

**Yaquina Bay
and
South Beach Marina
Sediment Sampling Evaluation**

Abstract

This evaluation was conducted following procedures set forth in the Inland Testing Manual (ITM) and the Ocean Disposal Testing Manual (Green Book), developed jointly by the Corps and EPA to assess dredged material. Guidelines used are those developed to implement the Clean Water Act (CWA) and the Marine Protection, Research and Sanctuary Act (MPRSA). These guidelines and associated screening levels (SL) are those adopted for use in the Dredge Material Evaluation Framework (DMEF) for the Lower Columbia River Management Area, November 1998.

Nine (9) sediment samples and 1 QC duplicate were collected from Yaquina Bay and South Beach Marina (see Figures 1) on May 31, 2000. All samples were submitted for physical analyses, with 4 samples analyzed for metals (9 inorganic), total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and 3 samples submitted for organotin (TBT) analysis.

Sediment represented by samples collected during this sampling event meet the Tier II guidelines established in the DMEF for open inwater, unconfined placement without further characterization.

Introduction

This report will characterize the sediment to be dredged at Yaquina Bay and South Beach Marina for the purposes of dredging and disposal. The sampling and analysis objectives are stated in the Sampling and Analysis Plan (SAP) and are, also, 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) for evaluation of environmental impact of both the dredging and disposal events.
- Collect, handle and analyze representative sediment, of the proposed dredging prism, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.

- Conduct physical and chemical characterization only, for this sediment evaluation, unless DMEF screening levels are exceeded and further characterization (Tier III Biological Assays) is needed to determine disposal method.

Previous Studies

Previous sediment evaluation studies of the main Yaquina Bay channel were conducted in 1980, 1986, 1990, 1991 and 1995. Sediment evaluations were conducted in South Beach Marina in 1991 and 1995. The Federal Channel sediment is sandy material with the exception of the shoal in the northeast side of the turning basin, which is predominantly silt. Samples collected in the turn between river mile (RM) 1 and 2 contained gravel and shell hash. In a joint USACE/EPA 1991 sediment study TBT, phenol and 4-methylphenol were detected at levels greater than the established levels of concern in the South Beach Marina. The May 1991 study re-sampled the area of concern and subjected the samples to additional physical, chemical and bioassay analyses. Based upon the biological testing these and all other sediments of previous studies have been found suitable for open water, unconfined placement.

Current Sampling Event

Nine (9) sediment samples and 1 QC duplicate were collected from Yaquina Bay and South Beach Marina (see Figures 1). All samples were sent to Sound Analytical Services, Inc., laboratory of Tacoma, WA. Nine (9) samples were submitted for physical analyses, with 4 samples being analyzed for: metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and 3 samples submitted for organotin (TBT) (pore water method) analysis. The samples submitted for chemical analysis were from the fine-grained material areas of South Beach Marina and the southeast corner of the turning basin (RM 2.35). The 3 TBT samples were collected from South Beach Marina.

Low-level contamination was present in the method blank associated with the metals analyses. The data was flagged appropriately. The relative percent difference value for cadmium in the duplicate analysis of sample YB-BC-05 exceeded the quality control limits due to analyte levels near the practical quantitation limit. These laboratory quality control (QC) observations do not significantly effect the quality of results reported. All other QC was within the acceptable limits for all analytical methods performed.

Sediment represented by samples collected during this sampling event meet the Tier II guidelines established in the DMEF for open inwater, unconfined placement without further characterization.

Results/Discussion

Physical and Volatile Solids, (ASTM methods): Data for these analyses are presented in Table 1. Four (4) of the 9 samples submitted for analysis exceeded 20% fines and/or 5% volatile solids. Five (5) samples submitted were classified as “poorly graded sand”, 2 as “sandy silt” and 2 as “silty sand”. Median grain size for all samples is 0.15 mm, with 79.55% sand and 20.11% fines. All samples were brown to gray in color. Volatile solids ranged from 0.58% to 12.72%. Samples

collected from South Beach Marina and sample YB-BC-05 (collected from the southeast side of the shoal in the turning basin RM 2.35) were 46.08% sand (.08mm) with 10.7% volatile solids. The other five samples from the main channel and turning basin were 98.77% sand (0.19mm) with 1.3% volatile solids.

Metals (method 6020/7471), Total Organic Carbon (TOC) (method 9060) Organotin (TBT) (pore water method): Data for these analyses are presented in Table 2. Low levels of most metals analyzed for were found in all of the samples collected, but levels do not approach the SL. The highest level detected was for nickel, which is 35.7% of the SL. TOC ranged from 26,500 to 52,000 mg/kg. Organotin was not detected at the method detection limit (0.007 ppb).

Pesticide/PCBs (method 8081A), Phenols, Phthalates and Misc. Extractables (method 8270): Data for these analyses are presented in Table 3. No PCBs were found at the method detection limits (MDL). The compounds 3&4-methylphenol were detected in all samples at levels < 10% of the SL. Three (3) phthalates were detected at levels < 2% of the SL. Two extractable compounds were detected at low levels, benzoic acid at < 2% of the SL and bis(2-chloroethyl)ether at 44 ppb (no SL has been established). Total DDT and its breakdown products, DDD and DDE were not detected above the MDL. Two (2) other chlorinated pesticides (no established SL) were detected at <6.2 ppb.

Polynuclear Aromatic Hydrocarbons (PAHs) (method 8270): Data for these analyses are presented in Tables 4 & 5. Low levels of some individual “low molecular weight” PAHs were found in some samples at levels <2% of the SL. Low levels of most “high molecular weight” PAHs were found in some samples at low levels. The highest was Fluoranthene at 17.1% of the SL.

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 with regional EPA, Corps, Oregon Dept. of Environmental Quality and Washington Depts. of Ecology and Natural Resources. This document is a guideline for implementing the Clean Water Act, 40 CFR 230 sec 404 (b)(1) and for the Marine Protection, Research and Sanctuary Act (MPRSA). The screening levels used are those adopted for use in the DMEF, final November 1998. The DMEF Tiered testing approach requires that material in excess of 20% fines and greater than 5% volatile solids, as well as any material with prior history or is suspected (“reason to believe”) of being contaminated, be subjected to chemical as well as physical analyses. Under the Tiered approach, if the chemical analytical results do not exceed the established screening levels (SL), the material is considered suitable for unconfined in-water disposal. Any sediment represented by sample analyses that exceed the SLs requires additional (Tier III) evaluation prior to determining suitability for unconfined open water placement.

Sediment represented by samples collected during this sampling event meet the Tier II guidelines established in the DMEF for open inwater, unconfined placement without further characterization.

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. Turner, R. 1980 & 1986. Findings of Compliance, Dredged Material Disposal Activities, Yaquina Bay & River Federal Channel. U.S. Army Corps of Engineers, Portland District.
5. Britton J. U.S. Army Corps of Engineers, Portland District. 17 July 1990. Yaquina Bay Sediment Evaluation April 1990.
6. Britton J. U.S. Army Corps of Engineers, Portland District. October 1990. Characterization of Sediments at Yaquina Bay & Harbor. Prepared for U.S. EPA Region 10.
7. U.S. Army Corps of Engineers, Portland District. April 1985. Yaquina Bay Interim Ocean Dredged Material Disposal Site Evaluation Study.
8. U.S. Army Corps of Engineers, Portland District. 1986. Data on file in the Portland District database. No formal sediment evaluation prepared.
9. Siipola, M. U.S. Army Corps of Engineers, Portland District. July 1991. Yaquina Bay, South Beach Marina Sediment Evaluation June 1991.
10. Britton J. U.S. Army Corps of Engineers, Portland District. April 1994. Yaquina River Sediment Evaluation.
11. Britton J. U.S. Army Corps of Engineers, Portland District. August 1995. Yaquina Bay, South Beach Marina Sediment Evaluation 1995.

Physical Analysis & Volatile Solids

Sample I.D.	Grain Size (mm)				%				
	Median		Mean		Gravel	Sand	Silt/Clay	Volatile solids	
YB-BC-01	0.19		0.15		0.00	99.57	0.43		0.58
YB-BC-02	0.18		0.13		0.00	100.00	0.00		0.72
YB-BC-03	0.19		0.13		0.00	96.49	3.51		0.74
YB-BC-04	0.20		0.17		0.00	98.58	1.42		1.00
YB-BC-05	0.05		0.12		0.00	46.94	53.06		12.72
YB-BC-06	0.19		0.14		0.00	99.21	0.79		3.54
YB-GC-07	0.15		0.12		0.00	84.70	15.30		10.40
YB-GC-08	0.08		0.20		2.13	55.73	42.14		8.87
YB-BC-09	0.04		0.16		0.00	35.59	64.41		9.05
YB-BC-09 DUP	0.04		0.11		0.00	33.80	66.20		8.77
Mean	0.15		0.15		0.23	79.55	20.11		5.29
Minimum	0.05		0.11		0.00	35.59	0.00		0.72
Maximum	0.02		0.20		2.13	100.00	66.20		12.72

Inorganic Metals, TOC and TBT

Sample I.D.	As	Sb	Cd	Cu	Pb	Hg	Ni	Ag	Zn	TOC	TBT
	mg/kg (ppm)										ug/L
YB-BC-05	11 ³	0.7 ^{1,2}	0.44 ¹	30	11 ³	<0.076	47	0.23 ^{1,2}	88 ³	52000	-
YB-GC-07	5.9 ³	1.1 ^{1,2}	0.92 ¹	15	5.8 ³	<0.059	31	0.17 ^{1,2}	54 ³	41000	<0.0072
YB-GC-08	6.6 ³	1.3 ^{1,2}	0.52 ¹	23	8.1 ³	<0.061	38	0.16 ^{1,2}	83 ³	27000	<0.0061
YB-BC-09	9.3 ³	1.1 ^{1,2}	0.86 ¹	37	11 ³	<0.087	50	0.2 ^{1,2}	110 ³	27000	<0.0047
YB-BC-A	8.2 ³	1.9 ^{1,2}	1 ¹	33	10 ³	<0.078	43	0.24 ^{1,2}	95 ³	26000	-
Screening level (SL)	57	150	5.1	390	450	0.41	140	6.1	410		
Mean	8.1	1.0	0.7	25.8	8.9	ND	34.4	0.2	81.9		
Maximum	11	1.9	1.0	37	11	ND	50	0.24	110		

YB-BC-A is a blind duplicate of YB-BC-09

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

² = Low level contamination was present in the method blank (reported level was < 10 times blank concentration).

³ = Low level contamination was present in the method blank (reported level was > 10 times blank concentration).

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	beta-BHC	Lindane Gamma-BHC	3-&4-Methyl phenol	Diethyl phthalate	bis(2-Ethyl) hexzyl phthalate	Butyl Benzyl phthalate	Bis(2-Chloro ethyl) ether	Benzoic Acid
YB-BC-05	<0.27	<0.56	<1.9	ND	<0.22	2.8	42	15 ^{1,2}	18 ^{1,2}	<4.8	32	<3.6
YB-GC-07	<0.21	<0.44	<1.5	ND	<0.17	<0.21	13 ¹	8.2 ^{1,2}	54 ²	<4.8	44	8.2 ¹
YB-GC-08	<0.23	<0.49	<1.7	ND	<0.19	<0.23	12 ¹	8 ^{1,2}	75 ²	6.4 ¹	<7	<3.6
YB-BC-09	<0.28	<0.58	<2	ND	6.2	<0.28	66 ¹	8.5 ^{1,2}	23 ^{1,2}	7.8 ¹	<7	11 ¹
YB-BC-A	<0.28	<0.59	<2	ND	5.1	<0.28	14 ¹	<7	32 ^{1,2}	<4.9	<7	<3.7
Screen level (SL)	DDD + DDE + DDT = 6.9				*	*	670	1200	8300	970	*	650
Mean				ND	1.4	0.7	26.8	8.9	43.6	1	19	4.8
Maximum				ND	6.2	2.8	66	15	54	7.8	44	11

* SL not established

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

YB-BC-A is a blind duplicate of YB-BC-09

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

² = Low level contamination was present in the method blank (reported level was < 10 times blank concentration).

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.	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	2-Methyl naphthalene	Naphthalene	Phenanthrene	Total Low PAHs
YB-BC-05	<2.1	<2.5	<2.5	<2.1	<4.4	<6	22	22
YB-GC-07	10	<2.5	12	5.1	<4.4	<6	51	78.1
YB-GC-08	<2.1	<2.5	<2.5	<2.1	<4.4	<6	9.1	9.1
YB-BC-09	<2.1	<2.5	<2.5	<2.1	<4.4	<6	<2	ND
YB-BC-A	<2.1	<2.5	<2.5	<2.1	<4.4	<6	7.3	7.3
Screen level (SL)	500	560	960	540	670	2100	1500	5200
Mean	2.5	ND	3	1.3	ND	ND	21.4	28.2
Maximum	10	ND	12	5.1	ND	ND	51	78.1

YB-BC-A is a blind duplicate of YB-BC-09

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) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(g,h,i) perylene	Chrysene	Pyrene	Benzo(a) pyrene	Dibenz(a,h) anthracene	Indeno (1,2,3-cd) pyrene	Fluoranthene	Total High PAHs
YB-BC-05	7.3	17		<0.8	20	47	<2.2	<1.4	<2	83	174
YB-GC-07	40	48		22	66	140	21	<1.4	14	290	641
YB-GC-08	6.4	9.1		<0.8	14	27	<2.2	<1.4	<2	41	98
YB-BC-09	<2.1	<1.9		<0.8	14	26	<2.2	<1.4	<2	43	83
YB-BC-A	11	16		<0.8	24	13	<2.2	<1.4	<2	17	81
Screen level (SL)	1300	3200		670	1400	2600	1600	230	600	1700	12000
Mean	14.8	22.3		5.5	29.8	58.4	5.3	ND	3.5	111	215
Maximum	40	48		22	66	140	21	ND	14	290	174

YB-BC-A is a blind duplicate of YB-BC-09

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

