CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD January 6, 2009

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED MAINTENANCE DREDGED MATERIAL FROM THE PORT OF SEATTLE TERMINAL 115 BERTH-1 MAINTENANCE DREDGING PROJECT (NWS-2008-01496) IN DUWAMISH RIVER, SEATTLE, WASHINGTON EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR UNCONFINED-OPEN-WATER DISPOSAL AT A DMMP NON-DISPERSIVE OPEN-WATER DISPOSAL SITE AND EVALUATING COMPLIANCE WITH WA ANTIDEGRADATION POLICY.

1. The following summary reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) on the suitability of an estimated 3,000 cy of maintenance material within the Terminal 115 berthing area (estimated dredging from -10 ft to -15 ft MLLW + 2 feet of allowable overdredge depth). The authorized project depth is -15 ft MLLW. The proposed dredged material was evaluated by the DMMP for open-water unconfined disposal at the Elliott Bay non-dispersive open-water disposal site in Seattle, Washington.

Table 1. Project Tracking Details

SAP received	November 25, 2007
SAP approved	February 14, 2008
Sampling date: Vibracorer	February 14, 2008
Final data characterization report submitted	June 20, 2008
Recency Determination: High (2 years)	February 2010
DAIS reference number:	PS115-1-A-F-264

2. This project lies within the Lower Duwamish Superfund Cleanup operational unit (see Figure 1 – Vicinity Map), and was ranked "high" for DMMP testing purposes. The Port of Seattle submitted a draft SAP for DMMP review on November 25, 2007, and the SAP was approved by DMMP agencies on February 14, 2008. Sampling was initiated on February 14, 2008, and consisted of collecting 4 vibracore samples at 4 stations (see Figure 2: plan view of sampling stations, and Figure 3: cross section of dredging prism and pier face), and compositing into 2 surface dredged material management units (DMMU's C1 and C2). Z-samples were collected at each of the 4 core stations to further evaluate the potential contamination within the expressed sediment surface following dredging consistent with the Washington State Antidegradation Policy. Z-samples were collected as follows: Z+1 foot samples were collected at all 4 core stations, and Z+2 foot samples were collected at 3 of the 4 core stations (e.g., within DMMU-C1: S1-2, and DMMU-C2: S2-1, and S2-2), and Z+3 foot samples were only collected within DMMU-C2 at both core stations (e.g., S2-1 and S2-2). The approved sampling and analysis plan was generally followed. The sampling and analysis characterization report was submitted to the DMMP agencies for review on June 20, 2008, and the DMMP agencies concluded that the quality assurance/quality control guidelines specified by the DMMP were generally complied with, and these data were deemed suitable for decision-making using best-professional-judgment.

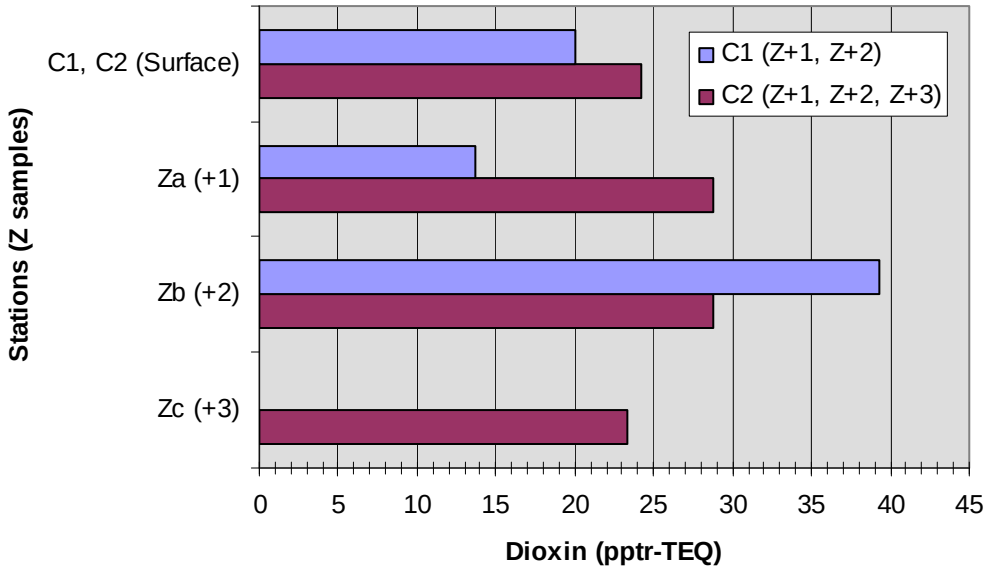
3. Chemical Analysis results for all chemicals of concern (COC) for the 2 surface DMMUs and for all Z-samples are provided in Table 2, and full congener specific dioxin testing results are summarized in Table 3. The results indicated that there were exceedances of SLs for HPAHs and total PCBs in both surface DMMUs, and detection limit exceedances for DDT. Bioaccumulation Trigger exceedances were noted in DMMU-C1 for Fluoranthene and Pyrene, and for Fluoranthene in the Z+1 subsample (e.g., ZA2) for DMMU-C1, and TBT BT exceedances were noted in the Z+1 foot sample (C2-ZA1) for DMMU-C2. Additionally, there were HPAH SL

exceedances noted in DMMU-C2, within the Z+1, Z+2, and Z+3 foot subsamples at the 2nd core station. There were dimethylphthalate SL exceedances within the DMMU-C2- Z+1 sample (ZA2), which exceeds the surface concentration, whereas bis(2-ethylhexyl)phthalate SL was exceeded for DMMU-C2. For DMMU-C1, the HPAH concentrations exceeded the ML for total HPAH, Fluoranthene, Pyrene, Benzo(a)anthracene, and total Benzofluoranthene, and ML exceedances extended to the ZA sample at core station 2 in DMMU-C1. No toxicity testing or bioaccumulation testing were performed on the two DMMUs, or on the Z-samples due to dioxin testing results summarized below.

4. Dioxin/furan concentrations within the proposed dredging areas and Z-samples analyzed are evaluated below relative to the DMMP interim dioxin framework. It should be noted that the DMMP's approach to determining suitability of dredged material containing dioxin is currently under review and expected to be revised as of the 2009 Sediment Management Annual Review Meeting (SMARM).

5. Dioxin Testing Results Summary. Table 3 provides the results of dioxin/furan testing results for the two DMMUs and Z-samples analyzed, and Figure 4 summarizes the dioxin data. The dioxin testing results show that dioxin concentrations were elevated in surface DMMU's C1 and C2 (20.1 and 24.1 pptr-TEQ, respectively), and in Z-samples (concentrations ranging from 12.9 to 39.3 pptr-TEQ), and the results were analyzed down to Z+3 foot depths below the proposed dredging surface (e.g., -15 ft MLLW + 2 ft of allowable overdredge depth), which indicates that the surface sediment quality expressed would be more contaminated than the existing pre-dredge surface for both DMMU-C1 and DMMU-C2.

Figure 4. Port of Seattle Terminal 115 Dioxin Summary



6. Dioxin Interim Interpretative Framework for Open-Water-Disposal at DMMP Non-Dispersive Sites. The DMMP agencies are currently using an interim framework for interpreting dioxin data for open-water disposal pending the development of a programmatic regulatory framework, expected sometime in 2009 (http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pagename=Dioxin_Guidelines). For open-water consideration, the interim framework involves a project specific comparison of dioxin/furan concentrations in project dredged material to the disposal site background outside the disposal site. The guidelines applicable to the Elliott Bay non-dispersive disposal site specify the following:

- Comparison of dioxin in test sediments to disposal-site background
- Background is defined using disposal site specific monitoring data, which defined an offsite maximum concentration of 12.2 pptr-TEQ, and an offsite average concentration of 8.7 pptr-TEQ
- Dioxin concentrations in any given DMMU may not exceed the site maximum (12.2 pptr-TEQ)
- Average dioxin concentrations (weighted to the volume of each DMMU cannot exceed the mean site concentration (8.7 pptr-TEQ)

7. As summarized in Table 3, both DMMUs were quantitated above the site maximum of 12.2 pptr-TEQ, and therefore, would not be suitable for unconfined-open-water disposal. Furthermore, the underlying Z-samples all exceed the site maximum of 12.2 pptr-TEQ, and were further analyzed relative to the surface DMMUs for compliance with the Washington State antidegradation policy, and indicate that the exposed surface at an elevation of -17 ft (e.g. -15 ft + 2 ft of allowable overdredge depth) would expose a sediment surface that would not be in compliance with the antidegradation policy for dioxin and also for PCBs for DMMU-C2.

8. Suitability for Unconfined-Open Water Disposal. Therefore, based on the Dioxin and non-dioxin Chemistry testing results, all 3,000 cy of proposed maintenance material is unsuitable for open-water disposal and would have to be disposed at an Ecology approved upland confined disposal site.

9. The DMMP agencies deliberated with the Port of Seattle about how to remedy the exposed surfaces following dredging, to bring the sediment surface back into compliance with the Washington State antidegradation policy. The Port agreed to place a nominal 1-foot clean sand cover of approximately 1,250 cy over the exposed sediment surface, and it is anticipated that the average thickness of the sand layer would be approximately 1.5 ft. This cover would provide an effective temporary cover to reduce the dioxin concentrations expressed after dredging at Terminal 115. However, the effectiveness of this cover will have to be re-evaluated as part of the Superfund Feasibility Study currently underway for the Lower Duwamish Waterway Superfund site. Because of the 1 to 1.5 ft cover, the Port now proposes increasing the dredging depth an additional 1.5 feet to -16.5 ft + 2 feet of allowable overdredge depth, which would make the effective maintenance dredge depth -18.5 ft, rather than the -17 feet depth initially proposed to insure an adequate Terminal depth between -17 to -17.5 feet MLLW.

10. The DMMP agencies and the City of Seattle have expressed concerns about side-slope stability of the underpier sediments immediately adjacent to the dredging area and especially the potential for sloughing of these sediments (presumed to be contaminated) back into the dredged berthing area. The Port of Seattle has agreed to address these concerns by installing a sheet pile retaining wall at the pierhead line. The sheet pile wall would extend approximately 430 linear ft, and would be located at approximately the -10 ft MLLW contour, and would extend vertically from -10 MLLW to the USACE-approved berth depth at -15 ft MLLW. The top of the wall would extend above the sediment surface approximately 2 feet in order to ensure slope stability and limit the movement of any sediment due to sloughing during and after maintenance dredging.

11. This memorandum affirms that all 3000 CY of material proposed for maintenance dredging at the Port of Seattle Terminal 115 are unsuitable for unconfined-open-water disposal at the DMMP non-dispersive disposal site in Elliott Bay. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this project must be completed as part of the final project approval process. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under Section 404(b)(1) of the Clean Water Act.

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Concur:

1/8/09
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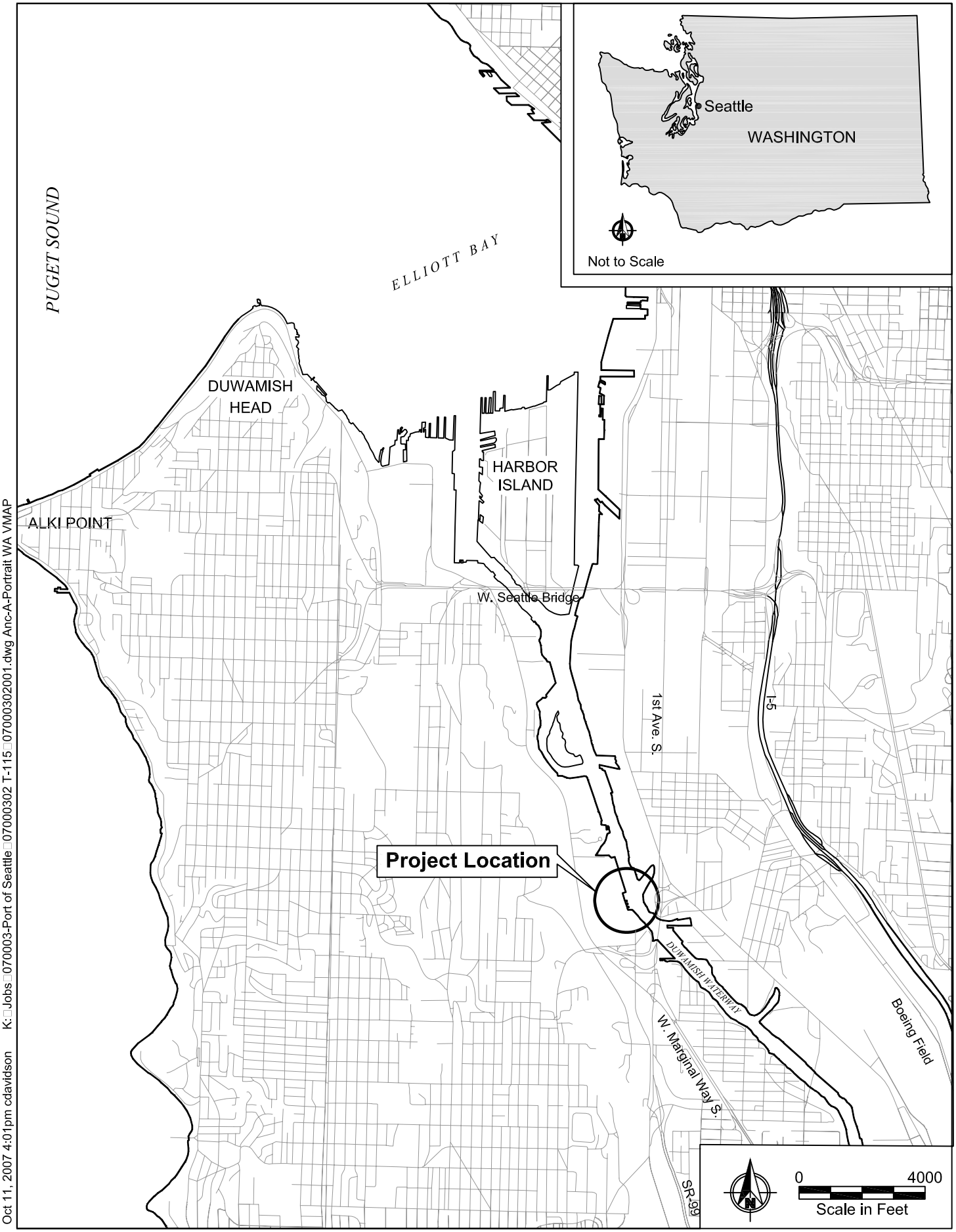


ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Vicinity Map
Terminal 115
Port of Seattle

P.O.S. TERMINAL 115

MOVEABLE LOADING RAMP. USE
2 EXIST. 70'X12' STEEL RAMPS

PIER A

PIER B

PIER C

SWD2 ▲

▲ SWD1

APPROXIMATE DAYLIGHT
(1.5:1 SIDE-SLOPES)

BASED ON
2004 SURVEY

A

A'

B

B'

DMMU-2

DMMU-1

T115-S2-02

T115-S2-01

T115-S1-01

T115-S1-02

SWD3

DUWAMISH WATERWAY
GEORGETOWN REACH

Horizontal Datum: Port of Seattle Tideland Grid.
Vertical Datum: Mean Lower Low Water (MLLW).

Proposed Dredge Cut to -15 MLLW with 12" Allowable Overdepth and 1.5:1 Side-Slopes

Contour 2007

−2.15 Spot Elevation (October 28, 2007)

T115-S1-01 ⊙ Core Sample

SWD1 ▲ Outfall

A' Cross Section Location and Designation

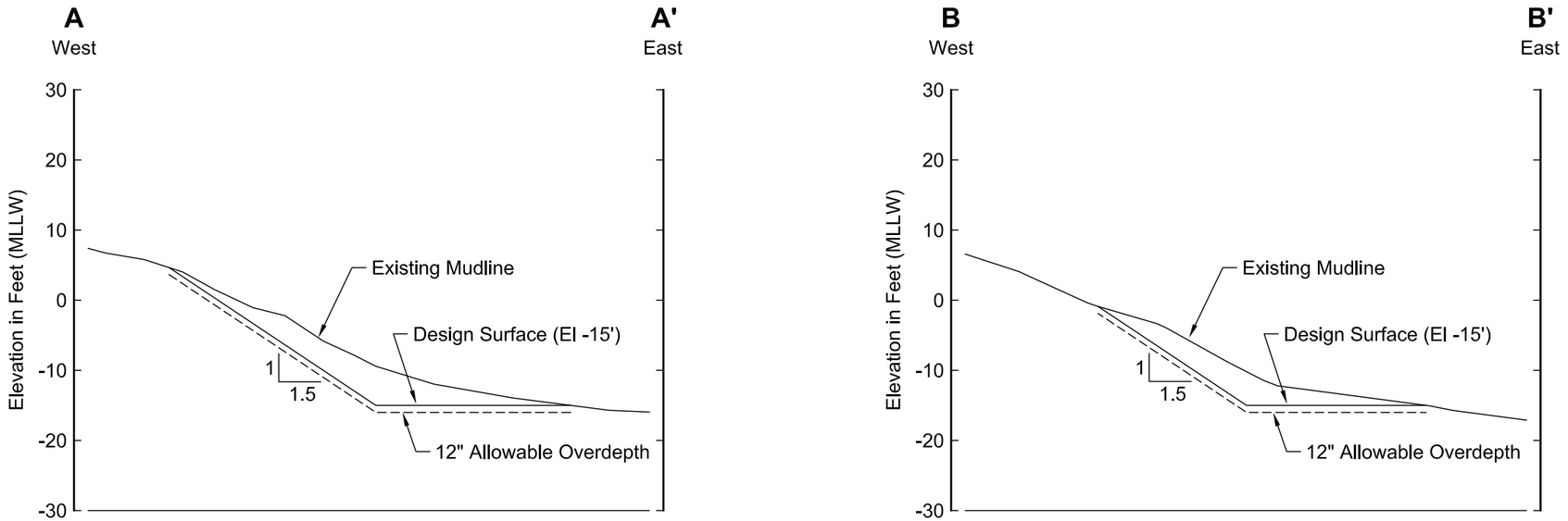
N

0 40
Scale in Feet

Nov 19, 2007 2:36pm dholmer K:\Jobs\070003-Port of Seattle\07000302 T-115\07000302002.dwg PLAN VIEW

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Ramp 1 Proposed Dredging
Port of Seattle
Terminal 115



Horizontal Datum: Port of Seattle Tideland Grid.
Vertical Datum: Mean Lower Low Water (MLLW).

0 40
Scale in Feet

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Cross Sections A-A' and B-B'
Port of Seattle
Terminal 115

Table 2
Summary of Chemical Analytical Results for DMMU Composite Samples and Z-Samples Collected at Port of Seattle Terminal 115

Sample	Dredged Material Management Program Guidelines			DMMU-C1-Surface	C1-ZA1	C1-ZA2	C1-ZB2	DMMU-C2-Surface	C2-ZA1	C2-ZB1	C2-ZC1	C2-ZA2	C2-ZB2	C2-ZC2
				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
Conventionals (mg/kg)														
Sulfide	--	--	--	3420	1220	196	--	1800	2390	--	--	2460	--	--
Conventionals (mg-N/kg)														
Ammonia	--	--	--	24	10.2	37.6	--	53.7	32.6	--	--	51.7	--	--
Conventionals (pct)														
Total organic carbon	--	--	--	2.59	2.08	1.98	1.92	1.84	2.23	1.89	5.25	1.6	5.02	3.53
Total Solids	--	--	--	53.9	69.4	55.1	66.5	53.5	69.1	78.5	78.4	61.4	60.1	68.9
Total solids (preserved)	--	--	--	48.6	75.3	53	--	62.9	61.3	--	--	57.5	--	--
Total volatile solids	--	--	--	6.87	3.32	7.34	--	7.63	4.6	--	--	6.36	--	--
Grain Size (pct)														
Gravel	--	--	--	28.6	66.6	4.3	0.8	10.6	63.2	41	45.1	3.7	22.7	25.4
Sand	--	--	--	22.7	19.8	13.9	11.2	25	21.8	38	43	31.6	43.9	51.2
Silt	--	--	--	36.6	10	61.8	62.9	48.6	9.7	15.6	8.1	50.7	24.3	16.3
Clay	--	--	--	12	3.7	19.8	25.3	15.8	5.4	5.3	3.8	14.1	9.1	7.1
Fines (Silt + Clay)	--	--	--	48.6	13.7	81.6	88.1	64.4	15.1	20.9	12	64.7	33.3	23.4
Metals (mg/kg)														
Antimony	150	--	200	10 UJ	7 UJ	9 UJ	7 U	9 UJ	20 U	20 U	20 U	8 UJ	8 U	7 U
Arsenic	57	507.1	700	10	7 U	9	8	14	20 U	20	20	13	12	12
Cadmium	5.1	11.3	14	0.6	0.4	0.5	0.3	0.7	0.8	0.9	0.6 U	0.7	0.6	0.5
Chromium	--	267	--	36	25.4	32.5	28.8	33.4	51	34	32	32.1	31.1	38.5
Copper	390	1027	1300	79.5	72.8	55.7	42.1	78.8	71.9	77.2	61.8	64.1	56.4	51.5
Lead	450	975	1200	60	46	27	18	53	133	71	71	58	68	76
Mercury	0.41	1.5	2.3	0.21	0.11	0.16	0.13	0.21	0.17	0.1	0.08	0.17	0.13	0.1
Nickel	140	370	370	30	29	29	23	26	36	27	31	35	29	32
Selenium	--	3	--	0.4	0.4	0.6	0.3 U	0.5	0.3 U	0.2 U	0.2 U	0.3 U	0.3 U	0.3 U
Silver	6.1	6.1	8.4	0.6 U	0.4 U	0.5 U	0.4 U	0.5 U	1 U	0.9 U	0.9 U	0.5 U	0.5 U	0.4 U
Zinc	410	2783	3800	155	96	115	88	188	266	213	212	172	179	195
Organometallic Compounds (µg/L)														
Tributyltin (ion)	0.15	0.15	--	0.019 U	0.03	0.019 U	--	0.024	0.19	--	--	0.019 U	--	--
LPAHs (µg/kg)														
Total LPAH [(1)]	5200	--	29000	2339	37	873	156	715	284	212	488	883 J	869	1049
Naphthalene	2100	--	2400	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	12 J	20 U	58
Acenaphthylene	560	--	1300	330	19 U	85 J	21 J	62 J	38	20 U	24	110 J	58	50
Acenaphthene	500	--	2000	79	19 U	28 J	20 UJ	28 J	20 U	20 U	35	36 J	35	81
Fluorene	540	--	3600	220	19 U	40 J	20 UJ	55 J	17 J	20 U	39	55 J	66	130
Phenanthrene	1500	--	21000	510	26	500 J	86 J	320 J	99	160	280	390 J	440	430
Anthracene	960	--	13000	1200	11 J	220 J	49 J	250 J	130	52	110	280 J	270	300
2-Methylnaphthalene	670	--	1900	20 U	19 U	9.9 J	20 UJ	20 U	20 U	20 U	20 U	11 J	20 U	20 U
HPAHs (µg/kg)														
Total HPAH	12000	--	69000	122960	588	19485 J	4138 J	10710	5278	2969	5478	11540 J	11830	15220
Fluoranthene	1700	4600	30000	47000	120	7400 J	1000 J	2400	650	330	730	2000 J	1200	1100
Pyrene	2600	11980	16000	34000	140 J	5500 J	1400 J	2900	1500	1100	1600	3300 J	4600	8500
Benzo(a)anthracene	1300	--	5100	6800	37	1200 J	360 J	800 J	400	140	370	570 J	680	740
Chrysene	1400	--	21000	16000	63	2600 J	350 J	1300	550	220	600	1600 J	1500	1300
Total Benzofluoranthenes (b, j, k) [(2)]	3200	--	9900	14200	134	1780 J	590 J	1890 J	1560	760	1390	2500 J	2400	2100
Benzo(a)pyrene	1600	--	3600	3400	49	560 J	240 J	720 J	420	260	520	820 J	940	1000
Indeno(1,2,3-cd)pyrene	600	--	4400	730	19 J	190 J	94 J	280 J	92	69	120	330 J	210	200
Dibenzo(a,h)anthracene	230	--	1900	300	19 U	85 J	21 J	130 J	47	28	48	150 J	110	110
Benzo(g,h,i)perylene	670	--	3200	530	26 J	170 J	83 J	290 J	59	62	100	270 J	190	170
Chlorinated Hydrocarbons (µg/kg)														

Table 2
Summary of Chemical Analytical Results for DMMU Composite Samples and Z-Samples Collected at Port of Seattle Terminal 115

Sample	Dredged Material Management Program Guidelines			DMMU-C1-Surface	C1-ZA1	C1-ZA2	C1-ZB2	DMMU-C2-Surface	C2-ZA1	C2-ZB1	C2-ZC1	C2-ZA2	C2-ZB2	C2-ZC2
				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
1,3-Dichlorobenzene	170	--	--	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
1,4-Dichlorobenzene	110	--	120	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
1,2-Dichlorobenzene	35	--	110	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,2,4-Trichlorobenzene	31	--	64	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Hexachlorobenzene	22	168	230	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Phthalates (µg/kg)														
Dimethylphthalate	71	--	1400	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	**77 J**	**24**	20 U
Diethylphthalate	200	--	1200	20 U	19 U	**37 J**	20 UJ	**38 J**	20 U	20 U	20 U	20 U	20 U	20 U
Di-n-butylphthalate	1400	--	5100	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	**22**	20 U	**25**	20 U
Butylbenzylphthalate	63	--	970	**13 J**	**16 J**	**17 J**	20 UJ	**45 J**	20 U	**25**	20 U	**34 J**	**27**	20 U
Bis(2-Ethylhexyl)phthalate	1300	--	8300	**410**	**150**	**260 J**	**110 J**	**6700 J**	**1000**	**490**	**920**	**1000 J**	**1300**	**490**
Di-n-octylphthalate	6200	--	6200	**13 J**	19 U	20 U	20 UJ	**42 J**	**38**	**20**	20 U	**12 J**	20 U	20 U
Phenols (µg/kg)														
Phenol	420	--	1200	30 U	19 U	**22 J**	20 UJ	**68 J**	46 U	20 U	20 U	**37 J**	**22**	**20**
2-Methylphenol	63	--	77	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	**33**
4-Methylphenol	670	--	3600	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
2,4-Dimethylphenol	29	--	210	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	400	504	690	99 U	97 U	99 U	99 UJ	99 U	99 U	**160**	99 U	99 U	99 U	98 U
Miscellaneous Extractables (µg/kg)														
Benzyl alcohol	57	--	870	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
Benzoic acid	650	--	760	200 U	190 U	200 U	200 UJ	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Dibenzofuran	540	--	1700	**41**	19 U	**20 J**	20 UJ	**22 J**	**10 J**	20 U	**25**	**27 J**	**35**	**62**
Hexachloroethane	1400	--	14000	20 U	19 U	20 U	20 UJ	20 U	20 U	20 UJ	20 UJ	20 U	20 UJ	20 UJ
Hexachlorobutadiene	29	--	270	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
n-Nitroso-di-phenylamine	28	--	130	20 U	19 U	20 U	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Volatile Organics (µg/kg)														
Trichloroethene	160	--	1600	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Tetrachloroethene	57	--	210	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Ethylbenzene	10	--	50	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
m,p-Xylene	--	--	--	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
o-Xylene	--	--	--	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Total Xylene [3]	40	--	160	2 U	1.2 U	1.8 U	--	1.9 U	1.3 U	--	--	1.3 U	--	--
Pesticides (µg/kg)														
Total DDT [4]	6.9	50	69	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	7 U
4,4'-DDD	--	--	--	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	2 U
4,4'-DDE	--	--	--	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	7 U
4,4'-DDT	--	--	--	9.9 U	3.9 U	9.9 U	2 U	9.9 U	9.9 U	2 U	2 U	9.9 U	2 U	2 U
Aldrin	10	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
Total Chlordane [5]	10	37		9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	140 U	--	--
alpha-Chlordane (cis-Chlordane)	--	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
gamma-Chlordane (trans, beta-Chlordane)	--	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
cis-Nonachlor	--	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	9.9 U	--	--
Oxychlordane	--	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	140 U	--	--
trans-Nonachlor	--	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	130 U	--	--
Dieldrin	10	--	--	9.9 U	3.9 U	9.9 U	--	9.9 U	9.9 U	--	--	9.9 U	--	--
Heptachlor	10	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--
gamma-BHC (Lindane)	10	--	--	4.9 U	1.9 U	5 U	--	5 U	4.9 U	--	--	5 U	--	--

Table 2
Summary of Chemical Analytical Results for DMMU Composite Samples and Z-Samples Collected at Port of Seattle Terminal 115

Sample	Dredged Material Management Program Guidelines			DMMU-C1-Surface	C1-ZA1	C1-ZA2	C1-ZB2	DMMU-C2-Surface	C2-ZA1	C2-ZB1	C2-ZC1	C2-ZA2	C2-ZB2	C2-ZC2
				T115-S1-CS-0803	T115-S1-01-ZA-0803	T115-S1-02-ZA-0803	T115-S1-02-ZB-0803	T115-S2-CS-0803	T115-S2-01-ZA-0803	T115-S2-01-ZB-0803	T115-S2-01-ZC-0803	T115-S2-02-ZA-0803	T115-S2-02-ZB-0803	T115-S2-02-ZC-0803
Sample Date	Screening Level	Bioaccumulation Trigger	Maximum Level	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08	3/14/08
Depth				Composite	-15.5 to -16.5 ft	-16 to -17 ft	-17 to -18 ft	Composite	-15.7 to -16.7 ft	-16.7 to -17.7 ft	-17.7 to -18.7 ft	-17.1 to -18.1 ft	-18.1 to -19.1 ft	-19.1 to -20.1 ft
PCBs (mg/kg OC)														
Total PCB	--	38	--	**5.4**	**4.1**	**6.4**	**4.1**	**9.3**	**13.3**	**14**	**3.4**	**11.4**	**6.5**	**6.6**
PCBs (µg/kg)														
Total PCB	130	--	3100	**141**	**86**	**126**	**78**	**172**	**297**	**264**	**177**	**182**	**324**	**234**
Aroclor 1016	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1221	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1232	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1242	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1248	--	--	--	**35**	20 U	**33**	20 U	**41**	**53**	**34**	20 U	**42**	**74**	**54**
Aroclor 1254	--	--	--	**63**	**46**	**55**	**44**	**77**	**94**	**90**	**67**	**68**	**100**	**90**
Aroclor 1260	--	--	--	**43**	**40**	**38**	**34**	**54**	**150**	**140**	**110**	**72**	**150 J**	**90**
Aroclor 1262	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Aroclor 1268	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Dioxin/Furans: pptr-TEQ (U = 1/2 DL)*	--	--	--	**20.1**	**12.9**	**14.5**	**39.3**	**24.1**	**32.9**	**28.2**	**23.5**	**24.6**	**29.4**	**23.1**
Bioassay Determination: (P/F)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BTs exceeded:				**yes**	no	**yes**	no	no	no	no	no	no	no	no
Bioaccumulation conducted:				no	no	no	no	no	no	no	no	no	no	no
ML Rule exceeded:				**yes**	no	**yes**	no	no	no	no	no	no	no	no
PSDDA Determination (UCOWD)				**Unsuitable**				**Unsuitable**						
Meets/exceeds WA antidegradation standards					**Meets**	**Meets**	**Exceeds**		**Exceeds**	**Exceeds**	**Exceeds**	**Exceeds**	**Exceeds**	**Exceeds**
Mean Core sampling depth				**4.6**				5.6						
Maximum sampling depth (mudline) (Z-sample)				**6.5**				6.3						
DMMU Volume (cy)				**1380**				**1620**						
DMMU-ID				**DMMU-C1-Surface**	**C1-ZA1 (Z+1)**	**C1-ZA2 (Z+1)**	**C1-ZB2 (Z+2)**	**DMMU-C2-Surface**	**C2-ZA1 (Z+1)**	**C2-ZB1 (Z+2)**	**C2-ZC1 (Z+3)**	**C2-ZA2 (Z+1)**	**C2-ZB2 (Z+2)**	**C2-ZC2 (Z+3)**

*** see Table 3 for summary of PCDD/F congeners**
NA = Not Analyzed

Detected concentration > than DMMP SL
Detected concentration > than DMMP BT
Detected concentration > than DMMP BT/ML
Detected concentration > than DMMP ML
Non-detected concentration > than DMMP SL

- - = No Guideline
Bold = Detected result
J = Estimated value
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit

(1) 2-Methylnapthalene is not included in the sum of LPAHs
(2) Benzo(j)fluoranthene is included in the total of benzo(b&k)fluoranthenes

(3) Total xylene is the sum of o-, m-, p- isomers
(4) Total DDT consists of the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT
(5) Total Chlordane includes alpha-chlordane (cis-chlordane), beta-chlordane (trans-chlordane, gamma-chlordane), cis-nonaclor, trans-nonaclor and oxychlordane.

Table 3. Dioxin Testing Summary for Terminal 115

		C1-Surface DMMU			C1-ZA1 (Z+1)			C1-ZA2 (Z+1)			C1-ZB2 (Z+2)			C2-Surface DMMU			C2-ZA1 (Z+1)			C2-ZB1 (Z+2)			C2-ZC1 (Z+3)			C2-ZA2 (Z+1)			C2-ZB2 (Z+2)			C2-ZC2 (Z+3)		
	WHO (05)	T115-S1-CS-0803 3/14/08			T115-S1-01-ZA-0803 3/14/08			T115-S1-02-ZA-0803 3/14/08			T115-S1-02-ZB-0803 3/14/08			T115-S2-CS-0803 3/14/08			T115-S2-01-ZA-0803 3/14/08			T115-S2-01-ZB-0803 3/14/08			T115-S2-01-ZC-0803 3/14/08			T115-S2-02-ZA-0803 3/14/08			T115-S2-02-ZB-0803 3/14/08			T115-S2-02-ZC-0803 3/14/08		
Analyte	TEF	Composite	LQ	TEQ	-15.5 to -16.5 ft	LQ	TEQ	-16 to -17 ft	LQ	TEQ	-17 to -18 ft	LQ	TEQ	Composite	LQ	TEQ	-15.7 to -16.7 ft	LQ	TEQ	-16.7 to -17.7 ft	LQ	TEQ	-17.7 to -18.7 ft	LQ	TEQ	-17.1 to -18.1 ft	LQ	TEQ	-18.1 to -19.1 ft	LQ	TEQ	-19.1 to -20.1 ft	LQ	TEQ
2,3,7,8-TCDD	**1**	0.724		0.724	0.605		0.605	0.486	j	0.486	0.443	j	0.443	0.614		0.614	0.894		0.894	0.649		0.649	0.485		0.485	0.659		0.659	0.619		0.619	0.456	j	0.456
1,2,3,7,8-PeCDD	**1**	2.51		2.51	2.11	j	2.11	1.47	j	1.47	1.22	j	1.22	2.53		2.53	4.14		4.14	3.24		3.24	2.61		2.61	2.69		2.69	2.44	j	2.44	1.95	j	1.95
1,2,3,4,7,8-HxCDD	**0.1**	4.53		0.453	2.88		0.288	3.08		0.308	5.02		0.502	5.07		0.507	7.47		0.747	5.72		0.572	5.1		0.51	5.37		0.537	4.91		0.491	4.29		0.429
1,2,3,6,7,8-HxCDD	**0.1**	20.6		2.06	13.9		1.39	13.4		1.34	46.8		4.68	22.1		2.21	35.9		3.59	33.7		3.37	22.3		2.23	22.1		2.21	22.3		2.23	18.4		1.84
1,2,3,7,8,9-HxCDD	**0.1**	10.6		1.06	8.51		0.851	6.46		0.646	8.27		0.827	10.9		1.09	17.8		1.78	14.1		1.41	10.9		1.09	11.9		1.19	10.8		1.08	8.59		0.859
1,2,3,4,6,7,8-HpCDD	**0.01**	615		6.15	349		3.49	532		5.32	2040		20.4	845	j	8.45	1110		11.1	1010		10.1	865		8.65	816		8.16	1130		11.3	938		9.38
OCDD	**0.0003**	5850		1.755	3110		0.933	5470		1.641	20900	j	6.27	9430	j	2.829	11200	j	3.36	9340	j	2.802	8400		2.52	10800	j	3.24	18600	j	5.58	12700	j	3.81
2,3,4,7,8-PeCDF	**0.3**	4.57		1.371	2.91		0.873	3.13		0.939	5.32		1.596	5.14		1.542	5.91		1.773	5.29		1.587	4.54		1.362	5.1		1.53	4.54		1.362	3.58		1.074
2,3,7,8-TCDF	**0.1**	1.61		0.161	1.03		0.103	1.16		0.116	1.25		0.125	1.9		0.19	2.01		0.201	1.77		0.177	1.35		0.135	1.92		0.192	1.71		0.171	1.46		0.146
1,2,3,4,7,8-HxCDF	**0.1**	9.72		0.972	5.87		0.587	5.57		0.557	8.2		0.82	10.3		1.03	10.4		1.04	7.74		0.774	7.78		0.778	9.95		0.995	8.96		0.896	6.67		0.667
1,2,3,6,7,8-HxCDF	**0.1**	3.59		0.359	2.4	j	0.24	2.06	j	0.206	3.1		0.31	3.71		0.371	5.06		0.506	4.38		0.438	4.39		0.439	4.04		0.404	3.66		0.366	2.78		0.278
2,3,4,6,7,8-HxCDF	**0.1**	5.08		0.508	3.43		0.343	3.09		0.309	5.31		0.531	5.48		0.548	7.39		0.739	7.08		0.708	6.59		0.659	5.73		0.573	5.81		0.581	4.13		0.413
1,2,3,7,8,9-HxCDF	**0.1**	10.6		1.06	5.51		0.551	6.46		0.646	8.27		0.827	10.9		1.09	17.8		1.78	14.1		1.41	10.9		1.09	11.9		1.19	10.8		1.08	8.59		0.859
1,2,3,7,8-PeCDF	**0.03**	1.54	j	0.0462	0.944	j	0.02832	0.977	j	0.02931	2.3	j	0.069	1.57	j	0.0471	2.16	j	0.0648	1.95	j	0.0585	1.49	j	0.0447	1.6	j	0.048	1.52	j	0.0456	1.25	j	0.0375
1,2,3,4,6,7,8-HpCDF	**0.01**	73.9		0.739	46.3		0.463	44.9		0.449	60.3		0.603	91.4		0.914	99.4		0.994	82.6		0.826	74.1		0.741	85.7		0.857	90.8		0.908	66.4		0.664
1,2,3,4,7,8,9-HpCDF	**0.01**	6.23		0.0623	3.77		0.0377	3.62		0.0362	3.96		0.0396	7.46		0.0746	7.52		0.0752	5.73		0.0573	6.12		0.0612	7.18		0.0718	8.34		0.0834	6.07		0.0607
OCDF	**0.0003**	242		0.0726	134		0.0402	157		0.0471	127		0.0381	363		0.1089	302		0.0906	234		0.0702	241		0.0723	313		0.0939	444		0.1332	299		0.0897
Total TEQ: (U = 1/2)				**20.1**			**12.9**			**14.5**			**39.3**			**24.1**			**32.9**			**28.2**			**23.5**			**24.6**			**29.4**			**23.0**
Total TEQ: (U = 0)				**20.1**			**12.9**			**14.5**			**39.3**			**24.1**			**32.9**			**28.2**			**23.5**			**24.6**			**29.4**			**23.0**
Total TOC, %:				**2.59**			**2.08**			**1.98**			**1.92**			**1.84**			**2.23**			**1.89**			**5.25**			**1.6**			**5.02**			**3.53**