January 2000

Eugene Delta Ponds - 206
Sediment Quality Evaluation

Abstract

The Clean Water Act (CWA) of 1977 as amended, regulates dredging and other inwater activities and requires sediment quality evaluation, including testing, prior to these activities. Guidelines to implement 40 CFR Part 230-Section 404(b)(1) regulations of the CWA, the national Inland Testing Manual (ITM) and the regional Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF) have adopted a tiered testing approach for the evaluation of dredge material. Tier IIa (physical testing) and Tier IIb (chemical testing) have been completed for this evaluation, using screening levels (SL) adopted in the DMEF.

Three (3) current sampling events are included as part of this evaluation.

On July 24-25, 2000 six (6) surface grab sediment samples were collected from the ponds and sloughs within the Eugene Delta Ponds site (Figure 1, samples 01-06). All samples were sent to Sound Analytical Services, Inc (SAS). laboratory of Tacoma, WA, for physical and chemical analyses, to include: inorganic metals (9), total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables and polynuclear aromatic hydrocarbons (PAHs). Material represented by the following samples did not meet SL guidelines of the DMEF, EDP-G-01 (Cd & Zn), EDP-G-02 (Cd) and EDP-G-05 (Benzoic Acid).

As a result, of these exceedances of the SL from the first sampling event and project options selected, additional samples were collected.

On November 29-30, 2000 six (6) additional composite samples (samples 07-12) were collected at sites identified as potential excavation for culverts, pond connections, clean fill and a Willamette River connection site. These samples were analyzed, by SAS, for the same analytes as listed above for samples 01-06. The following samples did not meet SL guidelines of the DMEF, EDP-CSG-07 (Benzyl Alcohol), EDP-CSG-10 (Phenol, Benzyl Alcohol, Benzoic Acid and Benzo (b, k) fluroanthene) and EDP-CSG-11 (Benzyl Alcohol and Benzoic Acid).

On December 6, 2000 eight (8) additional samples (samples 13-20) were collected to address the level and extent of the metals found in the July sampling event. Four (4) metals (Cd, Cr, Ag, Zn) were tested for, with SL exceedances found in EDP-P-13 (Ag, Zn), EDP-P-16 (Ag, Zn), EDP-P-17 (Ag), EDP-P-18 (Ag, Zn), EDP-P-19 (Zn), EDP-P-20 (Cd, Zn).

The project goals should still be able to be accomplished, but care needs to be taken to deal with the potential point source of contamination and identified contamination managed.

Introduction

The purpose of this report is to characterize the sediment of portions of Eugene Delta Ponds for the purpose of habitat and water quality improvement based on the sampling events described. The sampling and analysis objectives are listed below. This report will outline the procedures used to accomplish these goals.

SAMPLING AND ANALYSIS OBJECTIVES

- Characterize sediments in accordance with the regional dredge material testing manual, the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF).

- Collect, handle and analyze representative sediment, of the purposed areas of concern, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.

- Evaluate project sediments for potential environmental impact.

- Conduct physical and chemical characterization only, for this sediment evaluation, unless further characterization is needed.

Previous Studies

No previous sediment data was found from the Eugene Delta Ponds and sloughs study area. The "Scientific Natural Resource Assessment Delta Ponds – Eugene, Oregon" study conducted by Russ Fetrow Engineering, Inc. and Scientific Resources, Inc., May 17, 1998, does not include any sediment sampling data. There was insufficient data available to characterize sediment without conducting sampling and analyses.

Current Sampling Event

The Corps of Engineers, Portland District personnel collected 6 initial surface grab sediment samples (01-06) on July 24-25, 2000. Six (6) additional composite samples (samples 07-12) were collected at sites identified as potential excavation for culverts, pond connections, clean fill and a Willamette River connection site. All samples were sent to Sound Analytical Services, Inc. laboratory of Tacoma, WA, for physical and chemical analyses, to include: Inorganic metals (10), total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs). On December 6, 2000 eight (8) additional samples (samples 13-20) were collected to address the level and extent of the metals found in the July sampling event.

All samples were collected and placed on ice and shipped to Sound Analytical Services, Inc (SAS) laboratory of Tacoma, WA. Samples 01-12 were submitted for physical and chemical analyses, to include: inorganic metals (9), total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables

and polynuclear aromatic hydrocarbons (PAHs). Samples 13-20 were analyzed for metals (Cd, Cr, Ag, Zn) only.

Samples were numbered with the following convention, EDP (Eugene Delta Ponds) followed by a P = ponar or G = grab or CSG = composite surface grab, followed by the sequence number (01-20).

Samples designated with a (P = ponar) were collected from the bottom of the pond. Samples designated with a (G = grab) were collected from the bank of the pond as close to the water as possible. Samples designated with a (CSG = composite surface grab) were collected from more than one (1) location and composited into one (1) sample for analyses. Some of the samples collected with a ponar (in December) contained mostly vegetation and were high in water content (elevates reporting levels).

The laboratory conducted standard EPA accepted methods and protocol in their analyses of all samples, meeting holding times for extractions and analyses. Laboratory quality control (QC) was acceptable with minor exception flagged appropriately.

Results/Discussion

Physical and Volatile Solids: Data for these analyses (samples 01-12) are presented in Table 1. Nine (9) samples submitted were classified as "silty sand", 1 as " sandy silt" and 2 as "poorly graded sand with silt and gravel". Median grain-size for samples 01-06 is 0.24 mm, with 69.87% sand and 25.41% fines. Median grain-size for samples 07-12 is 0.71 mm, with 9.2% gravel, 75.57% sand and 18.22% fines. All samples were brown to gray in color. Volatile solids ranged from 5.76% to 52.99%.

Metals, Total Organic Carbon (TOC): Data for these analyses (samples 01-20 for metals, 01-12 for TOC) are presented in Table 2. Low levels of all metals of concern were found in most of the samples collected. The DMEF screening levels (SL) were exceeded for Cadmium (Cd) (5.1ppm SL) in samples, EDP-G-01 (9.1 ppm), EDP-G-02 (32 ppm) and EDP-G-20 (8.2). Silver (Ag) exceeded the 6.1 ppm SL in samples, EDP-P-13 (18 ppm), EDP-P-16 (11 ppm), EDP-P-17 (13 ppm) & EDP-P-18 (12 ppm). Zinc (Zn) exceeded the 410 ppm SL in samples, EDP-G-01 (3100 ppm), EDP-P-13 (520 ppm), EDP-P-16 (1100 ppm), EDP-P-18 (840 ppm), EDP-P-19 (890 ppm) and EDP-G-20 (5900 ppm). Chromium (Cr) was analyzed for in samples 13-20 (Cr was detected in the water quality tests and added to sediment analysis). No DMEF screening level has been established for Cr; levels ranged from 8.4 ppm to 160 ppm. TOC ranged from 18,000 to 160,000 ppm in samples tested (01-12).

Pesticide/PCBs, Phenols, Phthalates and Misc. Extractables: Data for these analyses (samples 01-12) are presented in Table 3. No PCBs were found at the method detection limits in any of the samples. Phenol was detected above the SL (420 ppb) in sample EDP-CSG-10 (620 ppb). Two (2) phthalates were detected at levels <40% of SL. Benzoic Acid was detected in most samples and exceeded the SL (650 ppb) in samples EDP-G-05 (1100 ppb), EDP-G-10 (2000 ppb) and EDP-G-11 (820 ppb). Benzyl Alcohol was detected in some samples and exceeded the SL (57

ppb) in samples EDP-G-07 (65 ppb), EDP-G-10 (340 ppb) and EDP-G-11 (60 ppb). DDT was detected in two (2) samples below the SL (6.9 ppb), samples EDP-G-07 (2.4 ppb), EDP-G-10 (5.4 ppb).

Benzoic Acid occurs in natural forms and is manufactured for pharmaceutical and industrial uses. Benzyl Alcohol is used as a commercial solvent (The Merck Index).

Polynuclear Aromatic Hydrocarbons (PAHs): Data for these analyses (samples 01-12) are presented in Tables 4 & 5. Five (5) of the twelve (12) samples tested for individual "low molecular weight" PAHs indicated low levels at < 1.7 % of the total low level SL (5200 ppb). "High molecular weight" PAHs were found in eight (8) of twelve (12) samples collected. Benzofluroanthenes were detected in sample EDP-CSG-10 above the SL (3200 ppb) at 10,100 ppb. Total PAHs exceeded the total high PAH total SL of 12,000 ppb at 12,684 ppb.

Fluoranthenes are produced from the pyrolytic processing of organic raw materials such as coal and petroleum at high temperatures. It is also known to occur naturally as a product of plant biosynthesis (Handbook of Toxic and Hazardous Chemicals).

Conclusion

Collection and evaluation of the sediment data was completed using guidelines from the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (DMEF). The DMEF is a regional manual developed jointly through a regional EPA, Corps, Oregon Dept. of Environmental Quality and Washington Depts. of Ecology and Natural Resources partnership. The screening levels used are those adopted for use in the DMEF, final November 1998. Any sediment represented by sample analyses that exceed the SLs is not acceptable for unconfined open inwater placement. This and other documents provide guidelines for implementing the Clean Water Act, 40 CFR 230 sec 404 (b)(1).

Areas represented by samples that have not exceeded the DMEF screening levels (SL) can be dredged or excavated and placed inwater without further characterization. In areas where SLs has been exceeded, the contaminated sediment has to be handled in a manor consistent with the Clean Water Act guidelines.

Management Options - There are several management options that can be considered for sediment represented by analyses that exceeded the screening levels of the DMEF.

Prior to project construction, determination must be made whether detected contamination is an active point source or historical contamination only. An active point source must be stopped for project to be an effective use of resources.

- Where possible, avoid dredging in the contaminated areas.

- Isolate contaminated sediment with a suitably designed cap of clean material (this can be with sediment in place or by dredging contaminated sediments and placing in suitable

area to be capped). Newly exposed surface must be left "clean". This can be accomplished by over dredging and capping with clean fill, if contamination is present throughout dredging prism.

- Place material upland (without return water). Upland placement of this material, without return water, would remove in from regulation under the Clean Water Act. The material would have to meet disposal site requirements for human health concerns.

- Further characterize sediment at the Tier III testing level of the DMEF, bioassay analyses; if sediments pass bioassay tests they are considered suitable for open inwater placement.

- Further sampling can be done as specific sites of excavation are identified (such as excavation to join ponds).

- Culvert placement - Contamination should not prevent culvert placement, as the culvert will isolate the contamination from the aquatic environment. Human health concerns would have to be evaluated, if contaminates are exposed in culvert cover (these areas can also be covered with clean fill).

The project goals should still be able to be accomplished, but care needs to be taken to deal with the potential point source of contamination and identified contamination managed.

References

1. U.S. army Corps of Engineers, Portland District, Seattle District; U.S. Environmental Protection Agency, Region 10; Oregon Department of Environmental Quality; Washington State Department of Natural Resources and Department of Ecology. 1998 Final. Dredge Material Evaluation Framework for the Lower Columbia River Management Area.

2. U. S. Environmental Protection Agency and U. S. Army Corps of Engineers. February 1998. Evaluation of Dredged Material Proposed for Discharge in Inland and Near Coastal Waters – Testing Manual, dated (referred to as the "Inland Testing Manual").

3. The Clean Water Act, 40 CFR 230 (b) (1).

4. Russ Fetrow Engineering, Inc., Scientific Resources, Inc. May 17, 1998. Scientific Natural Resource Assessment Delta Ponds – Eugene, Oregon.

5. Sittig, Marshall. 1981. Handbook of Toxic and Hazardous Chemicals. Noyes Publication, New Jersey.

6. Merck & Co. 1976. The Merck Index an Encyclopedia of Chemicals and Drugs. Rahway, New Jersey.

Table 1, Eugene Delta Ponds **Sampled July 24-25, 2000**

Physical Analysis

	Grain Size (mm)				%					
Sample I.D.	**Median**		**Mean**		**Gravel**	**Sand**	**Silt/Clay**	**Volatile solids**		
EDP-G-01	0.51		0.76		4.58	83.78	11.64		31.9	
EDP-G-02	0.51		1.73		22.54	70.56	6.90		52.99	
EDP-P-03	0.05		0.10		0.00	42.96	57.04		13.01	
EDP-G-04	0.09		0.24		1.13	57.67	41.20		6.48	
EDP-G-05	0.16		0.21		0.00	80.74	19.26		22.20	
EDP-G-06	0.13		0.15		0.20	81.85	17.95		6.74	
EDP-G-06 DUP	0.15		0.14		0.00	85.11	14.89		5.76	
Mean	0.24		0.53		4.73	69.87	25.41		22.14	
Minimum	0.05		0.10		0.00	42.96	6.90		5.76	
Maximum	0.51		1.73		22.54	85.11	57.04		52.99	

Table 1, Eugene Delta Ponds **Sampled November 29-30, 2000**

Physical Analysis

	Grain Size (mm)				%					
Sample I.D.	**Median**		**Mean**		**Gravel**	**Sand**	**Silt/Clay**	**Volatile solids**		
EDP-CSG-07	0.16		0.14		0.00	84.20	15.80		9.5	
EDP-CSG-08	0.16		0.14		0.00	75.38	24.62		6.86	
EDP-CSG-09	3.1		4.0		42.93	51.15	5.92		6.31	
EDP-CSG-10	0.22		0.33		2.14	77.72	20.14		11.38	
EDP-CSG-11	0.41		0.76		6.8	78.5	14.7		5.77	
EDP-CSG-12	0.17		0.19		0.00	68.28	31.72		10.07	
EDP-CSG-12 DUP	0.21		0.51		6.73	68.67	24.60		10.01	
Mean	0.71		0.95		9.2	75.57	33.31		8.31	
Minimum	0.16		0.14		0.00	51.15	5.92		5.77	
Maximum	3.1		4.0		42.93	84.20	31.72		11.38	

Table 2, Eugene Delta Ponds **Sampled July 24-25, 2000**

Inorganic Metals and TOC

Sample I.D.	As	Sb	Cd	Cu	Pb	Hg	Ni	Ag	Zn	TOC
	mg/kg (ppm)									
EDP-G-01	9.5 [1]	3.2 [1,2]	**9.1** [3]	90 [3]	250	<0.12	41 [3]	0.58 [1,2]	**3100** [3]	150000
EDP-G-02	0.94 [1,2]	13 [1,2]	**32** [3]	110 [3]	110	<0.22	37 [3]	5.1 [3]	310 [3]	160000
EDP-P-03	8.8 [2]	3.6 [1,2]	3.7 [2]	65 [3]	24	<0.16	50 [3]	0.69 [1,2]	130 [3]	33000
EDP-G-04	4.5 [2]	1.3 [1,2]	1.6 [2]	52 [3]	14	0.071 [1]	41 [3]	0.31 [1,2]	110 [3]	18000
EDP-G-05	0.89 [2]	1.6 [1,2]	2.5 [1,2]	41 [2]	73	<0.15	34 [3]	0.4 [1,2]	210 [3]	110000
EDP-G-06	2.6 [2]	0.71 [1,2]	1.5 [2]	35 [3]	17	0.09	33 [3]	0.24 [1,2]	100 [3]	19000
Screening level (SL)	57	150	5.1	390	450	0.41	140	6.1	410	
Mean	4.5	3.9	8.4	65.5	81.3	0.027	39.3	1.2	660	
Maximum	9.5	13	32	110	250	0.09	50	5.1	3100	

[1] = Estimated value (reported values are above the MDL, but below the PQL).

[2] = Low level contamination was present in the method blank, (analytical result is < 10 times blank concentration).

[3] = Low level contamination was present in the method blank, (analytical result is > 10 times blank concentration).

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Table 2, Eugene Delta Ponds **Sampled November 29-30, 2000 (7-12) & December 6, 2000 (13-20)**

Inorganic Metals and TOC

Sample I.D.	As	Sb	Cd	Cu	Pb	Hg	Ni	Ag	Zn	Cr	TOC
	mg/kg (ppm)										
EDP-CSG-07	6.3	0.26 J	0.69	37	13 B2	0.078	33	0.18 J	96	-	37000
EDP-CSG-08	4.3	1.1 J	0.56 J	28	9.1 B2	0.083	28	0.13 J	65	-	21000
EDP-CSG-09	4.3	0.9 J	0.69 J	32	42 B2	0.057	25	0.10 J	97	-	43000
EDP-CSG-10	4.0	0.59 J	0.46 J	38	13 B2	0.100	32	0.11 J	72	-	43000
EDP-CSG-11	5.5	0.42 J	0.55 J	31	12 B2	0.064	22	0.10 J	69	-	19000
EDP-CSG-12	5.5	0.44 J	0.95 J	36	28 B2	0.070	31	0.17 J	110	-	36000
EDP-P-13	-	-	1.0 J	-	-	-	-	**18** J,B1	**520**	28	-
EDP-G-14	-	-	0.75 J	-	-	-	-	3.4 J,B1	310	16	-
EDP-P-15	-	-	1.1 J	-	-	-	-	3.5 J,B1	360	31	-
EDP-P-16	-	-	0.82 J	-	-	-	-	**11** J,B1	**1100**	16	-
EDP-P-17	-	-	1.0 J	-	-	-	-	**13** J,B1	380	8.4	-
EDP-P-18	-	-	1.2 J	-	-	-	-	**12** J,B1	**840**	24	-
EDP-P-19	-	-	2.1 J	-	-	-	-	5.6 J,B1	**890**	21	-
EDP-G-20	-	-	**8.2**	-	-	-	-	3.0	**5900**	160	-
Screening level (SL)	57	150	5.1	390	450	0.41	140	6.1	410	*	
Mean	5.0	0.62	1.7	33.7	19.5	0.075	28.5	5.9	900.8		
Maximum	6.3	1.1	8.2	38	42	0.100	33	18	5900		

J= Estimated value (reported values are above the MDL, but below the PQL).
B1= Low level contamination was present in the method blank, indicated in parenthesis (analytical result is < 10 times blank concentration).
B2= Low level contamination was present in the method blank, indicated in parenthesis (analytical result is > 10 times blank concentration).
(-) indicates no analysis run
* SL not established
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Pesticides/PCBs, Phenols, Phthalates, Herbicides and Extractables

Sample I.D.	Pesticides				Phenols	Phthalates		Extractables	
	ug/kg (ppb)								
	4,4'-DDD	4,4'-DDE	4,4'-DDT	Total DDT	3-&4- Methyl phenol	bis(2-Ethyl) hexzyl phthalate	Butyl Benzyl phthalate	2,6-Dinitro toluene	Benzoic Acid
EDP-G-01	<0.56	<0.68	<.83	ND	630	1900	390 [1]	<51	290 [1]
EDP-G-02	<1.0	<1.5	<2.1	ND	360 [1]	260 [1]	<110	170 [1]	480 [1]
EDP-P-03	<0.79	<0.95	<1.2	ND	<150	<170	<85	140 [1]	500 [1]
EDP-G-04	<0.29	<0.35	<0.43	ND	<55	<63	<31	<26	170 [1]
EDP-G-05	<0.68	<0.82	<1.0	ND	<130	340 [1]	<73	<62	**1100**
EDP-G-06	<0.23	<0.28	<0.35	ND	<44	<51	<25	<21	64 [1]
Screen level (SL)	DDD + DDE + DDT =			6.9	670	8300	970	*	650
Mean	ND	ND	ND	ND	165	417	65	52	434
Maximum	ND	ND	ND	ND	630	1900	390	170	1100

* SL not established

PCBs = Non-detect (ND) <18.0 ppb (SL = 130 ppb).

[1] = Estimated value (reported values are above the MDL, but below the PQL).

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Pesticides/PCBs, Phenols, Phthalates, Herbicides and Extractables

Sample I.D.	Pesticides				Phenols	Phthalates			Extractables	
	ug/kg (ppb)									
	4,4'-DDD	4,4'-DDE	4,4'-DDT	Total DDT	Phenol	Di-n-butyl phthalate	bis(2-Ethyl) hexzyl phthalate	Butyl Benzyl phthalate	Benzyl Alcohol	Benzoic Acid
EDP-CSG-07	<0.15	<0.18	2.4	2.4	6.3	30	38	5.2	**65**	140
EDP-CSG-08	<0.15	<0.18	<0.22	ND	<4.5	29	5.6	<2.1	<4.3	19
EDP-CSG-09	<0.16	<0.19	<0.24	ND	<4.5	<15	<4.3	<2.1	54	<1.6
EDP-CSG-10	<0.17	<0.2	5.2	5.2	**620**	<15	68	<2.1	**340**	**2000**
EDP-CSG-11	<0.14	<0.17	<0.21	ND	88	<15	<4.3	<2.1	**60**	**820**
EDP-CSG-12	<0.15	<0.17	<0.22	ND	<4.5	44	<4.3	17	<4.3	<1.6
Screen level (SL)	DDD + DDE + DDT =			6.9	420	420	8300	970	57	650
Mean				1.3	120	17.2	111.6	22.3	86.5	496.5
Maximum				5.4	620	44	68	17	340	2000

PCBs = Non-detect (ND) <18.0 ppb (SL = 130 ppb).

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Polynuclear Aromatic Hydrocarbons (PAHs)

Low Molecular Weight Analytes

ug/kg (ppb)

Sample I.D.	Acenapththene	Acenaphthylene	Anthracene	Fluorene	2-Methyl napthalene	Naphthalene	Phenanthrene	Total Low PAHs
EDP-G-01	<29	<33	<39	<33	<58	<80	<27	ND
EDP-G-02	<53	<61	<73	<61	<110	<150	<50	ND
EDP-P-03	<40	<47	<56	<47	<82	<110	<38	ND
EDP-G-04	<15	<17	<20	<17	<30	<41	<14	ND
EDP-G-05	<35	<40	<48	<40	<71	<98	<33	ND
EDP-G-06	<12	<14	<16	<14	<24	<33	<11	ND
Screen level (SL)	500	560	960	540	670	2100	1500	5200
Mean	ND	ND	ND	ND	ND	ND	ND	ND
Maximum	ND	ND	ND	ND	ND	ND	ND	ND

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Polynuclear Aromatic Hydrocarbons (PAHs)

Low Molecular Weight Analytes

ug/kg (ppb)

Sample I.D.	Acenapththene	Acenaphthylene	Anthracene	Fluorene	2-Methyl napthalene	Naphthalene	Phenanthrene	Total Low PAHs
EDP-CSG-07	15	<4.0	3	<1.0	2.5	3	7.1	30.6
EDP-CSG-08	10	<4.0	3.8	<1.0	<1.8	<2.5	3.5	17.3
EDP-CSG-09	<0.87	<4.0	<1.3	<1.0	5.7	7.7	<0.81	13.4
EDP-CSG-10	<0.87	<4.0	<1.3	<1.0	<1.8	<2.5	<0.81	ND
EDP-CSG-11	<0.87	<4.0	<1.3	<1.0	<1.8	<2.5	1.2	1.2
EDP-CSG-12	12	<4.0	2.7	<1.0	2.2	<2.5	7.1	24
Screen level (SL)	500	560	960	540	670	2100	1500	5200
Mean	6.2	ND	1.6	ND	1.7	1.8	3.2	Total
Maximum	15	ND	3.8	ND	5.7	7.7	7.1	86.5

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)

Polynuclear Aromatic Hydrocarbons (PAHs)

High Molecular Weight Analytes

ug/kg (ppb)

Sample I.D.	Benzo(a) anth racene	Benzo(b) fluro anthene	Benzo(k) fluro anthene	Benzo(g,h,i) perylene	Chrysene	Pyrene	Benzo(a) pyrene	Dibenz(a,h) anthracene	Indeno (1,2,3-cd) pyrene	Fluoran thene	Total High PAHs
EDP-G-01	<26	89		<12	89	140	<34	<19	<30	<26	318
EDP-G-02	<48	<50		<23	<63	<43	<62	<35	<56	<48	ND
EDP-P-03	<37	<38		<17	<48	140	<48	<27	<43	<37	140
EDP-G-04	<13	<14		<6.2	<17	<12	<17	<9.6	<16	<13	ND
EDP-G-05	160	270		<15	140	280	170	<23	130	220	1370
EDP-G-06	<9.5	<11		<5	<14	<9.5	<14	<7.8	<13	<11	ND
Screen level (SL)	1300	3200		670	1400	2600	1600	230	600	1700	12000
Mean	26.7	59.8		ND	38.2	93.3	28.3	ND	21.7	36.7	Sub-total
Maximum	160	270		ND	140	280	170	ND	130	220	1688

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).

Polynuclear Aromatic Hydrocarbons (PAHs)

High Molecular Weight Analytes

ug/kg (ppb)

Sample I.D.	Benzo(a) anth racene	Benzo(b) fluro anthene	Benzo(k) fluro anthene	Benzo(g,h,i) perylene	Chrysene	Pyrene	Benzo(a) pyrene	Dibenz(a,h) anthracene	Indeno (1,2,3-cd) pyrene	Fluoran thene	Total High PAHs
EDP-CSG-07	29	31.9		16	28	46	<1.0	<0.59	19	23	192.9
EDP-CSG-08	22	20.8		8.6	21	37	14	<0.59	7.6	27	158
EDP-CSG-09	<0.87	<0.91		<0.41	<1.1	22	<1.1	<0.59	<1.0	<0.87	22
EDP-CSG-10	<0.87	**10,100**		<0.41	<1.1	<0.77	<1.1	<0.59	<1.0	<0.87	**10,100**
EDP-CSG-11	<0.87	<0.91		<0.41	<1.1	<0.77	<1.1	<0.59	<1.0	<0.87	ND
EDP-CSG-12	28	47		<0.41	41	45	26	<0.59	<1.0	24	211
Screen level (SL)	1300	3200		670	1400	2600	1600	230	600	1700	12000
Mean	13	1700		4.1	15	25	6.7	ND	4.4	12.3	Total for 12 Samples
Maximum	29	10,100		16	41	46	14	ND	19	27	**12,372**

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).

Figure 1, Eugene Delta Pond

Sampled July 24-25 (01-06), November 29-30 (07-12) & December 6 (13-20), 2000

Sample Site Locations