

US EPA ARCHIVE DOCUMENT



Loureiro Engineering Associates, Inc.

Superfund Records Center

SITE: Centredale

BREAK: 2.03

OTHER: 48762

November 8, 2002

**U.S. Environmental Protection Agency
New England Regional Office
1 Congress Street, Suite 1100 (HBO)
Boston, Massachusetts 02114-2023**

Attn: Anna Krasko, On-Scene Coordinator

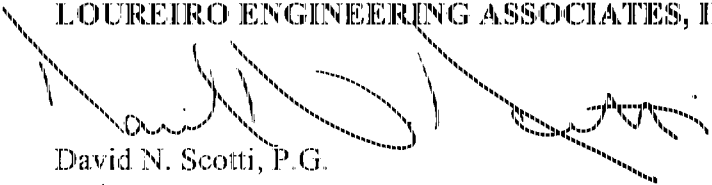
**RE: Data Validation Summary Report
September Sampling Event
Centredale Manor Restoration Project
North Providence, Rhode Island**

Dear Ms. Krasko:

As requested, the data validation summary report for the September 2002 sampling event is attached for your review. This report includes Region I worksheets and annotated Form Is for the sample delivery group associated with this sampling event. Upon your review of the attached report, please feel free to contact me at (860) 410-2976 should you have any questions.

Sincerely,

LOUREIRO ENGINEERING ASSOCIATES, INC.



David N. Scotti, P.G.
Project Manager

Copy to: Centredale Manor Performing Parties Group (w/o attachment)

Attachment

TABLE 1
SUMMARY OF CONSTITUENTS DETECTED IN SOIL
ADDITIONAL SAMPLING - DIOXIN DELINEATION
CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

Location ID	03 / 04-DEL-104	03 / 04-DEL-104		03 / 04-DEL-105		10-DEL-304			
Sample ID	2112412	2112416 (Duplicate)		2112413		2112410			
Sample Date	9/10/02	9/10/02		9/10/02		9/10/02			
Sample Time	1405	1405		1435		1135			
Sample Depth	0.0-2.0'	0.0-2.0'		0.0-2.0'		0.0-2.0'			
Laboratory	STL	STL		STL		STL			
Lot Number	G2H120184	G2H120184		G2H120184		G2H120184			
Lab. Number	003	007		004		001			
Date Dioxins/Furans Analyzed									
Constituent	TEF	Result	TEQ	Result	TEQ	Result	TEQ	Result	TEQ
2,3,7,8-TCDD	1.000	18	18	11	11	19	19	64 J	64
Total TCDD	-	18	-	11	-	39	-	79	-
1,2,3,7,8-PeCDD	1.000	<0.20	0	<0.15	0	<0.24	0	<0.86	0
Total PeCDD	-	<0.82	-	<0.76	-	8.2	-	6.7	-
1,2,3,4,7,8-HxCDD	0.100	<0.42	0	<0.45	0	<1.4	0	<0.90	0
1,2,3,6,7,8-HxCDD	0.100	<0.99	0	<0.90	0	5.2 J	0.52	<3.3	0
1,2,3,7,8,9-HxCDD	0.100	<0.96	0	<1.0	0	4.4 J	0.44	<3.4	0
Total HxCDD	-	2.9	-	3.2	-	44	-	15	-
1,2,3,4,6,7,8-HpCDD	0.010	21	0.21	24	0.24	150	1.5	66	0.66
Total HpCDD	-	38	-	44	-	270	-	130	-
OCDD	0.0001	140	0.014	160	0.016	1200	0.12	680	0.068
2,3,7,8-TCDF	0.100	<0.42 CON	0	0.82 J, CON	0.082	7.8 CON	0.78	5.2 CON	0.52
Total TCDF	-	7.5	-	8.1	-	90	-	61	-
1,2,3,7,8-PeCDF	0.050	<0.27	0	<0.31	0	3.6 J	0.18	<1.8	0
2,3,4,7,8-PeCDF	0.500	<0.56	0	<0.61	0	6.0	3.0	<2.7	0
Total PeCDF	-	18	-	8.1	-	130	-	70	-
1,2,3,4,7,8-HxCDF	0.100	<0.77	0	<0.88	0	5.2 J	0.52	<2.1	0
1,2,3,6,7,8-HxCDF	0.100	<0.59	0	<0.71	0	4.8 J	0.48	<2.8	0
2,3,4,6,7,8-HxCDF	0.100	<0.63	0	<0.68	0	4.7 J	0.47	<2.3	0
1,2,3,7,8,9-HxCDF	0.100	<0.15	0	<0.097	0	<0.23	0	<0.14	0
Total HxCDF	-	7.8	-	9.6	-	97	-	33	-
1,2,3,4,6,7,8-HpCDF	0.010	3.5 J	0.035	4.1 J	0.041	35	0.35	26	0.26
1,2,3,4,7,8,9-HpCDF	0.010	<0.26	0	<0.34	0	<2.5	0	<1.3	0
Total HpCDF	-	7.6	-	9.2	-	76	-	59	-
OCDF	0.0001	6.3 J	0.00063	7.3 J	0.00073	51	0.0051	46	0.0046
Total TEQ Concentration	-	-	18	-	11	-	27	-	66

TABLE 1 (continued)
SUMMARY OF CONSTITUENTS DETECTED IN SOIL
ADDITIONAL SAMPLING - DIOXIN DELINEATION
CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

Notes to Table 1

Laboratory results of samples analyzed by STL using USEPA Method 8290; results have been adjusted for dry weight

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

TEQ = Toxic Equivalents

Total TEQ concentration reported to the nearest pg/g

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

J = Estimated result; result is less than the reporting limit

CON = Confirmation analysis

STL = Severn Trent Laboratories, Inc. - Sacramento

Data Validation Qualifiers presented in Italics:

J = The associated numerical value is an estimated quantity.

TABLE 2
SUMMARY OF EQUIPMENT RINSATE BLANK SAMPLE RESULTS
ADDITIONAL SAMPLING - DIOXIN DELINEATION
CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

Location ID	BKE		
Sample ID	2112417		
Sample Date	9/10/02		
Sample Time	1500		
Sample Depth	NA		
Laboratory	STL		
Lot Number	G21120184		
Lab. Number	008		
Date Dioxins/Furans Analyzed			
Constituent	TEF	pg/L	TEQ
2,3,7,8-TCDD	1.000	<0.70	0
Total TCDD	-	<0.82	-
1,2,3,7,8-PeCDD	1.000	<1.4	0
Total PeCDD	-	<1.4	-
1,2,3,4,7,8-HxCDD	0.100	<0.68	0
1,2,3,6,7,8-HxCDD	0.100	<0.59	0
1,2,3,7,8,9-HxCDD	0.100	<0.58	0
Total HxCDD	-	<2.0	-
1,2,3,4,6,7,8-HpCDD	0.010	<1.3	0
Total HpCDD	-	<1.3	-
OCDD	0.0001	<11	0
2,3,7,8-TCDF	0.100	<1.1	0
Total TCDF	-	<1.1	-
1,2,3,7,8-PeCDF	0.050	<0.64	0
2,3,4,7,8-PeCDF	0.500	<0.61	0
Total PeCDF	-	<0.87	-
1,2,3,4,7,8-HxCDF	0.100	<0.92	0
1,2,3,6,7,8-HxCDF	0.100	<0.36	0
2,3,4,6,7,8-HxCDF	0.100	<0.44	0
1,2,3,7,8,9-HxCDF	0.100	<0.46	0
Total HxCDF	-	<0.92	-
1,2,3,4,6,7,8-HpCDF	0.010	<0.75	0
1,2,3,4,7,8,9-HpCDF	0.010	<0.78	0
Total HpCDF	-	<0.78	-
OCDF	0.0001	<1.4	0
Total TEQ Concentration	-	-	0

TABLE 2 (continued)
SUMMARY OF EQUIPMENT RINSATE BLANK SAMPLE RESULTS
ADDITIONAL SAMPLING - DIOXIN DELINEATION
CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE
NORTH PROVIDENCE, RHODE ISLAND

Notes to Table 2

Laboratory results of samples analyzed by STL using USEPA Method 8290

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

TEQ = Toxic Equivalents

Total TEQ concentration reported to the nearest pg/L

STL = Severn Trent Laboratories, Inc. - Sacramento

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

DIOXIN DATA VALIDATION REPORT
USEPA REGION I - TIER III

SDG No.: G21120184
Laboratory: Severn Trent Laboratories, Inc., West Sacramento, CA
Site: Centredale Manor
Date: November 4, 2002
Samples:
Dioxin: 4/Soil/2112410, 2112412, 2112413, 2112416
1/Aqueous/2112417

A Tier III validation was performed on the dioxin/furan analytical data for four soil samples and one aqueous blank 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:

- 2378-TCDD has been qualified as estimated (J) in sample 2112410 due to high matrix spike recoveries.

Matrix Spike Analysis

Matrix spike sample recoveries outside of QC criteria that resulted in qualifications are summarized below.

MS/MSD ID	Compound	MS/MSD %R	RPD	Action
2112410	2378-TCDD	153%/165%	Ok	J

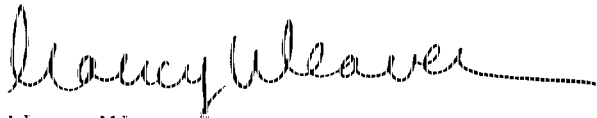
- 2378-TCDD has been qualified as estimated (J) in sample 2112410.

Additional Comments

- The samples were received at 0°C but were not frozen.

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 Severn Trent West Sacramento, CA
DAS/Project No. Centredale Manor
SDG No. 02F120184
No. of Samples/Matrix 45/1W

Tech. Spec./Method No. 8290-High Res. Dioxin/F
Sampling Date(s) 9/10/02
Shipping Date(s) 9/11/02
Date(s) Rec'd by Lab 9/12/02

Traffic Report Sample Nos. 2112410, 2112412, 2112413, 2112414, 2112417

Equipment Blank Nos. 2112417

Field Duplicate Nos. 2112412 / 2112416

PES Nos. _____

The Region I EPA-NE Data Validation Functional Guidelines for Evaluating Dioxin/Furan Analyses, November 1993 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: Margie Heuer

Date: 11/4/02

I. DATA COMPLETENESS

MISSING INFORMATION

DATE LAB CONTACTED

DATE RECEIVED

All criteria were met.

Additional comments: The samples were received at 0°C but were not frozen.

Reviewer: Maureen Kaver

Date: 11/4/02

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

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

SDO No. G2T1208 CASE/PROJECT No. Centredale Manor

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

(Y) N

PE Sample Number	Ampule Number	Type of PES	Matrix	Analyte	Conc	Region I EPA PES Series*	Non-EPA PES Series**	Samples Affected	Action
E8JJ31AC	—	LCS	Soil	all analytes	2/R all miss	(60-140)	—	all soils	None
(E8JW51AC/	—	LCS/	water	123478-	149/147	(60-140)	—	all water (2/124/12)	(J) N
E8JHS1AD)	—	LCSO	"	HXCDD					None
↓	↓	↓	↓	123789 HXCDD	142/142	(60-140)	—		↓
↓	↓	↓	↓	OCDD	04/142	(60-140)	—		↓

* 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)

Validator: Mulcahey

Date: 11/4/02

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
7/3/02	31JL02A9053	all analytes	all PASS					all samples	None
8/6/02	06AU021D2								
9/2/02	215F028D5								
9/24/02	245E028D5								
9/25/02	235F029D5								
10/6/02	050C028D5								
10/9/02	070C021D2								
Comments: all criteria were met.									

Validator:

M. Weaver

Date:

11/4/02

Region 1

Data Review Worksheets - (Low or High Resolution)

V. INITIAL AND CONTINUING CALIBRATIONS Continued

YD. CONTINUING CALIBRATION

[illegible]

Validator:

Oliver

Date: 11/4/02

VI. COLUMN PERFORMANCE RESOLUTION CHECK

Date: _____ ID: _____

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

% Valley _____ -TCDD/ _____ -TCDD _____ (QC Limit ≤ 25%)

% Valley _____ -TCDF/ _____ -TCDF _____ (QC Limit ≤ 50%)

For DB-225 columns:

% Valley _____ -TCDD/ _____ -TCDD _____ (QC Limit ≤ 25%)

% Valley _____ -TCDF/ _____ -TCDF _____ (QC Limit ≤ 50%)

ACTIONS:

- A. If the GC resolution criteria do not meet specifications, the positive hits will be qualified as "U". All tetras and hexas (for both dioxin 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: A. Leaver

Date: 11/4/02

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: R2 Company: Loureiro Eng.

Contacted: Yes ☐ No ☐ Date: _____

1. Laboratory: Method and Instrument Blanks

Date Extracted	Date Analyzed	Matrix	Sample No. (Blank Type)	Instrument	Compound	Conc. (units)
9/19/02	9/24/02	Soil	E8JJ31AA	HRGC/HRMS	all ND	all ND
9/19/02	9/25/02	Water	E8JWS1AA	HRGC/HRMS	OCDD	85 pg/L

Water
Sample
ND
No action

2. Field: Equipment (Rinsate) Blanks

Date Extracted	Date Analyzed	Matrix	Sample No. (Blank Type)	Instrument	Compound	Conc. (units)
9/19/02	9/25/02	Water	2112417 ER	HRGC/HRMS	all ND	—

Validator: luhlaver

Date: 11/4/02

VIII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

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

2112410

Compound	MS % Rec	MSD % Rec	RPD	Method QC Limits		Concentration			MRSD	Action
				% Rec	RPD	Unspiked Sample	MS	MSD		
2378-TCDD	153	165	OK	60-140	0-30					(J)
2378-TCDF										
12378-PeCDF										
12378-PeCDD										
23478-PeCDF										
123478-HxCDF										
123678-HxCDF										
123478-HxCDD	OK	142	OK	60-140	0-30					(J)
123678-HxCDD										
123789-HxCDD										
234678-HxCDF										
123789-HxCDF										
1234678-HxCDF										
1234678-HpCDD										
1234789-HpCDF										
OCDD										
OCDF										

ND
NO
action

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.

Validator:

W. Leaver

Date:

11/4/02

IX. LABORATORY AND FIELD DUPLICATES

Was a duplicate run for each matrix?

Yes () No ☒

The RPD of each analyte detected must be within the 30% of the acceptance range for aqueous and 50% for solids.

SAMPLE ID: 2112412 DUPLICATE ID: 2112416

Compound	Sample Conc.	Sample EDL		Duplicate Conc.	Duplicate EDL		%RPD	Action
		EDL	2xEDL		EDL	2xEDL		
2373-TCDD	18	1.1	2.2	11	1.1	2.2	48	None
2373-TCDF	ND	0.42	0.84	0.82	1.1	2.2	NC	None
12373-PeCDF								
12373-PeCDD								
23473-PeCDF								
123473-HxCDF								
123673-HxCDF								
123473-HxCDD								
123673-HxCDD								
123739-HxCDD								
234673-HxCDF								
123739-HxCDF								
1234673-HpCDF	3.5	5.4	10.8	4.1	5.5	11.0	44	None
1234673-HpCDD	21	5.4	10.8	24	5.5	11.0	13	"
1234739-HpCDF								
OCDD	140	11	22	160	11	22	13	None
OCDF	6.3	11	22	7.3	11	22	15	"

ACTIONS:

If RPD is greater than 30% for aqueous or 50% for solids, flag all positive results "J" and non-detects "UJ". Recheck all calculations if the duplicate precision is beyond the specified range. Professional judgement should be used to ascertain effect on the final data despite sample concentration.

Validator:

M. W. Weaver

Date:

11/14/02

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 -123478-11xCDD												
¹² C ₁₂ -123678-11xCDD												
¹² C ₁₂ -123789-11xCDD												
¹² C ₁₂ -123478-11xCDF												
¹² C ₁₂ -123678-11xCDF												
¹² C ₁₂ -123789-11xCDF												
¹² C ₁₂ -234678-11xCDF												
¹² C ₁₂ -1234678-11pCDD												
¹² C ₁₂ -1234678-11pCDF												
¹² C ₁₂ -1234789-11pCDF												
¹² C ₁₂ -OCDD												
¹² C ₁₂ -2378-TCDD												

all PASS

Validator: AW Weaver

Date: 11/4/02

Region I
Data Review Worksheet - (High Resolution)

XI. Sample Analysis and Identification

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

SAMPLE No.	RT	SN	Int. Ratio	RT	SN	Int. Ratio
1271-TCDD						
1271-TCDF						
1271-PeCDF						
1271-PeCDD						
12471-PeCDF						
12471-HxCDF						
12471-HxCDD						
12471-HxCDD						
12471-HxCDD						
12471-HxCDF						
12471-HxCDF						
12471-HxCDF						
12471-HxCDD						
12471-HxCDF						
OCDD						
OCDF						
INTERNAL STANDARDS VS. RECOVERY STANDARDS						
TC-1271-TCDD						
TC-1271-TCDF						
TC-1271-PeCDF						
TC-1271-PeCDD						
TC-12471-PeCDF						
TC-12471-HxCDF						
TC-12471-HxCDD						
TC-12471-HxCDD						
TC-12471-HxCDF						
TC-12471-HxCDF						
TC-12471-HxCDF						
TC-12471-HxCDD						
TC-12471-HxCDF						
TC-12471-HxCDF						
TC-OCDD						
TC-OCDF						
RECOVERY STANDARDS						
TC-1271-TCDD						
TC-1271-PeCDD						

all PASS

Validator: Ch. Heaver

Date: 11/4/02

XII. SAMPLE CALCULATION

2112410

$$2378\text{-TCDD} = \frac{9703420 \times 2000}{41552900 \times 0.70 \times 10 \times 1.05} = 63.5 \approx 64 \text{ pg/g}$$

$$1234678\text{-HpCDD} = \frac{7295200 \times 2000}{32168000 \times 0.70 \times 10 \times 1.05} = 66.1 \approx 66 \text{ pg/g}$$

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

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

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

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. Uleaver

Date: 11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2112410

Lot-Sample #.: G21120184 - 001
 Date Sampled.: 09/10/02
 Prep Date.: 09/19/02
 Prep Batch #.: 2262500

Work Order #.: E74941AC
 Date Received.: 09/12/02
 Analysis Date.: 10/06/02
 Dilution Factor: 1

Matrix.: SOLID
 Instrument: 8D5
 Units.: pg/g
 % Moisture: 30

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	64 J	1.4	1	64.000
Total TCDD	79	1.4		
1,2,3,7,8-PeCDD	ND	0.86	1	0
Total PeCDD	6.7	7.1		
1,2,3,4,7,8-HxCDD	ND	0.90	0.1	0
1,2,3,6,7,8-HxCDD	ND	3.3	0.1	0
1,2,3,7,8,9-HxCDD	ND	3.4	0.1	0
Total HxCDD	15	7.1		
1,2,3,4,6,7,8-HpCDD	66	7.1	0.01	0.660
Total HpCDD	130	7.1		
OCDD	680	14	0.0001	0.068
2,3,7,8-TCDF	5.2 CON	1.4	0.1	0.520
Total TCDF	61	1.4		
1,2,3,7,8-PeCDF	ND	1.8	0.05	0
2,3,4,7,8-PeCDF	ND	2.7	0.5	0
Total PeCDF	70	7.1		
1,2,3,4,7,8-HxCDF	ND	2.1	0.1	0
1,2,3,6,7,8-HxCDF	ND	2.8	0.1	0
2,3,4,6,7,8-HxCDF	ND	2.3	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.14	0.1	0
Total HxCDF	33	7.1		
1,2,3,4,6,7,8-HpCDF	26	7.1	0.01	0.260
1,2,3,4,7,8,9-HpCDF	ND	1.3	0.01	0
Total HpCDF	59	7.1		
OCDF	46	14	0.0001	0.005
Total TEQ Concentration				65.513

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	75	40 - 135
13C-1,2,3,7,8-PeCDD	71	40 - 135
13C-1,2,3,6,7,8-HxCDD	81	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	92	40 - 135
13C-OCDD	87	40 - 135
13C-2,3,7,8-TCDF	73	40 - 135
13C-1,2,3,7,8-PeCDF	75	40 - 135
13C-1,2,3,4,7,8-HxCDF	86	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	87	40 - 135

Handwritten signature
 11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8190)

Client Sample ID: 2112410

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.

glw
11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2112412

Lot-Sample #...: G21120184 - 003
 Date Sampled...: 09/10/02
 Prep Date...: 09/19/02
 Prep-Batch #...: 2262500

Work Order #...: E75AE1AC
 Date Received...: 09/12/02
 Analysis Date...: 10/06/02
 Dilution Factor: 1

Matrix...: SOLID
 Instrument: 8D5
 Units...: pg/g
 % Moisture: 7.0

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	18	1.1	1	18.000
Total TCDD	18	1.1		
1,2,3,7,8-PeCDD	ND	0.20	1	0
Total PeCDD	ND	0.82		0
1,2,3,4,7,8-HxCDD	ND	0.42	0.1	0
1,2,3,6,7,8-HxCDD	ND	0.99	0.1	0
1,2,3,7,8,9-HxCDD	ND	0.96	0.1	0
Total HxCDD	2.9	5.4		
1,2,3,4,6,7,8-HpCDD	21	5.4	0.01	0.210
Total HpCDD	38	5.4		
OCDD	140	11	0.0001	0.014
2,3,7,8-TCDF	ND	0.42	0.1	0
Total TCDF	7.5	1.1		
1,2,3,7,8-PeCDF	ND	0.27	0.05	0
2,3,4,7,8-PeCDF	ND	0.56	0.5	0
Total PeCDF	18	5.4		
1,2,3,4,7,8-HxCDF	ND	0.77	0.1	0
1,2,3,6,7,8-HxCDF	ND	0.59	0.1	0
2,3,4,6,7,8-HxCDF	ND	0.63	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.15	0.1	0
Total HxCDF	7.8	5.4		
1,2,3,4,6,7,8-HpCDF	3.5	5.4	0.01	0.035
1,2,3,4,7,8,9-HpCDF	ND	0.26	0.01	0
Total HpCDF	7.6	5.4		
OCDF	6.3	11	0.0001	0.001
Total TEQ Concentration				18.260

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	61	40 - 135
13C-1,2,3,7,8-PeCDD	60	40 - 135
13C-1,2,3,6,7,8-HxCDD	69	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	71	40 - 135
13C-OCDD	71	40 - 135
13C-2,3,7,8-TCDF	62	40 - 135
13C-1,2,3,7,8-PeCDF	66	40 - 135
13C-1,2,3,4,7,8-HxCDF	76	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	71	40 - 135

Handwritten signature and date:
 11/10/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxin/Furans, HRC/HRMS (8290)

Client Sample ID: 2112412

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.

YUW
11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, EHRGC/HRMS (8290)

Client Sample ID: 2112413

Lot-Sample #: G21120184 - 004
 Date Sampled: 09/10/02
 Prep Date: 09/19/02
 Prep Batch #: 2262500

Work Order #: E75AG1AC
 Date Received: 09/12/02
 Analysis Date: 10/06/02
 Dilution Factor: 1

Matrix: SOLID
 Instrument: BD5
 Units: pg/g
 % Moisture: 16

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	19	1.2	1	19.000
Total TCDD	39	1.2		
1,2,3,7,8-PeCDD	ND	0.24	1	0
Total PeCDD	8.2	6.0		
1,2,3,4,7,8-HxCDD	ND	1.4	0.1	0
1,2,3,6,7,8-HxCDD	5.2 J	6.0	0.1	0.520
1,2,3,7,8,9-HxCDD	4.4 J	6.0	0.1	0.440
Total HxCDD	44	6.0		
1,2,3,4,6,7,8-HpCDD	150	6.0	0.01	1.500
Total HpCDD	270	6.0		
OCDD	1200	12	0.0001	0.120
2,3,7,8-TCDF	7.8 CON	1.2	0.1	0.780
Total TCDF	90	1.2		
1,2,3,7,8-PeCDF	3.6 J	6.0	0.05	0.180
2,3,4,7,8-PeCDF	6.0	6.0	0.5	3.000
Total PeCDF	130	6.0		
1,2,3,4,7,8-HxCDF	5.2 J	6.0	0.1	0.520
1,2,3,6,7,8-HxCDF	4.8 J	6.0	0.1	0.480
2,3,4,6,7,8-HxCDF	4.7 J	6.0	0.1	0.470
1,2,3,7,8,9-HxCDF	ND	0.23	0.1	0
Total HxCDF	97	6.0		
1,2,3,4,6,7,8-HpCDF	35	6.0	0.01	0.350
1,2,3,4,7,8,9-HpCDF	ND	2.5	0.01	0
Total HpCDF	76	6.0		
OCDF	51	12	0.0001	0.005
Total TEQ Concentration				27.365

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	71	40 - 135
13C-1,2,3,7,8-PeCDD	82	40 - 135
13C-1,2,3,6,7,8-HxCDD	73	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	76	40 - 135
13C-OCDD	74	40 - 135
13C-2,3,7,8-TCDF	74	40 - 135
13C-1,2,3,7,8-PeCDF	84	40 - 135
13C-1,2,3,4,7,8-HxCDF	80	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	71	40 - 135

new
11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2112413

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.

Lee
11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2112416

Lot-Sample #...: G2H20184 - 007
 Date Sampled...: 09/10/02
 Prep Date...: 09/19/02
 Prep Batch #...: 2262500

Work Order #...: E75AR1AC
 Date Received...: 09/12/02
 Analysis Date...: 10/06/02
 Dilution Factor: 1

Matrix...: SOLID
 Instrument: 8D5
 Units...: pg/g
 % Moisture: 8.4

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	11	1.1	1	11.000
Total TCDD	11	1.1		
1,2,3,7,8-PeCDD	ND	0.15	1	0
Total PeCDD	ND	0.76		0
1,2,3,4,7,8-HxCDD	ND	0.45	0.1	0
1,2,3,6,7,8-HxCDD	ND	0.90	0.1	0
1,2,3,7,8,9-HxCDD	ND	1.0	0.1	0
Total HxCDD	3.2	5.5		
1,2,3,4,6,7,8-HpCDD	24	5.5	0.01	0.240
Total HpCDD	44	5.5		
OCDD	160	11	0.0001	0.016
2,3,7,8-TCDF	0.82	J CON 1.1	0.1	0.082
Total TCDF	8.1	1.1		
1,2,3,7,8-PeCDF	ND	0.31	0.05	0
2,3,4,7,8-PeCDF	ND	0.61	0.5	0
Total PeCDF	8.1	5.5		
1,2,3,4,7,8-HxCDF	ND	0.88	0.1	0
1,2,3,6,7,8-HxCDF	ND	0.71	0.1	0
2,3,4,6,7,8-HxCDF	ND	0.68	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.097	0.1	0
Total HxCDF	9.6	5.5		
1,2,3,4,6,7,8-HpCDF	4.1	J 5.5	0.01	0.041
1,2,3,4,7,8,9-HpCDF	ND	0.34	0.01	0
Total HpCDF	9.2	5.5		
OCDF	7.3	J 11	0.0001	0.001
Total TEQ Concentration				11.380
INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS		
13C-2,3,7,8-TCDD	71	40 - 135		
13C-1,2,3,7,8-PeCDD	70	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	78	40 - 135		
13C-2,3,7,8-TCDF	73	40 - 135		
13C-1,2,3,7,8-PeCDF	69	40 - 135		
13C-1,2,3,4,7,8-HxCDF	82	40 - 135		
13C-1,2,3,4,6,7,8-HpCDF	75	40 - 135		

Handwritten signature
 11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2112416

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.

000
7/14/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRC/HRMS (8290)

Client Sample ID: 2112417

Lot-Sample #...: G2I120184 - 008
 Date Sampled...: 09/10/02
 Prep Date...: 09/19/02
 Prep Batch #...: 2263162

Work Order #...: E75A.V1AA
 Date Received...: 09/12/02
 Analysis Date...: 09/25/02
 Dilution Factor: 1

Matrix...: WATER
 Instrument: 9D5
 Units...: pg/L
 % Moisture:

PARAMETER	RESULT	DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	ND	0.70	1	0
Total TCDD	ND	0.82		0
1,2,3,7,8-PeCDD	ND	1.4	1	0
Total PeCDD	ND	1.4		0
1,2,3,4,7,8-HxCDD	ND	0.68	0.1	0
1,2,3,6,7,8-HxCDD	ND	0.59	0.1	0
1,2,3,7,8,9-HxCDD	ND	0.58	0.1	0
Total HxCDD	ND	2.0		0
1,2,3,4,6,7,8-HpCDD	ND	1.3	0.01	0
Total HpCDD	ND	1.3		0
OCDD	ND	11	0.0001	0
2,3,7,8-TCDF	ND	1.1	0.1	0
Total TCDF	ND	1.1		0
1,2,3,7,8-PeCDF	ND	0.64	0.05	0
2,3,4,7,8-PeCDF	ND	0.61	0.5	0
Total PeCDF	ND	0.87		0
1,2,3,4,7,8-HxCDF	ND	0.92	0.1	0
1,2,3,6,7,8-HxCDF	ND	0.36	0.1	0
2,3,4,6,7,8-HxCDF	ND	0.44	0.1	0
1,2,3,7,8,9-HxCDF	ND	0.46	0.1	0
Total HxCDF	ND	0.92		0
1,2,3,4,6,7,8-HpCDF	ND	0.75	0.01	0
1,2,3,4,7,8,9-HpCDF	ND	0.78	0.01	0
Total HpCDF	ND	0.78		0
OCDF	ND	1.4	0.0001	0
Total TEQ Concentration				0

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	69	40 - 135
13C-1,2,3,7,8-PeCDD	69	40 - 135
13C-1,2,3,6,7,8-HxCDD	66	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	89	40 - 135
13C-OCDD	84	40 - 135
13C-2,3,7,8-TCDF	62	40 - 135
13C-1,2,3,7,8-PeCDF	78	40 - 135
13C-1,2,3,4,7,8-HxCDF	91	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	97	40 - 135

Handwritten signature and date:
 11/4/02

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

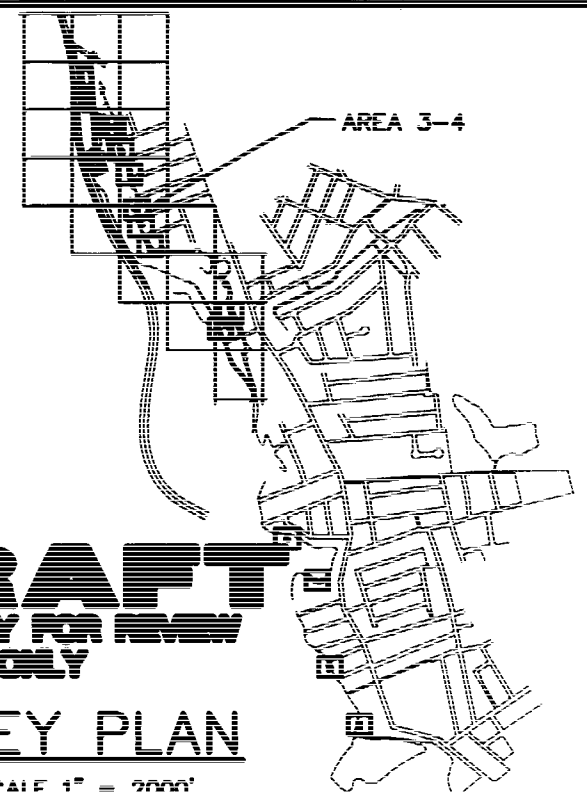
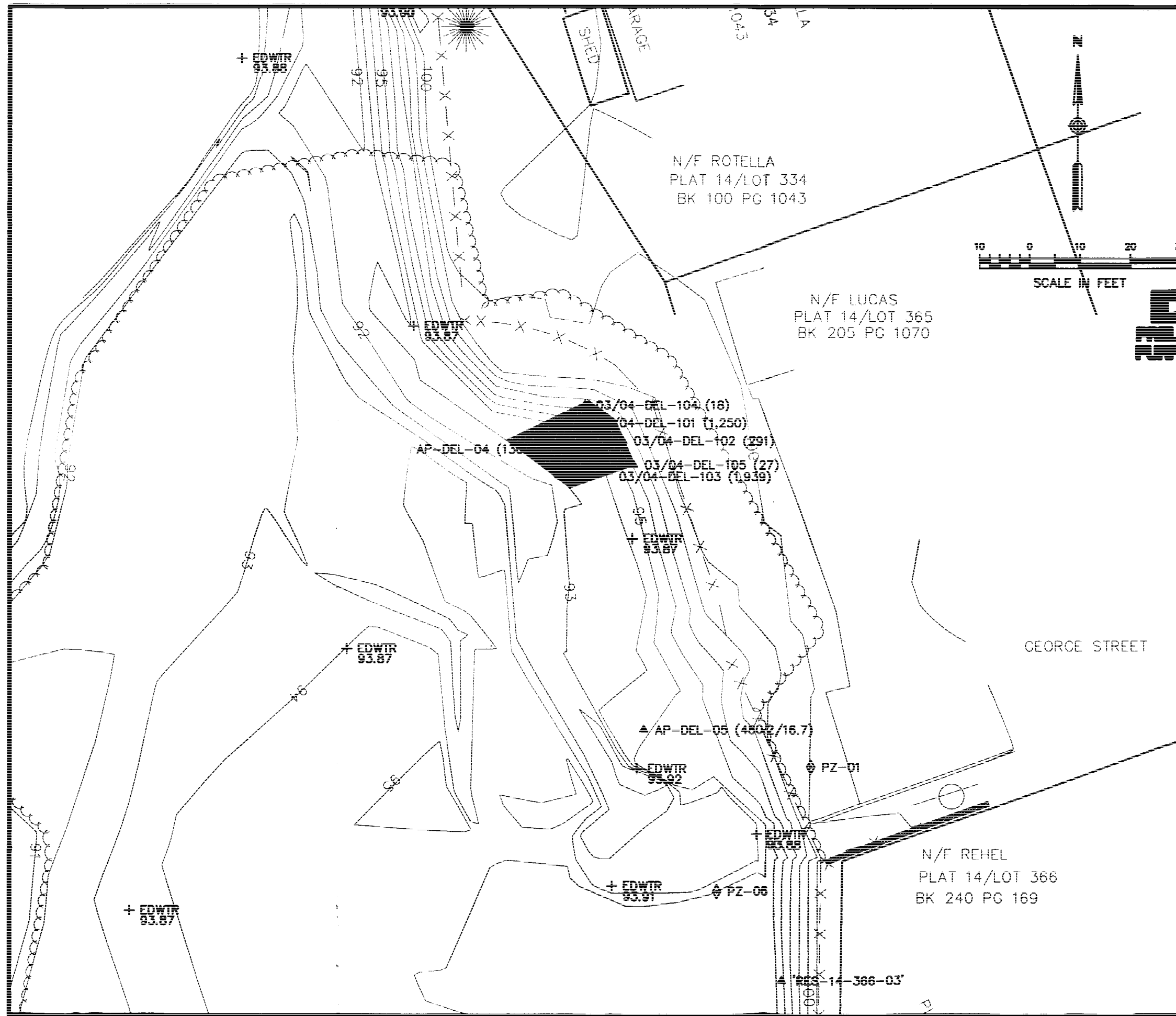
Client Sample ID: 2112417

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).

all
11/4/02

Original includes color coding.



DRAFT
FOR REVIEW
PURPOSE ONLY

KEY PLAN

SCALE 1" = 2000'

LEGEND

- ▲ CMS-422 EPA SOIL SAMPLE, DIOXIN < 1000 ppt
- ▲ CMS-455 EPA SOIL SAMPLE, DIOXIN > 1000 ppt (DIOXIN CONCENTRATION IN ppt)
- ◆ CMS-091 EPA SEDIMENT SAMPLE, DIOXIN < 1000 ppt
- ◆ CMS-123 EPA SEDIMENT SAMPLE, DIOXIN > 1000 ppt (DIOXIN CONCENTRATION IN ppt)
- ▲ AP-DEL-01 APRIL 2002 SAMPLE LOCATION (TOTAL TEQ CONCENTRATION IN ppt) (0-1.0'/1.0'-2.0')
- ▲ 02-DEL-201 SAMPLE LOCATION (TOTAL TEQ CONCENTRATION IN ppt) (< 1000 ppt)
- ▲ 01-DEL-201 SAMPLE LOCATION (TOTAL TEQ CONCENTRATION IN ppt) (>1000 ppt)
- PROPOSED AREA OF EXCAVATION
- + 96.70 SPOT ELEV. & OR WATER ELEV.
- ◆ ppt PIEZOMETER LOCATION PARTS PER TRILLION

CENTREDALE MANOR SUPERFUND SITE
NORTH PROVIDENCE, R.I.
PROPOSED AREA OF EXCAVATION
ACTION AREA 3-4

Comm.No.
15RP102.003

FIGURE 3/4



