	0.270000
Total HpCDD	61	6.1		
OCDD	85	12	0.0001	0.008500
2,3,7,8-TCDF	3.3 CON	1.2	0.1	0.330000
Total TCDF	29	1.2		
1,2,3,7,8-PeCDF	ND	2.3	0.05	0
2,3,4,7,8-PeCDF	ND	1.9	0.5	0
Total PeCDF	5.7	6.1		
1,2,3,4,7,8-HxCDF	ND	2.0	0.1	0
1,2,3,6,7,8-HxCDF	ND	1.9	0.1	0
2,3,4,6,7,8-HxCDF	ND	2.5	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.41	0.1	0
Total HxCDF	6.7	6.1		
1,2,3,4,6,7,8-HpCDF	9.4	6.1	0.01	0.094000
1,2,3,4,7,8,9-HpCDF	ND	1.6	0.01	0
Total HpCDF	18	6.1		
OCDF	8.7 J	12	0.0001	0.000870
Total TEQ Concentration				8.803370

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	76	40 - 135
13C-1,2,3,7,8-PeCDD	91	40 - 135
13C-1,2,3,6,7,8-HxCDD	64	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	69	40 - 135
13C-OCDD	112	40 - 135
13C-2,3,7,8-TCDF	59	40 - 135
13C-1,2,3,7,8-PeCDF	93	40 - 135
13C-1,2,3,4,7,8-HxCDF	65	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	56	40 - 135

9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108283

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON	Confirmation analysis.
D	Result was obtained from the analysis of a dilution.
J	Estimated result. Result is less than the reporting limit.

PLW
9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108284

Lot-Sample #...: G2G190281 - 003
 Date Sampled...: 07/17/02
 Prep Date...: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42HW2AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix...: SOLID
 Instrument: 6D5
 Units...: pg/g
 % Moisture: 58

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	530	2.4	1	530.000000
Total TCDD	670	2.4		
1,2,3,7,8-PeCDD	20	12	1	20.000000
Total PeCDD	100	12		
1,2,3,4,7,8-HxCDD	26	12	0.1	2.600000
1,2,3,6,7,8-HxCDD	96	12	0.1	9.600000
1,2,3,7,8,9-HxCDD	70	12	0.1	7.000000
Total HxCDD	680	12		
1,2,3,4,6,7,8-HpCDD	980	12	0.01	9.800000
Total HpCDD	1700	12		
OCDD	3700	24	0.0001	0.370000
2,3,7,8-TCDF	28	2.4	0.1	2.800000
Total TCDF	320	2.4		
1,2,3,7,8-PeCDF	23	12	0.05	1.200000
2,3,4,7,8-PeCDF	31	12	0.5	16.000000
Total PeCDF	350	12		
1,2,3,4,7,8-HxCDF	53	12	0.1	5.300000
1,2,3,6,7,8-HxCDF	41	12	0.1	4.100000
2,3,4,6,7,8-HxCDF	29	12	0.1	2.900000
1,2,3,7,8,9-HxCDF	ND	2.4	0.1	0
Total HxCDF	630	12		
1,2,3,4,6,7,8-HpCDF	580	12	0.01	5.800000
1,2,3,4,7,8,9-HpCDF	33	12	0.01	0.330000
Total HpCDF	1200	12		
OCDF	400	24	0.0001	0.040000
Total TEQ Concentration				617.840000

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	68	40 - 135
13C-1,2,3,7,8-PeCDD	77	40 - 135
13C-1,2,3,6,7,8-HxCDD	76	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	81	40 - 135
13C-OCDD	75	40 - 135
13C-2,3,7,8-TCDF	63	40 - 135
13C-1,2,3,7,8-PeCDF	76	40 - 135
13C-1,2,3,4,7,8-HxCDF	92	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	76	40 - 135

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9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108284

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

juw
9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108286

Lot-Sample #...: G2G190281 - 005
 Date Sampled...: 07/17/02
 Prep Date.....: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42H22AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix.....: SOLID
 Instrument: 6D5
 Units.....: pg/g
 % Moisture: 33

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	50	1.5	1	50.000000
Total TCDD	57	1.5		
1,2,3,7,8-PeCDD	ND	1.0	1	0
Total PeCDD	ND	2.8		0
1,2,3,4,7,8-HxCDD	ND	1.1	0.1	0
1,2,3,6,7,8-HxCDD	ND	1.8	0.1	0
1,2,3,7,8,9-HxCDD	ND	2.2	0.1	0
Total HxCDD	9.8	7.5		
1,2,3,4,6,7,8-HpCDD	19	7.5	0.01	0.190000
Total HpCDD	34	7.5		
OCDD	120	15	0.0001	0.012000
2,3,7,8-TCDF	2.9	1.5	0.1	0.290000
Total TCDF	23	1.5		
1,2,3,7,8-PeCDF	ND	1.8	0.05	0
2,3,4,7,8-PeCDF	ND	2.1	0.5	0
Total PeCDF	6.3	7.5		
1,2,3,4,7,8-HxCDF	ND	3.5	0.1	0
1,2,3,6,7,8-HxCDF	ND	1.6	0.1	0
2,3,4,6,7,8-HxCDF	ND	1.2	0.1	0
1,2,3,7,8,9-HxCDF	ND	1.3	0.1	0
Total HxCDF	5.0	7.5		
1,2,3,4,6,7,8-HpCDF	11	7.5	0.01	0.110000
1,2,3,4,7,8,9-HpCDF	ND	1.2	0.01	0
Total HpCDF	18	7.5		
OCDF	11	15	0.0001	0.001100
Total TEQ Concentration				50.603100

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	86	40 - 135
13C-1,2,3,7,8-PeCDD	101	40 - 135
13C-1,2,3,6,7,8-HxCDD	72	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	93	40 - 135
13C-OCDD	98	40 - 135
13C-2,3,7,8-TCDF	88	40 - 135
13C-1,2,3,7,8-PeCDF	100	40 - 135
13C-1,2,3,4,7,8-HxCDF	74	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	61	40 - 135

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108286

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al, 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108287

Lot-Sample #...: G2G190281 - 006
 Date Sampled...: 07/17/02
 Prep Date...: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42H52AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix...: SOLID
 Instrument: 6D5
 Units...: pg/g
 % Moisture: 31

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	2.7	1.5	1	2.700000
Total TCDD	5.8	1.5		
1,2,3,7,8-PeCDD	ND	0.71	1	0
Total PeCDD	ND	2.0		0
1,2,3,4,7,8-HxCDD	ND	1.1	0.1	0
1,2,3,6,7,8-HxCDD	4.4 J	7.3	0.1	0.440000
1,2,3,7,8,9-HxCDD	ND	3.6	0.1	0
Total HxCDD	17	7.3		
1,2,3,4,6,7,8-HpCDD	81	7.3	0.01	0.810000
Total HpCDD	160	7.3		
OCDD	870	15	0.0001	0.087000
2,3,7,8-TCDF	1.9 CON	1.5	0.1	0.190000
Total TCDF	20	1.5		
1,2,3,7,8-PeCDF	ND	1.4	0.05	0
2,3,4,7,8-PeCDF	ND	1.7	0.5	0
Total PeCDF	14	7.3		
1,2,3,4,7,8-HxCDF	ND	2.6	0.1	0
1,2,3,6,7,8-HxCDF	ND	2.2	0.1	0
2,3,4,6,7,8-HxCDF	ND	1.8	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.47	0.1	0
Total HxCDF	17	7.3		
1,2,3,4,6,7,8-HpCDF	22	7.3	0.01	0.220000
1,2,3,4,7,8,9-HpCDF	ND	1.7	0.01	0
Total HpCDF	56	7.3		
OCDF	38	15	0.0001	0.003800
Total TEQ Concentration				4.450800

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	76	40 - 135
13C-1,2,3,7,8-PeCDD	85	40 - 135
13C-1,2,3,6,7,8-HxCDD	72	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	88	40 - 135
13C-OCDD	90	40 - 135
13C-2,3,7,8-TCDF	79	40 - 135
13C-1,2,3,7,8-PeCDF	85	40 - 135
13C-1,2,3,4,7,8-HxCDF	70	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	69	40 - 135

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108287

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108288

Lot-Sample #...: G2G190281 - 007
 Date Sampled...: 07/17/02
 Prep Date.....: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42H62AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix.....: SOLID
 Instrument: 6D5
 Units.....: pg/g
 % Moisture: 11

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	3.9	1.1	1	3.900000
Total TCDD	5.5	1.1		
1,2,3,7,8-PeCDD	ND	1.5	1	0
Total PeCDD	ND	1.5		0
1,2,3,4,7,8-HxCDD	ND	0.64	0.1	0
1,2,3,6,7,8-HxCDD	3.7 J	5.6	0.1	0.370000
1,2,3,7,8,9-HxCDD	3.6 J	5.6	0.1	0.360000
Total HxCDD	30	5.6		
1,2,3,4,6,7,8-HpCDD	17	5.6	0.01	0.170000
Total HpCDD	38	5.6		
OCDD	93	11	0.0001	0.009300
2,3,7,8-TCDF	2.1 CON	1.1	0.1	0.210000
Total TCDF	37	1.1		
1,2,3,7,8-PeCDF	ND	2.0	0.05	0
2,3,4,7,8-PeCDF	6.3	5.6	0.5	3.100000
Total PeCDF	170	5.6		
1,2,3,4,7,8-HxCDF	5.8	5.6	0.1	0.580000
1,2,3,6,7,8-HxCDF	13	5.6	0.1	1.300000
2,3,4,6,7,8-HxCDF	15	5.6	0.1	1.500000
1,2,3,7,8,9-HxCDF	ND	0.51	0.1	0
Total HxCDF	260	5.6		
1,2,3,4,6,7,8-HpCDF	20	5.6	0.01	0.200000
1,2,3,4,7,8,9-HpCDF	ND	2.4	0.01	0
Total HpCDF	46	5.6		
OCDF	7.6 J	11	0.0001	0.000760
Total TEQ Concentration				11.700060

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	74	40 - 135
13C-1,2,3,7,8-PeCDD	70	40 - 135
13C-1,2,3,6,7,8-HxCDD	57	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	84	40 - 135
13C-OCDD	90	40 - 135
13C-2,3,7,8-TCDF	70	40 - 135
13C-1,2,3,7,8-PeCDF	74	40 - 135
13C-1,2,3,4,7,8-HxCDF	53	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	73	40 - 135

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 9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108288

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108289

Lot-Sample #...: G2G190281 - 008
 Date Sampled...: 07/17/02
 Prep Date.....: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42H72AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix....: SOLID
 Instrument: 6D5
 Units.....: pg/g
 % Moisture: 16

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	11	1.2	1	11.000000
Total TCDD	12	1.2		
1,2,3,7,8-PeCDD	ND	0.60	1	0
Total PeCDD	ND	1.2		0
1,2,3,4,7,8-HxCDD	ND	0.43	0.1	0
1,2,3,6,7,8-HxCDD	ND	1.7	0.1	0
1,2,3,7,8,9-HxCDD	ND	1.6	0.1	0
Total HxCDD	9.0	5.9		
1,2,3,4,6,7,8-HpCDD	11	5.9	0.01	0.110000
Total HpCDD	21	5.9		
OCDD	66	12	0.0001	0.006600
2,3,7,8-TCDF	1.1 J CON	1.2	0.1	0.110000
Total TCDF	43	1.2		
1,2,3,7,8-PeCDF	ND	1.3	0.05	0
2,3,4,7,8-PeCDF	3.9 J	5.9	0.5	1.900000
Total PeCDF	150	5.9		
1,2,3,4,7,8-HxCDF	3.5 J	5.9	0.1	0.350000
1,2,3,6,7,8-HxCDF	6.9	5.9	0.1	0.690000
2,3,4,6,7,8-HxCDF	6.0	5.9	0.1	0.600000
1,2,3,7,8,9-HxCDF	ND	0.32	0.1	0
Total HxCDF	140	5.9		
1,2,3,4,6,7,8-HpCDF	12	5.9	0.01	0.120000
1,2,3,4,7,8,9-HpCDF	ND	1.5	0.01	0
Total HpCDF	27	5.9		
OCDF	ND	5.0	0.0001	0
Total TEQ Concentration				14.886600

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	80	40 - 135
13C-1,2,3,7,8-PeCDD	96	40 - 135
13C-1,2,3,6,7,8-HxCDD	66	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	94	40 - 135
13C-OCDD	95	40 - 135
13C-2,3,7,8-TCDF	91	40 - 135
13C-1,2,3,7,8-PeCDF	97	40 - 135
13C-1,2,3,4,7,8-HxCDF	62	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	66	40 - 135

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108289

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al, 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108290

Lot-Sample #...: G2G190281 - 009
 Date Sampled...: 07/17/02
 Prep Date.....: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42H82AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix.....: SOLID
 Instrument: 6D5
 Units.....: pg/g
 % Moisture: 8.9

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	9.3	1.1	1	9.300000
Total TCDD	13	1.1		
1,2,3,7,8-PeCDD	ND	1.0	1	0
Total PeCDD	ND	3.8		0
1,2,3,4,7,8-HxCDD	ND	0.81	0.1	0
1,2,3,6,7,8-HxCDD	3.1 J	5.5	0.1	0.310000
1,2,3,7,8,9-HxCDD	2.9 J	5.5	0.1	0.290000
Total HxCDD	29	5.5		
1,2,3,4,6,7,8-HpCDD	16	5.5	0.01	0.160000
Total HpCDD	35	5.5		
OCDD	61	11	0.0001	0.006100
2,3,7,8-TCDF	1.6 CON	1.1	0.1	0.160000
Total TCDF	91	1.1		
1,2,3,7,8-PeCDF	ND	2.7	0.05	0
2,3,4,7,8-PeCDF	7.9	5.5	0.5	3.900000
Total PeCDF	280	5.5		
1,2,3,4,7,8-HxCDF	6.7	5.5	0.1	0.670000
1,2,3,6,7,8-HxCDF	11	5.5	0.1	1.100000
2,3,4,6,7,8-HxCDF	10	5.5	0.1	1.000000
1,2,3,7,8,9-HxCDF	ND	0.35	0.1	0
Total HxCDF	220	5.5		
1,2,3,4,6,7,8-HpCDF	24	5.5	0.01	0.240000
1,2,3,4,7,8,9-HpCDF	ND	1.7	0.01	0
Total HpCDF	42	5.5		
OCDF	7.0 J	11	0.0001	0.000700
Total TEQ Concentration				17.136800

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	77	40 - 135
13C-1,2,3,7,8-PeCDD	75	40 - 135
13C-1,2,3,6,7,8-HxCDD	81	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	95	40 - 135
13C-OCDD	99	40 - 135
13C-2,3,7,8-TCDF	71	40 - 135
13C-1,2,3,7,8-PeCDF	79	40 - 135
13C-1,2,3,4,7,8-HxCDF	76	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	92	40 - 135

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108290

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al, 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108292

Lot-Sample #...: G2G190281 - 011
 Date Sampled...: 07/17/02
 Prep Date.....: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42JC2AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix.....: SOLID
 Instrument: 6D5
 Units.....: pg/g
 % Moisture: 20

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	9.7	1.3	1	9.700000
Total TCDD	51	1.3		
1,2,3,7,8-PeCDD	6.8	6.3	1	6.800000
Total PeCDD	47	6.3		
1,2,3,4,7,8-HxCDD	5.0	6.3	0.1	0.500000
1,2,3,6,7,8-HxCDD	15	6.3	0.1	1.500000
1,2,3,7,8,9-HxCDD	12	6.3	0.1	1.200000
Total HxCDD	160	6.3		
1,2,3,4,6,7,8-HpCDD	64	6.3	0.01	0.640000
Total HpCDD	130	6.3		
OCDD	220	13	0.0001	0.022000
2,3,7,8-TCDF	15	1.3	0.1	1.500000
Total TCDF	450	1.3		
1,2,3,7,8-PeCDF	18	6.3	0.05	0.900000
2,3,4,7,8-PeCDF	40	6.3	0.5	20.000000
Total PeCDF	1000	6.3		
1,2,3,4,7,8-HxCDF	48	6.3	0.1	4.800000
1,2,3,6,7,8-HxCDF	58	6.3	0.1	5.800000
2,3,4,6,7,8-HxCDF	54	6.3	0.1	5.400000
1,2,3,7,8,9-HxCDF	ND	1.4	0.1	0
Total HxCDF	990	6.3		
1,2,3,4,6,7,8-HpCDF	150	6.3	0.01	1.500000
1,2,3,4,7,8,9-HpCDF	10	6.3	0.01	0.100000
Total HpCDF	260	6.3		
OCDF	40	13	0.0001	0.004000
Total TEQ Concentration				60.366000

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	65	40 - 135
13C-1,2,3,7,8-PeCDD	72	40 - 135
13C-1,2,3,6,7,8-HxCDD	59	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	74	40 - 135
13C-OCDD	74	40 - 135
13C-2,3,7,8-TCDF	63	40 - 135
13C-1,2,3,7,8-PeCDF	70	40 - 135
13C-1,2,3,4,7,8-HxCDF	67	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	62	40 - 135

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108292

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108293

Lot-Sample #...: G2G190281 - 012
 Date Sampled...: 07/17/02
 Prep Date.....: 08/06/02
 Prep Batch #...: 2218489

Work Order #...: E42JD2AC
 Date Received...: 07/19/02
 Analysis Date...: 08/15/02
 Dilution Factor: 1

Matrix.....: SOLID
 Instrument: 6D5
 Units.....: pg/g
 % Moisture: 19

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	16	1.2	1	16.000000
Total TCDD	21	1.2		
1,2,3,7,8-PeCDD	ND	0.82	1	0
Total PeCDD	ND	2.2		0
1,2,3,4,7,8-HxCDD	ND	0.68	0.1	0
1,2,3,6,7,8-HxCDD	3.2 J	6.2	0.1	0.320000
1,2,3,7,8,9-HxCDD	ND	1.3	0.1	0
Total HxCDD	19	6.2		
1,2,3,4,6,7,8-HpCDD	29	6.2	0.01	0.290000
Total HpCDD	49	6.2		
OCDD	150	12	0.0001	0.015000
2,3,7,8-TCDF	1.7 CON	1.2	0.1	0.170000
Total TCDF	57	1.2		
1,2,3,7,8-PeCDF	ND	1.4	0.05	0
2,3,4,7,8-PeCDF	4.5 J	6.2	0.5	2.200000
Total PeCDF	98	6.2		
1,2,3,4,7,8-HxCDF	3.8 J	6.2	0.1	0.380000
1,2,3,6,7,8-HxCDF	4.9 J	6.2	0.1	0.490000
2,3,4,6,7,8-HxCDF	3.6 J	6.2	0.1	0.360000
1,2,3,7,8,9-HxCDF	ND	0.58	0.1	0
Total HxCDF	88	6.2		
1,2,3,4,6,7,8-HpCDF	25	6.2	0.01	0.250000
1,2,3,4,7,8,9-HpCDF	ND	2.2	0.01	0
Total HpCDF	63	6.2		
OCDF	47	12	0.0001	0.004700
Total TEQ Concentration				20.479700

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	86	40 - 135
13C-1,2,3,7,8-PeCDD	113	40 - 135
13C-1,2,3,6,7,8-HxCDD	83	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	87	40 - 135
13C-OCDD	78	40 - 135
13C-2,3,7,8-TCDF	77	40 - 135
13C-1,2,3,7,8-PeCDF	102	40 - 135
13C-1,2,3,4,7,8-HxCDF	85	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	59	40 - 135

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9/11/2002

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108293

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

J Estimated result. Result is less than the reporting limit.

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9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108291

Lot-Sample #...: G2G190281 - 010
 Date Sampled...: 07/17/02
 Prep Date...: 07/24/02
 Prep Batch #...: 2205351

Work Order #...: E42H91AA
 Date Received...: 07/19/02
 Analysis Date...: 07/27/02
 Dilution Factor: 1

Matrix...: WATER
 Instrument: 6D5
 Units...: pg/L
 % Moisture:

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	ND	3.8	1	0
Total TCDD	ND	3.8		0
1,2,3,7,8-PeCDD	ND	4.0	1	0
Total PeCDD	ND	4.0		0
1,2,3,4,7,8-HxCDD	ND	3.2	0.1	0
1,2,3,6,7,8-HxCDD	ND	3.4	0.1	0
1,2,3,7,8,9-HxCDD	ND	3.0	0.1	0
Total HxCDD	ND	3.4		0
1,2,3,4,6,7,8-HpCDD	ND	2.5	0.01	0
Total HpCDD	ND	2.5		0
OCDD	ND	3.3	0.0001	0
2,3,7,8-TCDF	ND	2.2	0.1	0
Total TCDF	ND	2.2		0
1,2,3,7,8-PeCDF	ND	3.1	0.05	0
2,3,4,7,8-PeCDF	ND uJ	3.1	0.5	0
Total PeCDF	ND	3.3		0
1,2,3,4,7,8-HxCDF	ND	2.0	0.1	0
1,2,3,6,7,8-HxCDF	ND	2.0	0.1	0
2,3,4,6,7,8-HxCDF	ND	2.0	0.1	0
1,2,3,7,8,9-HxCDF	ND	2.1	0.1	0
Total HxCDF	ND	2.1		0
1,2,3,4,6,7,8-HpCDF	ND	1.4	0.01	0
1,2,3,4,7,8,9-HpCDF	ND	1.5	0.01	0
Total HpCDF	ND	1.5		0
OCDF	ND	2.8	0.0001	0
Total TEQ Concentration				0

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	63	40 - 135
13C-1,2,3,7,8-PeCDD	75	40 - 135
13C-1,2,3,6,7,8-HxCDD	76	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	80	40 - 135
13C-OCDD	80	40 - 135
13C-2,3,7,8-TCDF	63	40 - 135
13C-1,2,3,7,8-PeCDF	69	40 - 135
13C-1,2,3,4,7,8-HxCDF	79	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	79	40 - 135

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9/12/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108291

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997
(Van den Berg et al., 1998).

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9/12/02

TABLE 3
SUMMARY OF PERFORMANCE EVALUATION SAMPLE RESULTS
ADDITIONAL SAMPLING - DIOXIN DELINEATION
CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

		AQUEOUS		SOLID		Range of Expected Values ¹
		PE Standard	PE Sample Result	PE Standard	PE Sample Result	
Location ID		CMS-DEL-PEAQ	CMS-DEL-PEAQ	NA	CMS-DEL-PES1	CMS-DEL-PES2
Sample ID		2108401	2108401	NA	2108402	2108342
Sample Date		NA	NA	NA	NA	NA
Sample Time		NA	NA	NA	NA	NA
Sample Depth		NA	N/A	NA	N/A	N/A
Laboratory		CIL	STL	CIL	STL	STL
Lot Number		34761-95	G2G190281	MAR-21985-85-A	G2G230229	G2G240279
Lab. Number		NA	013	EDF-2513	021	020
Date Dioxins/Furans Analyzed		NA	07/27/2002	NA	08/08/2002	08/11/2002
Constituent	TEF	pg/L	pg/L	pg/g	pg/g	pg/g
2,3,7,8-TCDD	1.000	15000	8100 E	500	500 E	470 E
Total TCDD	-	ND	8100	ND	500	470
1,2,3,7,8-PeCDD	1.000	ND	<12	1000	1100	940
Total PeCDD	-	ND	<12	ND	1100	940
1,2,3,4,7,8-HxCDD	0.100	6000	2400	1000	840	810
1,2,3,6,7,8-HxCDD	0.100	15000	8100	1000	1000	940
1,2,3,7,8,9-HxCDD	0.100	ND	<42	1000	1000	1000
Total HxCDD	-	ND	11000	ND	2900	2800
1,2,3,4,6,7,8-HpCDD	0.010	20000	8700	1500	1500	1300
Total HpCDD	-	ND	8700	ND	1500	1400
OCDD	0.0001	30000	12000	2500	4100 E	3500 D
2,3,7,8-TCDF	0.100	7000	4600 CON E	500	440 CON E	450 CON E
Total TCDF	-	ND	4800	ND	500	450
1,2,3,7,8-PeCDF	0.050	5000	3000	1000	1100	920
2,3,4,7,8-PeCDF	0.500	ND	<3.2	1000	950	820
Total PeCDF	-	ND	3000	ND	2000	1800
1,2,3,4,7,8-HxCDF	0.100	ND	<13	1000	1100	940
1,2,3,6,7,8-HxCDF	0.100	ND	<14	1000	1200	1100
2,3,4,6,7,8-HxCDF	0.100	ND	<27	1000	1200	1200
1,2,3,7,8,9-HxCDF	0.100	ND	<3.7	1000	1200	1200
Total HxCDF	-	ND	27	ND	4600	4500
1,2,3,4,6,7,8-HpCDF	0.010	10000	5000	1500	1500	1200
1,2,3,4,7,8,9-HpCDF	0.010	ND	<3.4	1500	1500	1200
Total HpCDF	-	ND	5000	ND	3000	2400
OCDF	0.0001	ND	<4.3	2500	3000	2000

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TABLE 3 (continued)
SUMMARY OF PERFORMANCE EVALUATION SAMPLE RESULTS
ADDITIONAL SAMPLING - DIOXIN DELINEATION
CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

Notes to Table 3

Laboratory results of samples analyzed by STL using USEPA Method 8290

pg/g = picograms per gram = parts per trillion (ppt)

pg/L = picograms per liter = parts per trillion (ppt)

D = Result was obtained from the analysis of a dilution

E = Estimated result; result concentration exceeds the calibration range

CON = Confirmation analysis

NA = Not applicable

ND = Not determined

STL = Severn Trent Laboratories, Inc. - Sacramento

PE = Performance Evaluation

Results have been adjusted for dry weight; the solid performance evaluation sample, as prepared, is dry

TEF = Toxic Equivalency Factor provided by World Health Organization (WHO) (7/23/99).

TEQ = Toxic Equivalents

¹ These values represent the upper and lower 95% tolerance limits which indicate the range of results that 95% of the laboratories should obtain 95% of the time for a single sample analysis.

CIL = Cambridge Isotope Laboratories

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108401 *PE*

Lot-Sample #...: G2G190281 - 013
 Date Sampled...: 07/16/02
 Prep Date.....: 07/24/02
 Prep Batch #...: 2205351

Work Order #...: E42XE1AA
 Date Received...: 07/19/02
 Analysis Date...: 07/27/02
 Dilution Factor: 1

Matrix.....: WATER
 Instrument: 6D5
 Units.....: pg/L
 % Moisture:

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	8100 E	10	1	8,100.000000
Total TCDD	8100	10		
1,2,3,7,8-PeCDD	ND	12	1	0
Total PeCDD	ND	12		0
1,2,3,4,7,8-HxCDD	2400	50	0.1	240.000000
1,2,3,6,7,8-HxCDD	8100	50	0.1	810.000000
1,2,3,7,8,9-HxCDD	ND	42	0.1	0
Total HxCDD	11000	50		
1,2,3,4,6,7,8-HpCDD	8700	50	0.01	87.000000
Total HpCDD	8700	50		
OCDD	12000	100	0.0001	1.200000
2,3,7,8-TCDF	4600 CON E	10	0.1	460.000000
Total TCDF	4800	10		
1,2,3,7,8-PeCDF	3000	50	0.05	150.000000
2,3,4,7,8-PeCDF	ND	3.2	0.5	0
Total PeCDF	3000	50		
1,2,3,4,7,8-HxCDF	ND	13	0.1	0
1,2,3,6,7,8-HxCDF	ND	14	0.1	0
2,3,4,6,7,8-HxCDF	ND	27	0.1	0
1,2,3,7,8,9-HxCDF	ND	3.7	0.1	0
Total HxCDF	27	50		
1,2,3,4,6,7,8-HpCDF	5000	50	0.01	50.000000
1,2,3,4,7,8,9-HpCDF	ND	3.4	0.01	0
Total HpCDF	5000	50		
OCDF	ND	4.3	0.0001	0
Total TEQ Concentration				9,898.200000

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	85	40 - 135
13C-1,2,3,7,8-PeCDD	97	40 - 135
13C-1,2,3,6,7,8-HxCDD	65	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	100	40 - 135
13C-OCDD	108	40 - 135
13C-2,3,7,8-TCDF	79	40 - 135
13C-1,2,3,7,8-PeCDF	88	40 - 135
13C-1,2,3,4,7,8-HxCDF	54	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	71	40 - 135

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108401 PE

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Stockholm, Sweden, 15-18 June 1997 (Van den Berg et al., 1998).

CON Confirmation analysis.

E Estimated result. Result concentration exceeds the calibration range.