

CENPS-OP-DMMO

MEMORANDUM FOR RECORD

6 April 1994

SUBJECT: DETERMINATION OF THE SUITABILITY OF DREDGED MATERIAL TESTED FOR THE PORT OF GRAYS HARBOR TERMINAL 2 MAINTENANCE DREDGING (OYB-2-011037) FOR DISPOSAL AT EITHER THE SOUTH JETTY OR POINT CHEHALIS ESTUARINE OPEN WATER DISPOSAL SITES.

1. The Port of Grays Harbor proposes to maintenance dredge up to 60,000 cubic yards of material at its Terminal 2 facility at Aberdeen, Washington. The following summary reflects the consensus determination of the agencies' (Corps of Engineers, Department of Ecology, Department of Natural Resources and the Environmental Protection Agency) with jurisdiction over dredging and disposal on the acceptability of the sampling plan and all relevant test data to make a determination of suitability for the disposal of the material at the South Jetty or Point Chehalis open water disposal sites.
2. The ranking for the project area was "moderate", based on the guidance provided in the "Interim Evaluation Guidelines for Testing Sediments Proposed for Dredging from Regulated Projects In Grays Harbor and Willapa Bay" for Terminal 2. Sampling and testing for sediments at Terminal 2 took place in 1989 and 1992. Testing for dioxins/furans was completed in 1992. In both instances, the material was found suitable for open-water disposal.
3. A sampling and analysis plan was developed for this project and approved by the regulatory agencies on 31 January 1994. Sampling was conducted on 2 February 1994.
4. Due to the homogenous nature of the sediment, the agencies determined that grab samples would be adequate to characterize the material. Based on the interim guidelines, one grab sample was required for each 4,000 cubic yards, and one analysis required for each 20,000 cubic yards. Grab samples were taken from five locations for each composite, and were analyzed for 58 chemicals of concern. One randomly selected composite was analyzed for dioxins/furans.
5. Concurrent chemical and biological testing was planned due to a proposed dredging date in March 1994. When this schedule changed and dredging was delayed until June, the decision to pursue tiered testing was made by the Port, with the concurrence of the regulatory agencies. However, the 20-day *Neanthes* test had already been initiated, and this biological test was completed.
6. The chemistry data indicated that no detected exceedances of the Dredging Year 1994 PSDDA screening levels (SL) occurred. There were no detection limits reported above SL.
7. One dioxin analysis was completed on composited sediment from five grab sample locations. Testing was completed by Twin City Testing utilizing EPA method 8290. These data are summarized in Table 1. Results indicated that 2,3,7,8 TCDD (Tetrachloro-Dibenzo-p-Dioxin) was detected at 1.9 parts per trillion. This congener is regarded by EPA as the most toxic form of dioxin. A few other less toxic dioxin congeners were detected at low parts per trillion concentrations. In the following table, the toxicity equivalence in terms of 2,3,7,8-TCDD is shown for the most toxic congeners of dioxin.
8. One way to summarize potential toxicity for mammals is to calculate the toxicity equivalent concentrations (TEC) measured in tissue. Total TEC is calculated by multiplying the toxicity

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Terminal 2 (OYB-2-011037)

equivalent factor (TEF) by the congener specific concentration and summing the TEC's for all congeners. Total TEC comparisons are usually used for food ingestion, and have limited applicability to sediment because TEC does not consider the relative bioavailability of the congeners. Accordingly, TEC overstates toxicity to mammals when applied to sediments. TEC as a toxicity measure does not apply to fish, shellfish or birds. For comparison purposes only, the TEC totaled 5.87 parts per trillion for all congeners of dioxin quantified by EPA method 8290.

9. Based on the agencies' present best professional judgement, these low concentrations are unlikely to be environmentally harmful for this project. The agencies' consensus is that the material is suitable for open-water disposal relative to the dioxin test results.

10. In summary, agency approved protocols and procedures were followed, and quality assurance, quality control guidelines specified by the regulatory agencies were generally complied with. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the Grays Harbor/Willapa Bay interim guidelines. Based on the results of the chemical testing, the agencies conclude that up to 60,000 cubic yards of proposed dredged material are suitable for unconfined open-water disposal at the Point Chehalis or South Jetty disposal sites.

Concur:

5/11/94
Date

4/14/94
Date

4/25/94
Date

4/26/94
Date

5/2/94
Date

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Table 1

| Native Congeners | Concentration (ppt) | TEF | TEC (ppt) |
|---------------------|---------------------|-------|-------------------|
| 2,3,7,8-TCDD | 1.9 | 1 | 1.9 |
| 1,2,3,7,8-PeCDD | 2.2 | 0.5 | 1.1 |
| 1,2,3,4,7,8-HxCDD | 0.5 U | 0.1 | 0.02 ¹ |
| 1,2,3,6,7,8-HxCDD | 3.9 | 0.1 | 0.39 |
| 1,2,3,7,8,9-HxCDD | 6 | 0.1 | 0.6 |
| 1,2,3,4,6,7,8-HpCDD | 56 | 0.01 | 0.56 |
| OCDD | 360 | 0.001 | 0.36 |
| 2,3,7,8-TCDF | 1.7 | 0.1 | 0.17 |
| 1,2,3,7,8-PeCDF | 9.9 U | 0.05 | 0.25 |
| 2,3,4,7,8-PeCDF | .67 U | 0.5 | 0.17 |
| 1,2,3,4,7,8-HxCDF | 0.75 U | 0.1 | 0.04 |
| 1,2,3,6,7,8-HxCDF | .66 U | 0.1 | 0.03 |
| 2,3,4,6,7,8-HxCDF | .95 | 0.1 | 0.10 |
| 1,2,3,7,8,9-HxCDF | 0.58 U | 0.1 | 0.03 |
| 1,2,3,4,6,7,8-HpCDF | 12 | 0.01 | 0.12 |
| 1,2,3,4,7,8,9-HpCDF | 0.72 | 0.01 | 0 |
| OCDF | 28 | 0.001 | 0.03 |
| Total | | | 5.87 |

U = below detection limit

1. TEC for undetected values is calculated by multiplying one-half the undetected concentration by the TEF.

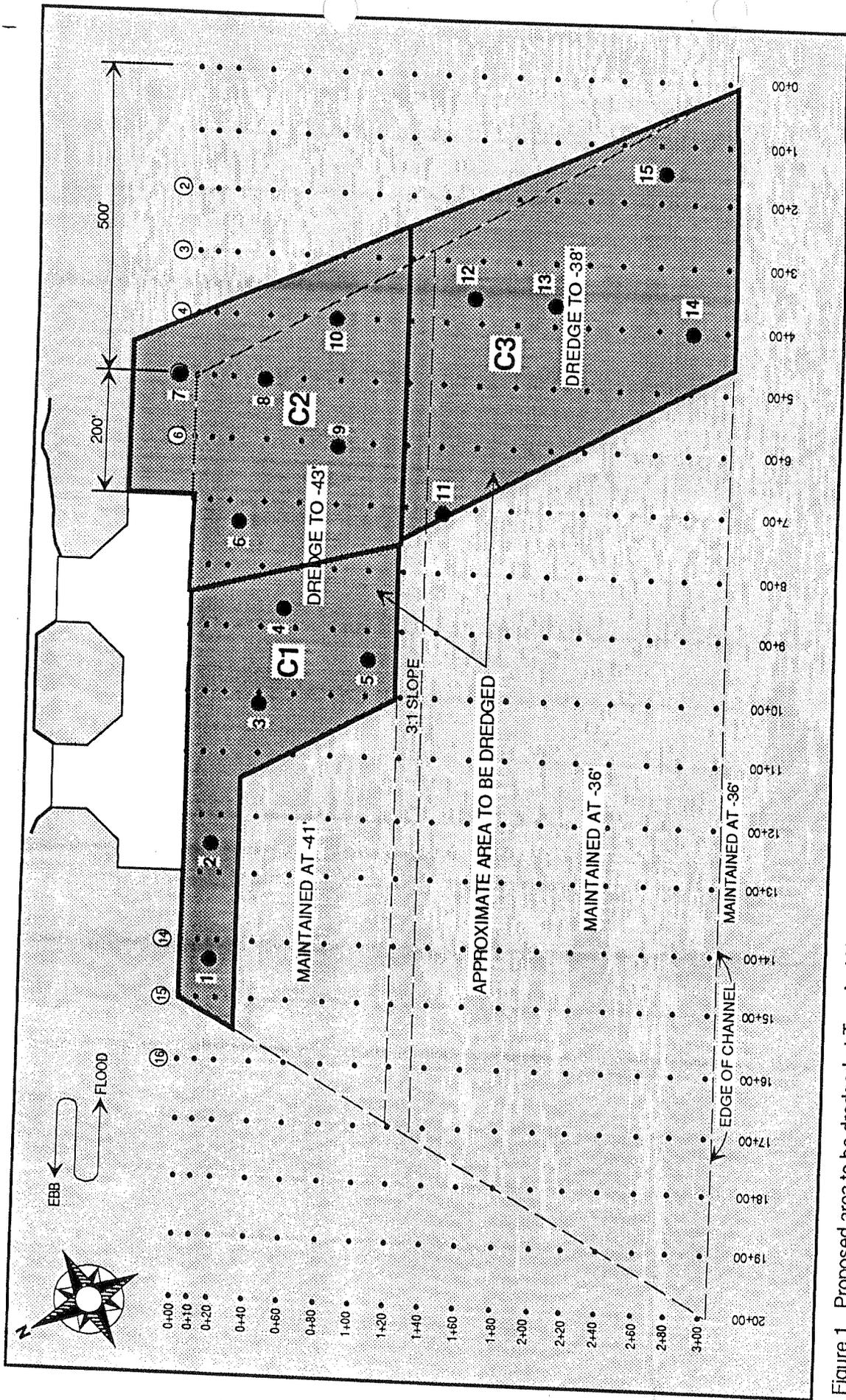


Figure 1. Proposed area to be dredged at Terminal No. 2, Port of Grays Harbor, including sampling station locations and compositing scheme. Station coordinates are provided in Table 2-1.

DAIS SUMMARY REPORTS

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DAIS Stations Summary Report

05/11/2007
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Survey: Grays Harbor, Port of, T2, DY94
 Tracking Number: PGHT21AF092

| Sampling Station | Latitude | Longitude | Station Name |
|------------------|---------------|-----------------|--------------|
| 1 | 46°57' 54.04" | 123° 51' 19.19" | Null |
| 2 | 46°57' 53.07" | 123° 51' 16.82" | Null |
| 3 | 46°57' 51.73" | 123° 51' 13.71" | Null |
| 4 | 46°57' 50.92" | 123° 51' 12.65" | Null |
| 5 | 46°57' 50.84" | 123° 51' 13.65" | Null |
| 6 | 46°57' 50.30" | 123° 51' 10.15" | Null |
| 7 | 46°57' 49.49" | 123° 51' 07.36" | Null |
| 8 | 46°57' 49.14" | 123° 51' 07.48" | Null |
| 9 | 46°57' 49.24" | 123° 51' 09.08" | Null |
| 10 | 46°57' 48.33" | 123° 51' 06.57" | Null |
| 11 | 46°57' 49.43" | 123° 51' 11.25" | Null |
| 12 | 46°57' 47.62" | 123° 51' 07.10" | Null |
| 13 | 46°57' 47.22" | 123° 51' 07.37" | Null |
| 14 | 46°57' 46.56" | 123° 51' 08.05" | Null |
| 15 | 46°57' 45.70" | 123° 51' 05.39" | Null |
| 16 | 47°00' 21.20" | 124° 05' 47.20" | GHS7 REF |
| 17 | 48°23' 00.00" | 122° 40' 00.00" | West Beach |

DAIS Lab Samples Summary Report

05/11/2007
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Survey: Grays Harbor, Port of, T2, DY94
 Tracking Number: PGHT21AF092

| Sample Id | Alias | Date | Sub Area | Sampling Rank | Stations | Depths (ft) | Sampling Method |
|-----------|----------|------------|----------|---------------|----------|-------------|-----------------|
| C1 | PGHT2-C1 | 02/02/1994 | 1 | M | 1 | 0.0-0.2 | VAN VEEN |
| | | | | | 2 | 0.0-0.2 | |
| | | | | | 3 | 0.0-0.2 | |
| | | | | | 4 | 0.0-0.2 | |
| | | | | | 5 | 0.0-0.2 | |
| C2 | PGHT2-C2 | 02/02/1994 | 1 | M | 6 | 0.0-0.2 | VAN VEEN |
| | | | | | 7 | 0.0-0.2 | |
| | | | | | 8 | 0.0-0.2 | |
| | | | | | 9 | 0.0-0.2 | |
| | | | | | 10 | 0.0-0.2 | |
| C3 | PGHT2-C3 | 02/02/1994 | 1 | M | 11 | 0.0-0.2 | VAN VEEN |
| | | | | | 12 | 0.0-0.2 | |
| | | | | | 13 | 0.0-0.2 | |
| | | | | | 14 | 0.0-0.2 | |
| | | | | | 15 | 0.0-0.2 | |

DAIS Grain Size Summary Report

05/11/2007
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Survey: Grays Harbor, Port of, T2, DY94
Tracking Number: PGHT21AF092

Analysis Method for Fine Fraction:
Grainsize Distribution Type:

| Samples | Percent Gravel >=2000 | Percent Sand 2000 to 62.5 | Percent Silt 62.5 to 3.9 | Percent Clay <3.9 | Percent Fines Total | <62.5 |
|---------|--------------------------|------------------------------|-----------------------------|----------------------|------------------------|-------|
| C1/1 | 0.5 | 23.7 | 61.0 | 14.7 | 99.9 | 75.7 |
| C2/1 | 0.0 | 15.0 | 51.8 | 16.8 | 83.6 | 68.6 |
| C3/1 | 0.9 | 29.6 | 56.4 | 0.0 | 86.9 | 56.4 |
| R1/1 | 0.6 | 67.1 | 22.7 | 0.0 | 90.4 | 22.7 |

Survey Means (Includes only the first replicate for 'S' and 'C' Samples)

Percent Gravel: 0.5
Percent Sand: 22.8
Percent Silt: 56.4
Percent Clay: 10.5
Percent Fines: 66.9

End of Report

DAIS Value Table - Dry Weight Basis

Project: PGHT21AF092

| | units | C1 | C2 | C3 |
|---------------------------------|-------|--------|--------|--------|
| SEDIMENT CONVENTIONALS | | | | |
| Total Solids | % | 42.5 | 41.2 | 45 |
| Volatile Solids | % | 5.4 | 6.7 | 6.4 |
| Total Organic Carbon | % | 2.7 | 2.5 | 2.1 |
| Ammonia | MG/KG | 0.5 | 0.7 | 0.6 |
| Total Sulfides | MG/KG | 28 | 19 | 48 |
| METALS | | | | |
| Antimony (1) | MG/KG | 0.54 | 0.33 | 0.36 |
| Arsenic | MG/KG | 8.1 | 7.5 | 6.8 |
| Cadmium | MG/KG | 0.14 | 0.14 | 0.14 |
| Copper | MG/KG | 53 | 57 | 58 |
| Lead (1) | MG/KG | 12 | 11 | 11 |
| Mercury | MG/KG | 0.02 u | 0.02 u | 0.02 u |
| Nickel | MG/KG | 26 | 30 | 32 |
| Silver | MG/KG | 0.2 | 0.15 | 0.16 |
| Zinc | MG/KG | 97 | 100 | 100 |
| LPAH | | | | |
| 2-Methylnaphthalene (1) | UG/KG | 35 u | 35 u | 30 u |
| Acenaphthene (1) | UG/KG | 35 u | 35 u | 30 u |
| Acenaphthylene (1) | UG/KG | 35 u | 35 u | 30 u |
| Anthracene (1) | UG/KG | 35 u | 35 u | 30 u |
| Fluorene (1) | UG/KG | 35 u | 35 u | 30 u |
| Naphthalene (1) | UG/KG | 35 u | 35 u | 30 u |
| Phenanthrene (1) | UG/KG | 48 | 64 | 30 u |
| Total LPAH (1) | UG/KG | 48 | 64 | 30 u |
| HPAH | | | | |
| Benzo(a)anthracene (1) | UG/KG | 35 u | 35 u | 30 u |
| Benzo(a)pyrene (1) | UG/KG | 35 u | 35 u | 30 u |
| Benzo(g,h,i)perylene (1) | UG/KG | 35 u | 35 u | 30 u |
| Benzofluoranthenes (1) | UG/KG | 35 u | 35 u | 30 u |
| Chrysene (1) | UG/KG | 35 u | 35 u | 30 u |
| Dibenzo(a,h)anthracene (1) | UG/KG | 35 u | 35 u | 30 u |
| Fluoranthene | UG/KG | 55 | 70 | 31 |
| Indeno(1,2,3-c,d)pyrene (1) | UG/KG | 35 u | 35 u | 30 u |
| Pyrene | UG/KG | 35 u | 51 | 30 u |
| Total HPAH (1) | UG/KG | 55 | 121 | 31 |
| CHLORINATED HYDROCARBONS | | | | |
| 1,2,4-Trichlorobenzene (1) | UG/KG | 11 u | 11 u | 9.1 u |
| 1,2-Dichlorobenzene (1) | UG/KG | 4 u | 4 u | 4 u |
| 1,3-Dichlorobenzene (3) | UG/KG | 4 u | 4 u | 4 u |
| 1,4-Dichlorobenzene (1) | UG/KG | 4 u | 4 u | 4 u |
| Hexachlorobenzene | UG/KG | 21 u | 21 u | 18 u |
| PHTHALATES | | | | |
| Bis(2-ethylhexyl)phthalate (1) | UG/KG | 40 | 40 | 30 u |
| Butyl benzyl phthalate (1) | UG/KG | 35 u | 35 u | 30 u |
| Di-n-butyl phthalate (1) | UG/KG | 35 u | 35 u | 30 u |

| | | | | |
|-----------------------------|-------|-------|-------|--------|
| Di-n-octyl phthalate (1) | UG/KG | 35 u | 35 u | 30 u |
| Diethyl phthalate (1) | UG/KG | 35 u | 35 u | 30 u |
| Dimethyl phthalate (1) | UG/KG | 35 u | 35 u | 30 u |
| PHENOLS | | | | |
| 2 Methylphenol (1) | UG/KG | 18 u | 18 u | 15 u |
| 2,4-Dimethylphenol (1) | UG/KG | 18 u | 18 u | 15 u |
| 4 Methylphenol (1) | UG/KG | 35 u | 35 u | 30 u |
| Pentachlorophenol | UG/KG | 88 u | 88 u | 76 u |
| Phenol (1) | UG/KG | 35 u | 35 u | 30 u |
| MISCELLANEOUS EXTRACTABLES | | | | |
| Benzoic acid (1) | UG/KG | 180 u | 180 u | 150 u |
| Benzyl alcohol (1) | UG/KG | 21 u | 21 u | 18 u |
| Dibenzofuran (1) | UG/KG | 35 u | 35 u | 30 u |
| Hexachlorobutadiene (1) | UG/KG | 28 u | 28 u | 24 u |
| Hexachloroethane (1) | UG/KG | 35 u | 35 u | 30 u |
| N-Nitrosodiphenylamine (1) | UG/KG | 21 u | 21 u | 18 u |
| VOLATILE ORGANICS | | | | |
| Ethylbenzene (1) | UG/KG | 4 u | 4 u | 4 u |
| Tetrachloroethene (1) | UG/KG | 4 u | 4 u | 4 u |
| Total Xylene (1) | UG/KG | 4 u | 4 u | 4 u |
| Trichloroethene (1) | UG/KG | 4 u | 4 u | 4 u |
| PESTICIDES AND PCBs | | | | |
| Aldrin (3) | UG/KG | 1.1 u | 1 u | 0.92 u |
| Chlordane (2) | UG/KG | 1.1 u | 1 u | 0.92 u |
| Dieldrin (3) | UG/KG | 1.4 u | 1.4 u | 1.2 u |
| Heptachlor (3) | UG/KG | 1.1 u | 1 u | 0.92 u |
| Lindane (3) | UG/KG | 1.1 u | 1 u | 0.92 u |
| Total DDT | UG/KG | 3.5 u | 3.5 u | 3 u |
| Total PCBs | UG/KG | 71 u | 70 u | 61 u |
| ORGANOMETALLICS | | | | |
| Tributyltin (porewater) (2) | UG/L | - | - | - |

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists

END OF REPORT

DAIS DIOXIN TEC REPORT

Report File: w:\daisvb\output\dioxin_tec_pght2092_007.csv
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Survey: Grays Harbor, Port of, T2, DY94
 Tracking Number: PGHT21AF092

| Sample | Congener/Isomer | Conc. | Toxic Equiv. Factor (ng/kg) | Toxic Equiv. Conc. (TEF) | (TEC) |
|--------|-----------------|-------|--------------------------------------|-----------------------------------|-------|
|--------|-----------------|-------|--------------------------------------|-----------------------------------|-------|

DIOXINS

| | | | | | |
|------|---------------------|-------|--------|-------|--|
| C1/1 | 2,3,7,8-TCDD | 1.9 | 1 | 1.9 | |
| | 1,2,3,7,8-PeCDD | 2.2 | 1 | 2.2 | |
| | 1,2,3,4,7,8-HxCDD | 0.5 u | 0.1 | 0.025 | |
| | 1,2,3,6,7,8-HxCDD | 3.9 | 0.1 | 0.39 | |
| | 1,2,3,7,8,9-HxCDD | 6 | 0.1 | 0.6 | |
| | 1,2,3,4,6,7,8-HpCDD | 56 | 0.01 | 0.56 | |
| | OCDD | 360 | 0.0003 | 0.108 | |

Subtotal for Dioxins: 5.783

FURANS

| | | | | | |
|--|---------------------|--------|--------|--------|--|
| | 2,3,4,7,8-PeCDF | 0.67 u | 0.3 | 0.1005 | |
| | 2,3,7,8-TCDF | 1.7 | 0.1 | 0.17 | |
| | 1,2,3,4,7,8-HxCDF | 0.75 u | 0.1 | 0.0375 | |
| | 1,2,3,6,7,8-HxCDF | 0.66 u | 0.1 | 0.033 | |
| | 2,3,4,6,7,8-HxCDF | 0.95 | 0.1 | 0.095 | |
| | 1,2,3,7,8,9-HxCDF | 0.58 u | 0.1 | 0.029 | |
| | 1,2,3,7,8-PeCDF | 9.9 u | 0.03 | 0.1485 | |
| | 1,2,3,4,6,7,8-HpCDF | 12 | 0.01 | 0.12 | |
| | 1,2,3,4,7,8,9-HpCDF | 0.72 u | 0.01 | 0.0036 | |
| | OCDF | 28 | 0.0003 | 0.0084 | |

Subtotal for Furans: 0.7455

Grand Total for Dioxins & Furans: 6.5285

NOTE: All concentrations with a qualifier of "u"
 have been divided by 2.

TOTAL ORGANIC CARBON

| Sample | Analyte | Conc.(%) |
|--------|----------------------|----------|
| C1/1 | Total Organic Carbon | 2.7 |
| C2/1 | Total Organic Carbon | 2.5 |
| C3/1 | Total Organic Carbon | 2.1 |
| R1/1 | Total Organic Carbon | 1.3 |

End of Report