

US EPA ARCHIVE DOCUMENT

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

SDG No.: G2G240279  
Laboratory: Severn Trent Laboratories, Inc., West Sacramento, CA  
Site: Centredale Manor  
Date: September 13, 2002  
Samples:  
Dioxin: 17/Soil/2108324, 2108325, 2108326, 2108327, 2108328, 2108329, 2108330,  
2108331, 2108332, 2108333, 2108334, 2108335, 2108336, 2108337, 2108338,  
2108339, 2108340  
1/PE Soil/2108342  
1/Aqueous/2108323

A Tier III validation was performed on the dioxin/furan analytical data for seventeen soil samples, one soil PE sample 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.



SDMS DocID 35798

- \* = 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:

- 1234678-HpCDF and OCDF have been qualified (J) in sample 2108336 due to low MS/MSD recoveries.
- 123478-HxCDF has been qualified as estimated (UJ) in sample 2108326 due to a low internal standard recovery.

#### **Matrix Spike Analysis**

MS/MSD Sample ID: 2108336

| Compound      | MS %R | MSD %R | RPD | Action |
|---------------|-------|--------|-----|--------|
| 1234678-HpCDF | 2.1%  | 0%     | Ok  | J/R    |
| OCDF          | 21%   | 24%    | Ok  | J/UJ   |

- 1234678-HpCDF and OCDF have been qualified (J) in sample 2108336.

#### **Internal/Clean-up/Recovery Standards**

| Sample  | Internal Standard                           | %R  | Action |
|---------|---------------------------------------------|-----|--------|
| 2108326 | <sup>13</sup> C <sub>12</sub> -123478-HxCDF | 37% | J/UJ   |

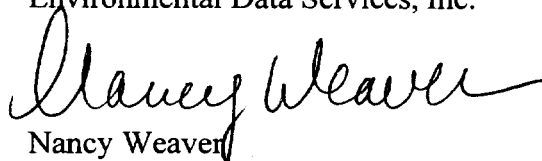
- 123478-HxCDF has been qualified as estimated (UJ) in sample 2108326.

#### **Additional Comments**

- Several samples exhibited several analytes that exceeded the linear range of the initial calibration curve and were flagged (E) by the laboratory. The reviewer further qualified these results as estimated (J).
- The samples were received at 0°C but were not 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.

A handwritten signature in black ink, appearing to read "Nancy Weaver", written in a cursive style.

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 Serena Treat - West Sacramento CA  
DAS/Project No. Centredale Manor  
SDG No. G2G240279  
No. of Samples/Matrix 18 soil / 1 water

Tech. Spec./Method No. 8290 High Res. Dioxin/F  
Sampling Date(s) 7/22/02  
Shipping Date(s) 7/23/02  
Date(s) Rec'd by Lab 7/24/02

Traffic Report Sample Nos. 2108324, 2108325, 2108326, 2108327, 2108328  
2108329, 2108330, 2108331, 2108332, 2108333, 2108334  
2108335, 2108336, 2108337, 2108338, 2108339, 2108340, 21083  
Equipment Blank Nos. 2108323  
Field Duplicate Nos. 2108334 / 2108335  
PES Nos. 2108342 (soil)

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: Nancy Weaver

Date: 9/13/02

I. DATA COMPLETENESS

MISSING INFORMATION

DATE LAB CONTACTED

DATE RECEIVED

All criteria were met.

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

Several samples exhibited compounds which exceeded the linear range of the instrument and were flagged (E) by the laboratory. The reviewer further qualified these results as estimated (5).

Reviewer:

Laurey Weaver

Date:

9/13/02

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

II. PRESERVATION AND HOLDING TIMES

Sampler: JM Company: Loureiro Contacted Yes No Date: \_\_\_\_\_

1. Circle sample numbers with exceeded <sup>ENR</sup> holding times or omitted preservation.

| Sample Number | Matrix | Preserved Y/N | Date Sampled | Date Extracted | Date Analyzed | Action |
|---------------|--------|---------------|--------------|----------------|---------------|--------|
| 2108324       | Soil   | N             | 7/22/02      | 7/31/02        | 8/8/02        | None   |
| 2108325       |        |               |              |                |               |        |
| 2108326       |        |               |              |                |               |        |
| 2108327       |        |               |              |                |               |        |
| 2108328       |        |               |              |                |               |        |
| 2108329       |        |               |              |                |               |        |
| 2108330       |        |               |              |                |               |        |
| 2108331       |        |               |              |                |               |        |
| 2108332       |        |               |              | 7/31/02        | 8/11/02       |        |
| 2108333       |        |               |              |                |               |        |
| 2108334       |        |               |              |                |               |        |
| 2108335       |        |               |              |                |               |        |
| 2108336       |        |               |              |                |               |        |
| 2108337       |        |               |              |                |               |        |
| 2108338       |        |               |              |                |               |        |
| 2108339       |        |               |              |                |               |        |
| 2108340       |        |               |              |                |               |        |
| (PE) 2108342  |        |               |              |                |               |        |
| 2108323       | Water  |               |              | 7/26/02        | 8/1/02        |        |

Validator: Mubever

Date: 9/13/02

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

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

SDG No: G2G240279 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 Scores* | Non-EPA PES Scores** | Samples Affected | Action |
|------------------|---------------|-------------|--------|--------------|----------------|--------------------------|----------------------|------------------|--------|
| E5N0V1AC         | —             | LCS         | Soil   | all analytes | IR<br>all pass | (60-140)                 | —                    | all soils        | None   |
| E5E421AC         | —             | LCS         | Water  | all analytes | "              | (60-140)                 | —                    | all water        | None   |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |
|                  |               |             |        |              |                |                          |                      |                  |        |

\* 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: Linleaver

Date: 9/13/02

## 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 | SN   | RT  | Resolution | Samples Affected | Action |
|--------------|----------------------|--------------|------|-----------|------|-----|------------|------------------|--------|
|              |                      |              | AU   |           |      |     |            |                  |        |
| 8/13/02      | 13AU021D2            | all analytes | PASS | AU        | All  | all | PASS       | all Samples      | None   |
| 8/12/02      | 10AU026D5            |              |      | PASS      | PASS |     |            |                  |        |
| 8/11/02      | 10 AU026D5           |              |      |           |      |     |            |                  |        |
| 8/13/02      | 13 AU027D5           |              |      |           |      |     |            |                  |        |
| 8/7/02       | 05AU028D5            |              |      |           |      |     |            |                  |        |
| 8/6/02       | 06AU021D2            |              |      |           |      |     |            |                  |        |
| 8/8/02       | 07AU026D5            |              |      |           |      |     |            |                  |        |
| 8/01/02      | 14MY028D5            |              |      |           |      |     |            |                  |        |
| 8/5/02       | 05AU028D5            |              |      |           |      |     |            |                  |        |

Comments:

All criteria were met.

Validator:

lu leaver

Date:

9/13/02

## Region I

## Data Review Worksheets - (Low or High Resolution)

## V. INITIAL AND CONTINUING CALIBRATIONS Continued

## Vb. CONTINUING CALIBRATION

| Date of CCAI | Instrument File Name | Compound     | %D   | Ion Ratio | S/N | RT | Resolution | Samples Affected | Action |
|--------------|----------------------|--------------|------|-----------|-----|----|------------|------------------|--------|
| 8/13/02      | 13AU021D2            | All analytes | PASS | —         | —   | —  | P          | All samples      | None   |
| 8/14/02      | "                    |              |      |           |     |    |            |                  |        |
| 8/13/02      | 13AU027D5            |              |      |           |     |    |            |                  |        |
| 8/8/02       | 07AU02A05            |              |      |           |     |    |            |                  |        |
| 8/27/02      | 26AU029D5            |              |      |           |     |    |            |                  |        |
| 8/1/02       | 31JL028D5            |              |      |           |     |    |            |                  | *      |
|              |                      |              |      |           |     |    |            |                  |        |
|              |                      |              |      |           |     |    |            |                  |        |
|              |                      |              |      |           |     |    |            |                  |        |
|              |                      |              |      |           |     |    |            |                  |        |

Comments:

All criteria were met.

Validator: MuleaverDate: 9/13/02

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 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: McKee

Date: 9/13/02

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: Laurens Eng.

Contacted: Yes ☐ No ☐ Date: \_\_\_\_\_

1. Laboratory: Method and Instrument Blanks

| Date Extracted | Date Analyzed | Matrix | Sample No.<br>(Blank Type) | Instrument | Compound | Conc. (units) |
|----------------|---------------|--------|----------------------------|------------|----------|---------------|
| 7/31/02        | 8/8/02        | Soil   | E5N9VIAA                   | HRGC/HRMS  | an ND    | —             |
| 7/26/02        | 8/1/02        | Water  | E5E421AA                   | " "        | an ND    | —             |
|                |               |        |                            |            |          |               |
|                |               |        |                            |            |          |               |
|                |               |        |                            |            |          |               |
|                |               |        |                            |            |          |               |

2. Field: Equipment (Rinsate) Blanks

| Date Extracted | Date Analyzed | Matrix | Sample No.<br>(Blank Type) | Instrument | Compound | Conc. (units) |
|----------------|---------------|--------|----------------------------|------------|----------|---------------|
| 7/26/02        | 8/1/02        | Water  | 2108323                    | HRGC/HRMS  | an       | —             |
|                |               | ER     |                            |            | ND       |               |
|                |               |        |                            |            |          |               |
|                |               |        |                            |            |          |               |
|                |               |        |                            |            |          |               |
|                |               |        |                            |            |          |               |

Validator: unleaver

Date: 9/13/02  
11/98



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

2108336

$$\begin{pmatrix} J \\ R \end{pmatrix}$$

ACTIONS:

NC = Recovery and/or RPD were  
not calculated - 4x rule - No.  
Professional judgment should be used to flag sample data. action

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

Validator:

Lu. Leaver

Date:

9/13/02

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: 2108334 DUPLICATE ID: 2108335

| Compound      | Sample Conc.<br>pg/g | Sample EDL |       | Duplicate Conc.<br>pg/g | Duplicate EDL |       | %RPD | Action |
|---------------|----------------------|------------|-------|-------------------------|---------------|-------|------|--------|
|               |                      | EDL        | 2xEDL |                         | EDL           | 2xEDL |      |        |
| 2373-TCDD     | 13                   | 1.1        | 2.2   | 11                      | 1.1           | 2.2   | 17   | None   |
| 2373-TCDF     | 3.8                  | 1.1        | 2.2   | 3.2                     | 1.1           | 2.2   | 17   | "      |
| 12373-PeCDF   |                      |            |       |                         |               |       |      |        |
| 12373-PeCDD   |                      |            |       |                         |               |       |      |        |
| 23473-PeCDF   | 2.8                  | 5.3        | 10.6  | ND                      | 2.0           | 4.0   | NC   | None   |
| 123473-HxCDF  | 2.8                  | 5.3        | 10.6  | ND                      | 2.4           | 4.8   | NC   | "      |
| 123673-HxCDF  |                      |            |       |                         |               |       |      |        |
| 123473-HxCDD  |                      |            |       |                         |               |       |      |        |
| 123673-HxCDD  |                      |            |       |                         |               |       |      |        |
| 123739-HxCDD  |                      |            |       |                         |               |       |      |        |
| 234673-HxCDF  |                      |            |       |                         |               |       |      |        |
| 123739-HxCDF  |                      |            |       |                         |               |       |      |        |
| 1234673-HpCDF | 7.1                  | 5.3        | 10.6  | 6.2                     | 5.6           | 11.2  | 14   | None   |
| 1234673-HpCDD | 14                   | 5.3        | 10.6  | 11                      | 5.6           | 11.2  | 24   | "      |
| 1234739-HpCDF |                      |            |       |                         |               |       |      |        |
| OCDD          | 94                   | 11         | 22    | 81                      | 11            | 22    | 15   | None   |
| OCDF          | 8.4                  | 11         | 22    | 7.1                     | 11            | 22    | 17   | "      |

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.

Idator:

Leu Leaver

Date:

9/13/02

Region I  
Data Review Worksheets - (High Resolution)

Xb. INTERNAL STANDARD RECOVERY

Recovery Acceptance Criteria per Table 10 in Dioxin Validation SOP:

| Sample Nos.                                  | 2108327 |     |              |        | 2108326 |     |              |        |        |     |              |        |
|----------------------------------------------|---------|-----|--------------|--------|---------|-----|--------------|--------|--------|-----|--------------|--------|
| Internal Standard                            | % Rec.  | S/N | QC Range (%) | Action | % Rec.  | S/N | QC Range (%) | Action | % Rec. | S/N | QC Range (%) | Action |
| <sup>12</sup> C <sub>12</sub> -2378-TCDD     |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -2378-TCDF     |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -12378-PeCDD   |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -12378-PeCDF   |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -23478-PeCDF   |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -123478-HxCDD  |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -123678-HxCDD  |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -123789-HxCDD  |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -123478-HxCDF  | 140%    | OK  | (40-135)     | (J)    | 37%     | OK  | (40-135)     | (J)    |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -123678-HxCDF  |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -123789-HxCDF  |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -234678-HxCDF  |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -1234678-HpCDD |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -1234678-HpCDF |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -1234789-HpCDF |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -OCDD          |         |     |              |        |         |     |              |        |        |     |              |        |
| <sup>12</sup> C <sub>12</sub> -2378-TCDD     |         |     |              |        |         |     |              |        |        |     |              |        |

Validator:

*MLC*

Date:

9/13/02



XII. SAMPLE CALCULATION

2108327

2378-TCDD

78230700 X 2000

151314200 X 0.82 X 10 X 1.05

12378-PCDD

= 120 pg/g

1261768 X 2000

114245000 X 0.82 X 10 X 1.05

= 2.1 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 <sub>x</sub>    | = | 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: Maureen Leaver

Date: 9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108324

Lot-Sample #...: G2G240279 - 004  
 Date Sampled...: 07/22/02  
 Prep Date...: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48R01AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix...: SOLID  
 Instrument: 8D5  
 Units...: pg/g  
 % Moisture: 16

| PARAMETER               | RESULT  | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|---------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 370     | 1.2                | 1             | 370.000000           |
| Total TCDD              | 390     | 1.2                |               |                      |
| 1,2,3,7,8-PeCDD         | 4.1 J   | 5.9                | 1             | 4.100000             |
| Total PeCDD             | 11      | 5.9                |               |                      |
| 1,2,3,4,7,8-HxCDD       | 4.1 J   | 5.9                | 0.1           | 0.410000             |
| 1,2,3,6,7,8-HxCDD       | 13      | 5.9                | 0.1           | 1.300000             |
| 1,2,3,7,8,9-HxCDD       | 12      | 5.9                | 0.1           | 1.200000             |
| Total HxCDD             | 98      | 5.9                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 250     | 5.9                | 0.01          | 2.500000             |
| Total HpCDD             | 460     | 5.9                |               |                      |
| OCDD                    | 1500    | 12                 | 0.0001        | 0.150000             |
| 2,3,7,8-TCDF            | 5.8 CON | 1.2                | 0.1           | 0.580000             |
| Total TCDF              | 49      | 1.2                |               |                      |
| 1,2,3,7,8-PeCDF         | ND      | 2.5                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | 4.5 J   | 5.9                | 0.5           | 2.200000             |
| Total PeCDF             | 55      | 5.9                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 6.4     | 5.9                | 0.1           | 0.640000             |
| 1,2,3,6,7,8-HxCDF       | 5.3 J   | 5.9                | 0.1           | 0.530000             |
| 2,3,4,6,7,8-HxCDF       | 4.3 J   | 5.9                | 0.1           | 0.430000             |
| 1,2,3,7,8,9-HxCDF       | ND      | 0.18               | 0.1           | 0                    |
| Total HxCDF             | 140     | 5.9                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 39      | 5.9                | 0.01          | 0.390000             |
| 1,2,3,4,7,8,9-HpCDF     | ND      | 2.6                | 0.01          | 0                    |
| Total HpCDF             | 86      | 5.9                |               |                      |
| OCDF                    | 74      | 12                 | 0.0001        | 0.007400             |
| Total TEQ Concentration |         |                    |               | 384.437400           |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 67                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 58                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 55                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 55                  | 40 - 135           |
| 13C-OCDD                | 48                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 60                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 61                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 53                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 57                  | 40 - 135           |

*juw*  
 9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108324**

**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.

*Juw*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108325

Lot-Sample #...: G2G240279 - 005  
 Date Sampled...: 07/22/02  
 Prep Date...: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48R31AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix...: SOLID  
 Instrument: 8D5  
 Units...: pg/g  
 % Moisture: 6.1

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 15     | 1.1                | 1             | 15.000000            |
| Total TCDD              | 19     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 1.2                | 1             | 0                    |
| Total PeCDD             | ND     | 2.6                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 2.2                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | 12     | 5.3                | 0.1           | 1.200000             |
| 1,2,3,7,8,9-HxCDD       | 6.0    | 5.3                | 0.1           | 0.600000             |
| Total HxCDD             | 60     | 5.3                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 450    | 5.3                | 0.01          | 4.500000             |
| Total HpCDD             | 820    | 5.3                |               |                      |
| OCDD                    | 3700   | 11                 | 0.0001        | 0.370000             |
| 2,3,7,8-TCDF            | 3.4    | 1.1                | 0.1           | 0.340000             |
| Total TCDF              | 27     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 1.6                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 2.3                | 0.5           | 0                    |
| Total PeCDF             | 45     | 5.3                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 3.1    | 5.3                | 0.1           | 0.310000             |
| 1,2,3,6,7,8-HxCDF       | 3.5    | 5.3                | 0.1           | 0.350000             |
| 2,3,4,6,7,8-HxCDF       | 3.7    | 5.3                | 0.1           | 0.370000             |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.13               | 0.1           | 0                    |
| Total HxCDF             | 90     | 5.3                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 62     | 5.3                | 0.01          | 0.620000             |
| 1,2,3,4,7,8,9-HpCDF     | 3.1    | 5.3                | 0.01          | 0.031000             |
| Total HpCDF             | 200    | 5.3                |               |                      |
| OCDF                    | 180    | 11                 | 0.0001        | 0.018000             |
| Total TEQ Concentration |        |                    |               | 23.709000            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 78                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 68                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 69                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 73                  | 40 - 135           |
| 13C-OCDD                | 78                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 76                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 70                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 64                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 69                  | 40 - 135           |

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9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108325**

**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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9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108326

Lot-Sample #...: G2G240279 - 006  
 Date Sampled...: 07/22/02  
 Prep Date...: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48TA1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix...: SOLID  
 Instrument: 8D5  
 Units...: pg/g  
 % Moisture: 9.0

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 4.3    | 1.1                | 1             | 4.300000             |
| Total TCDD              | 4.3    | 1.1                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 0.37               | 1             | 0                    |
| Total PeCDD             | ND     | 0.45               |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.38               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 2.7                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 1.6                | 0.1           | 0                    |
| Total HxCDD             | 5.1    | 5.5                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 48     | 5.5                | 0.01          | 0.480000             |
| Total HpCDD             | 88     | 5.5                |               |                      |
| OCDD                    | 290    | 11                 | 0.0001        | 0.029000             |
| 2,3,7,8-TCDF            | ND CON | 0.44               | 0.1           | 0                    |
| Total TCDF              | 3.0    | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 0.35               | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 0.73               | 0.5           | 0                    |
| Total PeCDF             | 15     | 5.5                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND     | 1.2                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND     | 1.2                | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     | 1.4                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.14               | 0.1           | 0                    |
| Total HxCDF             | 17     | 5.5                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 6.6    | 5.5                | 0.01          | 0.066000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.53               | 0.01          | 0                    |
| Total HpCDF             | 16     | 5.5                |               |                      |
| OCDF                    | 7.2 J  | 11                 | 0.0001        | 0.000720             |
| Total TEQ Concentration |        |                    |               | 4.875720             |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 55                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 56                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 46                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 60                  | 40 - 135           |
| 13C-OCDD                | 70                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 51                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 56                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 37 *                | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 48                  | 40 - 135           |

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**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108326**

**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).

- \* Surrogate recovery is outside stated control limits.
- CON Confirmation analysis.
- J Estimated result. Result is less than the reporting limit.

*lew*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108327

Lot-Sample #...: G2G240279 - 001  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48RF1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix....: SOLID  
 Instrument: 8D5  
 Units.....: pg/g  
 % Moisture: 21

| PARAMETER               | RESULT    | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|-----------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 4.4       | 1.3                | 1             | 4.400000             |
| Total TCDD              | 6.3       | 1.3                |               |                      |
| 1,2,3,7,8-PeCDD         | ND        | 0.41               | 1             | 0                    |
| Total PeCDD             | ND        | 1.0                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND        | 0.24               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND        | 0.46               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND        | 0.44               | 0.1           | 0                    |
| Total HxCDD             | ND        | 2.4                |               | 0                    |
| 1,2,3,4,6,7,8-HpCDD     | 5.3 J     | 6.4                | 0.01          | 0.053000             |
| Total HpCDD             | 10        | 6.4                |               |                      |
| OCDD                    | 33        | 13                 | 0.0001        | 0.003300             |
| 2,3,7,8-TCDF            | 1.0 CON J | 1.3                | 0.1           | 0.100000             |
| Total TCDF              | 9.3       | 1.3                |               |                      |
| 1,2,3,7,8-PeCDF         | ND        | 0.66               | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND        | 0.89               | 0.5           | 0                    |
| Total PeCDF             | 8.2       | 6.4                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND        | 1.4                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND        | 0.90               | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND        | 0.74               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND        | 0.14               | 0.1           | 0                    |
| Total HxCDF             | 3.8       | 6.4                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | ND        | 2.9                | 0.01          | 0                    |
| 1,2,3,4,7,8,9-HpCDF     | ND        | 0.61               | 0.01          | 0                    |
| Total HpCDF             | ND        | 2.9                |               | 0                    |
| OCDF                    | ND        | 2.8                | 0.0001        | 0                    |
| Total TEQ Concentration |           |                    |               | 4.556300             |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 74                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 66                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 97                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 79                  | 40 - 135           |
| 13C-OCDD                | 108                 | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 71                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 65                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 140 *               | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 72                  | 40 - 135           |

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9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108327**

**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).

- \* Surrogate recovery is outside stated control limits.
- CON Confirmation analysis.
- J Estimated result. Result is less than the reporting limit.

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9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108328

Lot-Sample #...: G2G240279 - 002  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48RQ1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 8D5  
 Units.....: pg/g  
 % Moisture: 18

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 120    | 1.2                | 1             | 120.000000           |
| Total TCDD              | 140    | 1.2                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 2.6                | 1             | 0                    |
| Total PeCDD             | 13     | 6.1                |               |                      |
| 1,2,3,4,7,8-HxCDD       | ND     | 1.8                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | 4.1 J  | 6.1                | 0.1           | 0.410000             |
| 1,2,3,7,8,9-HxCDD       | ND     | 2.8                | 0.1           | 0                    |
| Total HxCDD             | 42     | 6.1                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 40     | 6.1                | 0.01          | 0.400000             |
| Total HpCDD             | 77     | 6.1                |               |                      |
| OCDD                    | 220    | 12                 | 0.0001        | 0.022000             |
| 2,3,7,8-TCDF            | 10 CON | 1.2                | 0.1           | 1.000000             |
| Total TCDF              | 100    | 6.1                |               |                      |
| 1,2,3,7,8-PeCDF         | 6.0 J  | 6.1                | 0.05          | 0.300000             |
| 2,3,4,7,8-PeCDF         | 12     | 6.1                | 0.5           | 6.000000             |
| Total PeCDF             | 160    | 6.1                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 9.5    | 6.1                | 0.1           | 0.950000             |
| 1,2,3,6,7,8-HxCDF       | 9.2    | 6.1                | 0.1           | 0.920000             |
| 2,3,4,6,7,8-HxCDF       | 11     | 6.1                | 0.1           | 1.100000             |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.51               | 0.1           | 0                    |
| Total HxCDF             | 130    | 6.1                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 32     | 6.1                | 0.01          | 0.320000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 3.0                | 0.01          | 0                    |
| Total HpCDF             | 48     | 6.1                |               |                      |
| OCDF                    | 21     | 12                 | 0.0001        | 0.002100             |
| Total TEQ Concentration |        |                    |               | 131.424100           |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 82                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 71                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 79                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 76                  | 40 - 135           |
| 13C-OCDD                | 78                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 81                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 59                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 70                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 70                  | 40 - 135           |

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9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108328**

**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.

*juw*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108329

Lot-Sample #...: G2G240279 - 003  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: B48RX1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 8D5  
 Units.....: pg/g  
 % Moisture: 20

| PARAMETER               | RESULT  | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|---------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 630 J ✓ | 1.2                | 1             | 630.000000           |
| Total TCDD              | 640     | 1.2                |               |                      |
| 1,2,3,7,8-PeCDD         | 5.1 J   | 6.2                | 1             | 5.100000             |
| Total PeCDD             | 22      | 6.2                |               |                      |
| 1,2,3,4,7,8-HxCDD       | 4.1 J   | 6.2                | 0.1           | 0.410000             |
| 1,2,3,6,7,8-HxCDD       | 9.8     | 6.2                | 0.1           | 0.980000             |
| 1,2,3,7,8,9-HxCDD       | 12      | 6.2                | 0.1           | 1.200000             |
| Total HxCDD             | 110     | 6.2                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 320     | 6.2                | 0.01          | 3.200000             |
| Total HpCDD             | 520     | 6.2                |               |                      |
| OCDD                    | 2200    | 12                 | 0.0001        | 0.220000             |
| 2,3,7,8-TCDF            | 5.7 CON | 1.2                | 0.1           | 0.570000             |
| Total TCDF              | 54      | 1.2                |               |                      |
| 1,2,3,7,8-PeCDF         | ND      | 2.4                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | 4.2 J   | 6.2                | 0.5           | 2.100000             |
| Total PeCDF             | 35      | 6.2                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 5.8 J   | 6.2                | 0.1           | 0.580000             |
| 1,2,3,6,7,8-HxCDF       | 3.9 J   | 6.2                | 0.1           | 0.390000             |
| 2,3,4,6,7,8-HxCDF       | 4.2 J   | 6.2                | 0.1           | 0.420000             |
| 1,2,3,7,8,9-HxCDF       | ND      | 0.21               | 0.1           | 0                    |
| Total HxCDF             | 71      | 6.2                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 21      | 6.2                | 0.01          | 0.210000             |
| 1,2,3,4,7,8,9-HpCDF     | ND      | 1.7                | 0.01          | 0                    |
| Total HpCDF             | 37      | 6.2                |               |                      |
| OCDF                    | 24      | 12                 | 0.0001        | 0.002400             |
| Total TEQ Concentration |         |                    |               | 645.382400           |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 80                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 68                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 73                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 80                  | 40 - 135           |
| 13C-OCDD                | 85                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 74                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 68                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 66                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 70                  | 40 - 135           |

9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108329**

**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.

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

*Qlw*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108330

Lot-Sample #...: G2G240279 - 008  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48TK1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 8D5  
 Units.....: pg/g  
 % Moisture: 5.7

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 29     | 1.1                | 1             | 29.000000            |
| Total TCDD              | 33     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 0.29               | 1             | 0                    |
| Total PeCDD             | ND     | 1.7                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.31               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 0.72               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 0.75               | 0.1           | 0                    |
| Total HxCDD             | ND     | 2.5                |               | 0                    |
| 1,2,3,4,6,7,8-HpCDD     | 9.3    | 5.3                | 0.01          | 0.093000             |
| Total HpCDD             | 19     | 5.3                |               |                      |
| OCDD                    | 64     | 11                 | 0.0001        | 0.006400             |
| 2,3,7,8-TCDF            | 3.5    | 1.1                | 0.1           | 0.350000             |
| Total TCDF              | 18     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 1.2                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 1.2                | 0.5           | 0                    |
| Total PeCDF             | 5.3    | 5.3                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND     | 1.8                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND     | 0.82               | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     | 0.75               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.078              | 0.1           | 0                    |
| Total HxCDF             | 6.8    | 5.3                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 3.7    | 5.3                | 0.01          | 0.037000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.33               | 0.01          | 0                    |
| Total HpCDF             | 3.7    | 5.3                |               |                      |
| OCDF                    | ND     | 4.2                | 0.0001        | 0                    |
| Total TEQ Concentration |        |                    |               | 29.486400            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 68                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 62                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 69                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 72                  | 40 - 135           |
| 13C-OCDD                | 72                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 62                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 62                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 63                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 68                  | 40 - 135           |

*flw*  
 9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108330**

**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.

lew  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108331

Lot-Sample #...: G2G240279 - 009  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48TT1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/08/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 8D5  
 Units.....: pg/g  
 % Moisture: 16

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 41     | 1.2                | 1             | 41.000000            |
| Total TCDD              | 44     | 1.2                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 0.36               | 1             | 0                    |
| Total PeCDD             | ND     | 1.0                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.30               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 0.77               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 0.88               | 0.1           | 0                    |
| Total HxCDD             | ND     | 2.5                |               | 0                    |
| 1,2,3,4,6,7,8-HpCDD     | 13     | 5.9                | 0.01          | 0.130000             |
| Total HpCDD             | 25     | 5.9                |               |                      |
| OCDD                    | 220    | 12                 | 0.0001        | 0.022000             |
| 2,3,7,8-TCDF            | 2.5    | 1.2                | 0.1           | 0.250000             |
| Total TCDF              | 14     | 1.2                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 0.83               | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 1.0                | 0.5           | 0                    |
| Total PeCDF             | 4.1    | 5.9                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND     | 1.4                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND     | 0.72               | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     | 0.76               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.055              | 0.1           | 0                    |
| Total HxCDF             | 7.1    | 5.9                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 3.9    | 5.9                | 0.01          | 0.039000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.34               | 0.01          | 0                    |
| Total HpCDF             | 4.0    | 5.9                |               |                      |
| OCDF                    | ND     | 4.8                | 0.0001        | 0                    |
| Total TEQ Concentration |        |                    |               | 41.441000            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 80                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 76                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 79                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 81                  | 40 - 135           |
| 13C-OCDD                | 82                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 77                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 75                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 67                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 73                  | 40 - 135           |

*juw*  
 9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108331**

**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.

*JW*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108332

Lot-Sample #...: G2G240279 - 010  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48T01AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 6DS  
 Units.....: pg/g  
 % Moisture: 9.6

| PARAMETER               | RESULT |     | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|-----|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 43     | D   | 5.5                | 1             | 43.000000            |
| Total TCDD              | 43     |     | 5.5                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | D   | 4.4                | 1             | 0                    |
| Total PeCDD             | ND     | D   | 4.4                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     |     | 1.1                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     |     | 0.90               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     |     | 2.2                | 0.1           | 0                    |
| Total HxCDD             | 8.4    |     | 5.5                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 12     |     | 5.5                | 0.01          | 0.120000             |
| Total HpCDD             | 27     |     | 5.5                |               |                      |
| OCDD                    | 72     |     | 11                 | 0.0001        | 0.007200             |
| 2,3,7,8-TCDF            | 3.3    | CON | 1.1                | 0.1           | 0.330000             |
| Total TCDF              | 18     |     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     |     | 1.1                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | 3.8    | J   | 5.5                | 0.5           | 1.900000             |
| Total PeCDF             | 12     |     | 5.5                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND     |     | 2.2                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND     |     | 0.84               | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     |     | 0.84               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     |     | 0.22               | 0.1           | 0                    |
| Total HxCDF             | 10     |     | 5.5                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 5.1    | J   | 5.5                | 0.01          | 0.051000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     |     | 0.74               | 0.01          | 0                    |
| Total HpCDF             | 8.2    |     | 5.5                |               |                      |
| OCDF                    | ND     |     | 5.5                | 0.0001        | 0                    |
| Total TEQ Concentration |        |     |                    |               | 45.408200            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 80                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 91                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 45                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 66                  | 40 - 135           |
| 13C-OCDD                | 82                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 71                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 88                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 97                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 68                  | 40 - 135           |

luw  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108332

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.

*flw*  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108333

Lot-Sample #...: G2G240279 - 011  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48T51AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 6D5  
 Units.....: pg/g  
 % Moisture: 8.4

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 13     | 1.1                | 1             | 13.000000            |
| Total TCDD              | 17     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 0.59               | 1             | 0                    |
| Total PeCDD             | ND     | 1.9                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.47               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 1.1                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 1.3                | 0.1           | 0                    |
| Total HxCDD             | 3.5    | 5.5                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 8.4    | 5.5                | 0.01          | 0.084000             |
| Total HpCDD             | 16     | 5.5                |               |                      |
| OCDD                    | 51     | 11                 | 0.0001        | 0.005100             |
| 2,3,7,8-TCDF            | 3.4    | 1.1                | 0.1           | 0.340000             |
| Total TCDF              | 22     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 1.6                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 2.4                | 0.5           | 0                    |
| Total PeCDF             | 34     | 5.5                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND     | 2.7                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | 2.8    | 5.5                | 0.1           | 0.280000             |
| 2,3,4,6,7,8-HxCDF       | 2.8    | 5.5                | 0.1           | 0.280000             |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.37               | 0.1           | 0                    |
| Total HxCDF             | 32     | 5.5                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 4.7    | 5.5                | 0.01          | 0.047000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.60               | 0.01          | 0                    |
| Total HpCDF             | 7.9    | 5.5                |               |                      |
| OCDF                    | ND     | 4.6                | 0.0001        | 0                    |
| Total TEQ Concentration |        |                    |               | 14.036100            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 83                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 78                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 75                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 87                  | 40 - 135           |
| 13C-OCDD                | 84                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 80                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 83                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 69                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 75                  | 40 - 135           |

*HW*  
 9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108333**

**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.

plw  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108334

Lot-Sample #...: G2G240279 - 012  
 Date Sampled...: 07/22/02  
 Prep Date...: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48T81AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix...: SOLID  
 Instrument: 6D5  
 Units...: pg/g  
 % Moisture: 5.8

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 13     | 1.1                | 1             | 13.000000            |
| Total TCDD              | 15     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 0.78               | 1             | 0                    |
| Total PeCDD             | ND     | 2.0                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.57               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 1.6                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 1.5                | 0.1           | 0                    |
| Total HxCDD             | 11     | 5.3                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 14     | 5.3                | 0.01          | 0.140000             |
| Total HpCDD             | 27     | 5.3                |               |                      |
| OCDD                    | 94     | 11                 | 0.0001        | 0.009400             |
| 2,3,7,8-TCDF            | 3.8    | 1.1                | 0.1           | 0.380000             |
| Total TCDF              | 28     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 1.8                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | 2.8    | 5.3                | 0.5           | 1.400000             |
| Total PeCDF             | 25     | 5.3                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 2.8    | 5.3                | 0.1           | 0.280000             |
| 1,2,3,6,7,8-HxCDF       | ND     | 2.1                | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     | 2.3                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.20               | 0.1           | 0                    |
| Total HxCDF             | 21     | 5.3                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 7.1    | 5.3                | 0.01          | 0.071000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.82               | 0.01          | 0                    |
| Total HpCDF             | 12     | 5.3                |               |                      |
| OCDF                    | 8.4    | 11                 | 0.0001        | 0.000840             |
| Total TEQ Concentration |        |                    |               | 15.281240            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 96                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 85                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 87                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 95                  | 40 - 135           |
| 13C-OCDD                | 89                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 88                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 92                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 78                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 87                  | 40 - 135           |

juw  
9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108334**

**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.

*llw*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108335

Lot-Sample #...: G2G240279 - 013  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48VH1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

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

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 11     | 1.1                | 1             | 11.000000            |
| Total TCDD              | 14     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDD         | ND     | 0.65               | 1             | 0                    |
| Total PeCDD             | ND     | 1.4                |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.36               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 1.1                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 1.2                | 0.1           | 0                    |
| Total HxCDD             | 4.2    | 5.6                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 11     | 5.6                | 0.01          | 0.110000             |
| Total HpCDD             | 23     | 5.6                |               |                      |
| OCDD                    | 81     | 11                 | 0.0001        | 0.008100             |
| 2,3,7,8-TCDF            | 3.2    | 1.1                | 0.1           | 0.320000             |
| Total TCDF              | 19     | 1.1                |               |                      |
| 1,2,3,7,8-PeCDF         | ND     | 1.6                | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 2.0                | 0.5           | 0                    |
| Total PeCDF             | 12     | 5.6                |               |                      |
| 1,2,3,4,7,8-HxCDF       | ND     | 2.4                | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND     | 2.0                | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     | 2.1                | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.18               | 0.1           | 0                    |
| Total HxCDF             | 14     | 5.6                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 6.2    | 5.6                | 0.01          | 0.062000             |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.55               | 0.01          | 0                    |
| Total HpCDF             | 9.9    | 5.6                |               |                      |
| OCDF                    | 7.1    | 11                 | 0.0001        | 0.000710             |
| Total TEQ Concentration |        |                    |               | 11.500810            |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 83                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 81                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 78                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 94                  | 40 - 135           |
| 13C-OCDD                | 93                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 82                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 87                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 70                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 92                  | 40 - 135           |

9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108335**

**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.

HW  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108336

Lot-Sample #...: G2G240279 - 014  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48VV1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix....: SOLID  
 Instrument: 6D5  
 Units.....: pg/g  
 % Moisture: 38

| PARAMETER               | RESULT  | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|---------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 9500 D  | 16                 | 1             | 9,500.000000         |
| Total TCDD              | 9600    | 16                 |               |                      |
| 1,2,3,7,8-PeCDD         | 22      | 8.1                | 1             | 22.000000            |
| Total PeCDD             | 170     | 8.1                |               |                      |
| 1,2,3,4,7,8-HxCDD       | 26      | 8.1                | 0.1           | 2.600000             |
| 1,2,3,6,7,8-HxCDD       | 85      | 8.1                | 0.1           | 8.500000             |
| 1,2,3,7,8,9-HxCDD       | 77      | 8.1                | 0.1           | 7.700000             |
| Total HxCDD             | 780     | 8.1                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 1600    | 8.1                | 0.01          | 16.000000            |
| Total HpCDD             | 3000    | 8.1                |               |                      |
| OCDD                    | 15000 D | 160                | 0.0001        | 1.500000             |
| 2,3,7,8-TCDF            | 38 CON  | 1.6                | 0.1           | 3.800000             |
| Total TCDF              | 400     | 1.6                |               |                      |
| 1,2,3,7,8-PeCDF         | 23      | 8.1                | 0.05          | 1.200000             |
| 2,3,4,7,8-PeCDF         | 46      | 8.1                | 0.5           | 23.000000            |
| Total PeCDF             | 750     | 8.1                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 79      | 8.1                | 0.1           | 7.900000             |
| 1,2,3,6,7,8-HxCDF       | 71      | 8.1                | 0.1           | 7.100000             |
| 2,3,4,6,7,8-HxCDF       | 57      | 8.1                | 0.1           | 5.700000             |
| 1,2,3,7,8,9-HxCDF       | ND      | 2.2                | 0.1           | 0                    |
| Total HxCDF             | 1200    | 8.1                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 460 J   | 8.1                | 0.01          | 4.600000             |
| 1,2,3,4,7,8,9-HpCDF     | 25      | 8.1                | 0.01          | 0.250000             |
| Total HpCDF             | 1000    | 8.1                |               |                      |
| OCDF                    | 910 J B | 160                | 0.0001        | 0.091000             |
| Total TEQ Concentration |         |                    |               | 9,611.941000         |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 62                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 50                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 52                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 58                  | 40 - 135           |
| 13C-OCDD                | 45                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 54                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 55                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 50                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 52                  | 40 - 135           |

*mw*  
 9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108336**

**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.

luw  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108337

Lot-Sample #...: G2G240279 - 015  
 Date Sampled...: 07/22/02  
 Prep Date...: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48WG1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix...: SOLID  
 Instrument: 6D5  
 Units...: pg/g  
 % Moisture: 52

| PARAMETER               | RESULT  | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|---------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 8400 D  | 53                 | 1             | 8,400.000000         |
| Total TCDD              | 8600    | 53                 |               |                      |
| 1,2,3,7,8-PeCDD         | 24      | 11                 | 1             | 24.000000            |
| Total PeCDD             | 91      | 11                 |               |                      |
| 1,2,3,4,7,8-HxCDD       | 29      | 11                 | 0.1           | 2.900000             |
| 1,2,3,6,7,8-HxCDD       | 150     | 11                 | 0.1           | 15.000000            |
| 1,2,3,7,8,9-HxCDD       | 110     | 11                 | 0.1           | 11.000000            |
| Total HxCDD             | 1000    | 11                 |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 3200    | 11                 | 0.01          | 32.000000            |
| Total HpCDD             | 5800    | 11                 |               |                      |
| OCDD                    | 29000 D | 530                | 0.0001        | 2.900000             |
| 2,3,7,8-TCDF            | 38 CON  | 2.1                | 0.1           | 3.800000             |
| Total TCDF              | 300     | 2.1                |               |                      |
| 1,2,3,7,8-PeCDF         | 16      | 11                 | 0.05          | 0.800000             |
| 2,3,4,7,8-PeCDF         | 57      | 11                 | 0.5           | 28.000000            |
| Total PeCDF             | 510     | 11                 |               |                      |
| 1,2,3,4,7,8-HxCDF       | 120     | 11                 | 0.1           | 12.000000            |
| 1,2,3,6,7,8-HxCDF       | 65      | 11                 | 0.1           | 6.500000             |
| 2,3,4,6,7,8-HxCDF       | 28      | 11                 | 0.1           | 2.800000             |
| 1,2,3,7,8,9-HxCDF       | ND      | 1.9                | 0.1           | 0                    |
| Total HxCDF             | 1100    | 11                 |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 310     | 11                 | 0.01          | 3.100000             |
| 1,2,3,4,7,8,9-HpCDF     | 41      | 11                 | 0.01          | 0.410000             |
| Total HpCDF             | 1100    | 11                 |               |                      |
| OCDF                    | 1100 D  | 530                | 0.0001        | 0.110000             |
| Total TEQ Concentration |         |                    |               | 8,545.320000         |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 81                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 70                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 72                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 72                  | 40 - 135           |
| 13C-OCDD                | 69                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 70                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 75                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 71                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 68                  | 40 - 135           |

llw  
9/13/02

**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108337**

**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.

*juw*  
*9/13/02*

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108338

Lot-Sample #...: G2G240279 - 016  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48WH1AC  
 Date Received..: 07/24/02  
 Analysis Date..: 08/11/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 6D5  
 Units.....: pg/g  
 % Moisture: 79

| PARAMETER               | RESULT     | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|------------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 40000 J DE | 47                 | 1             | 40,000.000000        |
| Total TCDD              | 40000      | 47                 |               |                      |
| 1,2,3,7,8-PeCDD         | 29         | 23                 | 1             | 29.000000            |
| Total PeCDD             | 110        | 23                 |               |                      |
| 1,2,3,4,7,8-HxCDD       | 34         | 23                 | 0.1           | 3.400000             |
| 1,2,3,6,7,8-HxCDD       | 120        | 23                 | 0.1           | 12.000000            |
| 1,2,3,7,8,9-HxCDD       | 87         | 23                 | 0.1           | 8.700000             |
| Total HxCDD             | 790        | 23                 |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 2100       | 23                 | 0.01          | 21.000000            |
| Total HpCDD             | 3700       | 23                 |               |                      |
| OCDD                    | 15000      | 47                 | 0.0001        | 1.500000             |
| 2,3,7,8-TCDF            | 56 CON     | 4.7                | 0.1           | 5.600000             |
| Total TCDF              | 970        | 4.7                |               |                      |
| 1,2,3,7,8-PeCDF         | 23         | 23                 | 0.05          | 1.200000             |
| 2,3,4,7,8-PeCDF         | 54         | 23                 | 0.5           | 27.000000            |
| Total PeCDF             | 1200       | 23                 |               |                      |
| 1,2,3,4,7,8-HxCDF       | 58         | 23                 | 0.1           | 5.800000             |
| 1,2,3,6,7,8-HxCDF       | 56         | 23                 | 0.1           | 5.600000             |
| 2,3,4,6,7,8-HxCDF       | 28         | 23                 | 0.1           | 2.800000             |
| 1,2,3,7,8,9-HxCDF       | ND         | 2.0                | 0.1           | 0                    |
| Total HxCDF             | 1800       | 23                 |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 340        | 23                 | 0.01          | 3.400000             |
| 1,2,3,4,7,8,9-HpCDF     | 27         | 23                 | 0.01          | 0.270000             |
| Total HpCDF             | 920        | 23                 |               |                      |
| OCDF                    | 980        | 47                 | 0.0001        | 0.098000             |
| Total TEQ Concentration |            |                    |               | 40,127.368000        |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 81                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 76                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 82                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 70                  | 40 - 135           |
| 13C-OCDD                | 64                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 76                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 77                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 84                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 65                  | 40 - 135           |

W  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108338

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.
- E Estimated result. Result concentration exceeds the calibration range.

HW  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108339

Lot-Sample #....: G2G240279 - 017  
 Date Sampled....: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #....: 2212455

Work Order #....: E48WM1AC  
 Date Received..: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 6D5  
 Units.....: pg/g  
 % Moisture: 37

| PARAMETER               | RESULT    | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|-----------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 8600 J ED | 16                 | 1             | 8,600.000000         |
| Total TCDD              | 8800      | 16                 |               |                      |
| 1,2,3,7,8-PeCDD         | 21        | 7.9                | 1             | 21.000000            |
| Total PeCDD             | 110       | 7.9                |               |                      |
| 1,2,3,4,7,8-HxCDD       | 23        | 7.9                | 0.1           | 2.300000             |
| 1,2,3,6,7,8-HxCDD       | 72        | 7.9                | 0.1           | 7.200000             |
| 1,2,3,7,8,9-HxCDD       | 66        | 7.9                | 0.1           | 6.600000             |
| Total HxCDD             | 650       | 7.9                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 1300      | 7.9                | 0.01          | 13.000000            |
| Total HpCDD             | 2300      | 7.9                |               |                      |
| OCDD                    | 11000 D   | 160                | 0.0001        | 1.100000             |
| 2,3,7,8-TCDF            | 36 CON    | 1.6                | 0.1           | 3.600000             |
| Total TCDF              | 730       | 1.6                |               |                      |
| 1,2,3,7,8-PeCDF         | 20        | 7.9                | 0.05          | 1.000000             |
| 2,3,4,7,8-PeCDF         | 51        | 7.9                | 0.5           | 26.000000            |
| Total PeCDF             | 1000      | 7.9                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 77        | 7.9                | 0.1           | 7.700000             |
| 1,2,3,6,7,8-HxCDF       | 51        | 7.9                | 0.1           | 5.100000             |
| 2,3,4,6,7,8-HxCDF       | 28        | 7.9                | 0.1           | 2.800000             |
| 1,2,3,7,8,9-HxCDF       | ND        | 1.3                | 0.1           | 0                    |
| Total HxCDF             | 1300      | 7.9                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 180       | 7.9                | 0.01          | 1.800000             |
| 1,2,3,4,7,8,9-HpCDF     | 22        | 7.9                | 0.01          | 0.220000             |
| Total HpCDF             | 450       | 7.9                |               |                      |
| OCDF                    | 430 D     | 160                | 0.0001        | 0.043000             |
| Total TEQ Concentration |           |                    |               | 8,699.463000         |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 61                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 54                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 57                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 51                  | 40 - 135           |
| 13C-OCDD                | 44                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 53                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 54                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 68                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 45                  | 40 - 135           |

HW  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108339

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.

E Estimated result. Result concentration exceeds the calibration range.

mw  
9/13/02

## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108340

Lot-Sample #....: G2G240279 - 018  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #....: E48WV1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix.....: SOLID  
 Instrument: 6D5  
 Units.....: pg/g  
 % Moisture: 53

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 800    | 2.1                | 1             | 800.000000           |
| Total TCDD              | 910    | 2.1                |               |                      |
| 1,2,3,7,8-PeCDD         | 24     | 11                 | 1             | 24.000000            |
| Total PeCDD             | 180    | 11                 |               |                      |
| 1,2,3,4,7,8-HxCDD       | 35     | 11                 | 0.1           | 3.500000             |
| 1,2,3,6,7,8-HxCDD       | 110    | 11                 | 0.1           | 11.000000            |
| 1,2,3,7,8,9-HxCDD       | 62     | 11                 | 0.1           | 6.200000             |
| Total HxCDD             | 1000   | 11                 |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 3200   | 11                 | 0.01          | 32.000000            |
| Total HpCDD             | 6300   | 11                 |               |                      |
| OCDD                    | 35000  | D 530              | 0.0001        | 3.500000             |
| 2,3,7,8-TCDF            | 59     | CON 2.1            | 0.1           | 5.900000             |
| Total TCDF              | 340    | 2.1                |               |                      |
| 1,2,3,7,8-PeCDF         | 25     | 11                 | 0.05          | 1.200000             |
| 2,3,4,7,8-PeCDF         | 48     | 11                 | 0.5           | 24.000000            |
| Total PeCDF             | 720    | 11                 |               |                      |
| 1,2,3,4,7,8-HxCDF       | 120    | 11                 | 0.1           | 12.000000            |
| 1,2,3,6,7,8-HxCDF       | 100    | 11                 | 0.1           | 10.000000            |
| 2,3,4,6,7,8-HxCDF       | 53     | 11                 | 0.1           | 5.300000             |
| 1,2,3,7,8,9-HxCDF       | ND     | 2.4                | 0.1           | 0                    |
| Total HxCDF             | 1200   | 11                 |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 460    | 11                 | 0.01          | 4.600000             |
| 1,2,3,4,7,8,9-HpCDF     | 46     | 11                 | 0.01          | 0.460000             |
| Total HpCDF             | 1300   | 11                 |               |                      |
| OCDF                    | 1300   | D 530              | 0.0001        | 0.130000             |
| Total TEQ Concentration |        |                    |               | 943.790000           |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 71                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 68                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 65                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 67                  | 40 - 135           |
| 13C-OCDD                | 51                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 64                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 70                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 60                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 58                  | 40 - 135           |

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**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108340**

**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.

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*9/13/02*

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

|                              |        | AQUEOUS        |                     |                | SOLID               |                     |                                          |
|------------------------------|--------|----------------|---------------------|----------------|---------------------|---------------------|------------------------------------------|
|                              |        | PE<br>Standard | PE<br>Sample Result | PE<br>Standard | PE<br>Sample Result | PE<br>Sample Result | Range of<br>Expected Values <sup>1</sup> |
| Location ID                  |        | CMS-DEL-PEAQ   | CMS-DEL-PEAQ        | NA             | CMS-DEL-PES1        | CMS-DEL-PES2        | NA                                       |
| Sample ID                    |        | 2108401        | 2108401             | NA             | 2108402             | 2108342             | NA                                       |
| Sample Date                  |        | NA             | NA                  | NA             | NA                  | NA                  | NA                                       |
| Sample Time                  |        | NA             | NA                  | NA             | NA                  | NA                  | NA                                       |
| Sample Depth                 |        | NA             | N/A                 | NA             | N/A                 | N/A                 | N/A                                      |
| Laboratory                   |        | CIL            | STL                 | CIL            | STL                 | STL                 | CIL                                      |
| Lot Number                   |        | 34761-95       | G2G190281           | MAR-21985-85-A | G2G230229           | G2G240279           | MAR-21985-85-A                           |
| Lab. Number                  |        | NA             | 013                 | EDF-2513       | 021                 | 020                 | EDF-2513                                 |
| Date Dioxins/Furans Analyzed |        | NA             | 07/27/2002          | NA             | 08/08/2002          | 08/11/2002          | NA                                       |
| Constituent                  | TEF    | pg/L           | pg/L                | pg/g           | pg/g                | pg/g                | pg/g                                     |
| 2,3,7,8-TCDD                 | 1.000  | 15000          | 8100 E              | 500            | 500 E               | 470 E               | 260 - 670                                |
| Total TCDD                   | -      | ND             | 8100                | ND             | 500                 | 470                 | -                                        |
| 1,2,3,7,8-PeCDD              | 1.000  | ND             | <12                 | 1000           | 1100                | 940                 | 560 - 1370                               |
| Total PeCDD                  | -      | ND             | <12                 | ND             | 1100                | 940                 | -                                        |
| 1,2,3,4,7,8-HxCDD            | 0.100  | 6000           | 2400                | 1000           | 840                 | 810                 | 500 - 1290                               |
| 1,2,3,6,7,8-HxCDD            | 0.100  | 15000          | 8100                | 1000           | 1000                | 940                 | 520 - 1210                               |
| 1,2,3,7,8,9-HxCDD            | 0.100  | ND             | <42                 | 1000           | 1000                | 1000                | 460 - 1330                               |
| Total HxCDD                  | -      | ND             | 11000               | ND             | 2900                | 2800                | -                                        |
| 1,2,3,4,6,7,8-HpCDD          | 0.010  | 20000          | 8700                | 1500           | 1500                | 1300                | 710 - 2070                               |
| Total HpCDD                  | -      | ND             | 8700                | ND             | 1500                | 1400                | -                                        |
| OCDD                         | 0.0001 | 30000          | 12000               | 2500           | 4100 E              | 3500 D              | 1980 - 5030                              |
| 2,3,7,8-TCDF                 | 0.100  | 7000           | 4600 CON E          | 500            | 440 CON E           | 450 CON E           | 260 - 640                                |
| Total TCDF                   | -      | ND             | 4800                | ND             | 500                 | 450                 | -                                        |
| 1,2,3,7,8-PeCDF              | 0.050  | 5000           | 3000                | 1000           | 1100                | 920                 | 590 - 1150                               |
| 2,3,4,7,8-PeCDF              | 0.500  | ND             | <3.2                | 1000           | 950                 | 820                 | 410 - 1310                               |
| Total PeCDF                  | -      | ND             | 3000                | ND             | 2000                | 1800                | -                                        |
| 1,2,3,4,7,8-HxCDF            | 0.100  | ND             | <13                 | 1000           | 1100                | 940                 | 530 - 1230                               |
| 1,2,3,6,7,8-HxCDF            | 0.100  | ND             | <14                 | 1000           | 1200                | 1100                | 340 - 1560                               |
| 2,3,4,6,7,8-HxCDF            | 0.100  | ND             | <27                 | 1000           | 1200                | 1200                | 480 - 1350                               |
| 1,2,3,7,8,9-HxCDF            | 0.100  | ND             | <3.7                | 1000           | 1200                | 1200                | 390 - 1260                               |
| Total HxCDF                  | -      | ND             | 27                  | ND             | 4600                | 4500                | -                                        |
| 1,2,3,4,6,7,8-HpCDF          | 0.010  | 10000          | 5000                | 1500           | 1500                | 1200                | 520 - 2010                               |
| 1,2,3,4,7,8,9-HpCDF          | 0.010  | ND             | <3.4                | 1500           | 1500                | 1200                | 250 - 1980                               |
| Total HpCDF                  | -      | ND             | 5000                | ND             | 3000                | 2400                | -                                        |
| OCDF                         | 0.0001 | ND             | <4.3                | 2500           | 3000                | 2000                | 1170 - 3330                              |

**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

<sup>1</sup> 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: 2108342

PE

Lot-Sample #...: G2G240279 - 020  
 Date Sampled...: 07/22/02  
 Prep Date.....: 07/31/02  
 Prep Batch #...: 2212455

Work Order #...: E48XA1AC  
 Date Received...: 07/24/02  
 Analysis Date...: 08/11/02  
 Dilution Factor: 1

Matrix....: SOLID  
 Instrument: 6D5  
 Units.....: pg/g  
 % Moisture: 0.0

| PARAMETER               | RESULT    | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|-----------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | 470 E     | 1.0                | 1             | 470.000000           |
| Total TCDD              | 470       | 1.0                |               |                      |
| 1,2,3,7,8-PeCDD         | 940       | 5.0                | 1             | 940.000000           |
| Total PeCDD             | 940       | 5.0                |               |                      |
| 1,2,3,4,7,8-HxCDD       | 810       | 5.0                | 0.1           | 81.000000            |
| 1,2,3,6,7,8-HxCDD       | 940       | 5.0                | 0.1           | 94.000000            |
| 1,2,3,7,8,9-HxCDD       | 1000      | 5.0                | 0.1           | 100.000000           |
| Total HxCDD             | 2800      | 5.0                |               |                      |
| 1,2,3,4,6,7,8-HpCDD     | 1300      | 5.0                | 0.01          | 13.000000            |
| Total HpCDD             | 1400      | 5.0                |               |                      |
| OCDD                    | 3500 D    | 200                | 0.0001        | 0.350000             |
| 2,3,7,8-TCDF            | 440 CON E | 1.0                | 0.1           | 44.000000            |
| Total TCDF              | 450       | 1.0                |               |                      |
| 1,2,3,7,8-PeCDF         | 920       | 5.0                | 0.05          | 46.000000            |
| 2,3,4,7,8-PeCDF         | 820       | 5.0                | 0.5           | 410.000000           |
| Total PeCDF             | 1800      | 5.0                |               |                      |
| 1,2,3,4,7,8-HxCDF       | 940       | 5.0                | 0.1           | 94.000000            |
| 1,2,3,6,7,8-HxCDF       | 1100      | 5.0                | 0.1           | 110.000000           |
| 2,3,4,6,7,8-HxCDF       | 1200      | 5.0                | 0.1           | 120.000000           |
| 1,2,3,7,8,9-HxCDF       | 1200      | 5.0                | 0.1           | 120.000000           |
| Total HxCDF             | 4500      | 5.0                |               |                      |
| 1,2,3,4,6,7,8-HpCDF     | 1200      | 5.0                | 0.01          | 12.000000            |
| 1,2,3,4,7,8,9-HpCDF     | 1200      | 5.0                | 0.01          | 12.000000            |
| Total HpCDF             | 2400      | 5.0                |               |                      |
| OCDF                    | 2000      | 10                 | 0.0001        | 0.200000             |
| Total TEQ Concentration |           |                    |               | 2,666.550000         |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 84                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 89                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 77                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 95                  | 40 - 135           |
| 13C-OCDD                | 94                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 83                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 97                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 65                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 84                  | 40 - 135           |

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US EPA ARCHIVE DOCUMENT

LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108342

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.                                                |
| D   | Result was obtained from the analysis of a dilution.                  |
| E   | Estimated result. Result concentration exceeds the calibration range. |

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## LOUREIRO ENGINEERING ASSOCIATES, P.C.

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: 2108323

Lot-Sample #...: G2G240279 - 007  
 Date Sampled...: 07/22/02  
 Prep Date...: 07/26/02  
 Prep Batch #...: 2207466

Work Order #...: E48TE1AA  
 Date Received...: 07/24/02  
 Analysis Date...: 08/01/02  
 Dilution Factor: 1

Matrix...: WATER  
 Instrument: 8D5  
 Units...: pg/L  
 % Moisture:

| PARAMETER               | RESULT | DETECTION<br>LIMIT | TEF<br>FACTOR | TEQ<br>CONCENTRATION |
|-------------------------|--------|--------------------|---------------|----------------------|
| 2,3,7,8-TCDD            | ND     | 0.29               | 1             | 0                    |
| Total TCDD              | ND     | 0.44               |               | 0                    |
| 1,2,3,7,8-PeCDD         | ND     | 0.45               | 1             | 0                    |
| Total PeCDD             | ND     | 0.64               |               | 0                    |
| 1,2,3,4,7,8-HxCDD       | ND     | 0.35               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDD       | ND     | 0.39               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDD       | ND     | 0.33               | 0.1           | 0                    |
| Total HxCDD             | ND     | 1.3                |               | 0                    |
| 1,2,3,4,6,7,8-HpCDD     | ND     | 1.1                | 0.01          | 0                    |
| Total HpCDD             | ND     | 1.1                |               | 0                    |
| OCDD                    | ND     | 6.6                | 0.0001        | 0                    |
| 2,3,7,8-TCDF            | ND     | 0.30               | 0.1           | 0                    |
| Total TCDF              | ND     | 0.30               |               | 0                    |
| 1,2,3,7,8-PeCDF         | ND     | 0.29               | 0.05          | 0                    |
| 2,3,4,7,8-PeCDF         | ND     | 0.29               | 0.5           | 0                    |
| Total PeCDF             | ND     | 0.38               |               | 0                    |
| 1,2,3,4,7,8-HxCDF       | ND     | 0.68               | 0.1           | 0                    |
| 1,2,3,6,7,8-HxCDF       | ND     | 0.32               | 0.1           | 0                    |
| 2,3,4,6,7,8-HxCDF       | ND     | 0.33               | 0.1           | 0                    |
| 1,2,3,7,8,9-HxCDF       | ND     | 0.34               | 0.1           | 0                    |
| Total HxCDF             | ND     | 0.68               |               | 0                    |
| 1,2,3,4,6,7,8-HpCDF     | ND     | 0.62               | 0.01          | 0                    |
| 1,2,3,4,7,8,9-HpCDF     | ND     | 0.24               | 0.01          | 0                    |
| Total HpCDF             | ND     | 0.62               |               | 0                    |
| OCDF                    | ND     | 2.7                | 0.0001        | 0                    |
| Total TEQ Concentration |        |                    |               | 0                    |

| INTERNAL STANDARDS      | PERCENT<br>RECOVERY | RECOVERY<br>LIMITS |
|-------------------------|---------------------|--------------------|
| 13C-2,3,7,8-TCDD        | 92                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDD     | 79                  | 40 - 135           |
| 13C-1,2,3,6,7,8-HxCDD   | 94                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDD | 77                  | 40 - 135           |
| 13C-OCDD                | 81                  | 40 - 135           |
| 13C-2,3,7,8-TCDF        | 88                  | 40 - 135           |
| 13C-1,2,3,7,8-PeCDF     | 74                  | 40 - 135           |
| 13C-1,2,3,4,7,8-HxCDF   | 85                  | 40 - 135           |
| 13C-1,2,3,4,6,7,8-HpCDF | 81                  | 40 - 135           |

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**LOUREIRO ENGINEERING ASSOCIATES, P.C.**

**Dioxins/Furans, HRGC/HRMS (8290)**

**Client Sample ID: 2108323**

**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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