



**US Army Corps
of Engineers®**
Portland District

DEPOT SLOUGH (YAQUINA RIVER) SEDIMENT QUALITY EVALUATION REPORT



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**Prepared by:
Tim Sherman**

**Portland District
Corps of Engineers
CENWP-EC-HR**

EPA	Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
WDOE	Washington Department of Ecology
ODEQ	Oregon Department of Environmental Quality
WDNR	Washington Department of Natural Resources
DMEF	Dredge Material Evaluation Framework
NES	Newly Exposed Surface
QA/QC	Quality Assurance/Quality Control
TEL	Threshold Effects Level
TOC	Total Organic Carbon
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
MRL	Method Reporting Limit
TVS	Total Volatile Solids
TEF	Toxicity Equivalent Factor
TEQ	Toxicity Equivalent Quotient
ND	non-detect
pptr	parts per trillion – ng/kg
SL	Screening level
As	Arsenic
Cd	Cadmium
Ni	Nickel
Cu	Copper
Sb	Thallium
Cr	Chromium
Pb	Lead
Hg	Mercury
Ni	Nickel
Ag	Silver
Zn	Zi

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ABSTRACT

The project is located within the Yaquina River, Oregon, drainage basin, approximately 100 miles south of the Columbia River. The existing project provides for a navigation channel 10 feet deep and 150 feet wide from river mile 4 to river mile 14 with a turning basin 10 feet deep, 350 feet wide and 300 feet long. It also provides for a channel 10 feet deep and 200 feet wide and approximately 2000 feet long in Depot Slough at Toledo, Oregon (see figure 1).

This evaluation was conducted following procedures set forth in the Ocean Testing Manual and Inland Testing Manual, developed jointly by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency to assess dredged material. Guidelines used are those developed to implement the Clean Water Act and Marine Protection, Research and Sanctuaries Act. These national guidelines and associated local screening levels are those adopted for use in the regional Dredge Material Evaluation Framework (DMEF), November 1998.

A total of five (5) gravity-core sediment samples were collected along the length of the authorized channel at Depot Slough, on August 12, 2003 (see figure 2). All samples were submitted for physical analyses including total volatile solids and were, also, analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbon, dioxin/furan, and for both total and pore-water tributyltin.

The physical analyses resulted in mean values of 0.0% gravel, 4.71% sand (2.40%-6.06% range), and 95.3% silt/clay (93.94%-97.60% range), with 10.5% volatile solids (9.43%-11.85% range). Mean grain-size for all the samples is 0.042mm; this material is classified as silt.

The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF screening levels (SLs). No pesticides, PCBs, low molecular weight PAHs, or tributyltin were detected in any of the samples. Several high molecular weight PAHs, dioxin/furans and phthalates were detected, but at very low levels. Detection levels were sufficiently low enough to evaluate material proposed for dredging. The analytical results of this characterization are consistent with historical data.

Sediments represented by all samples in this sampling event are determined to be suitable for unconfined, in-water placement without further characterization.

INTRODUCTION

The sampling and analysis objectives are stated in the Sampling and Analysis Plan (SAP August 2003), and are, also, listed below. This report will characterize the sediment to be dredged and outline the procedures used to accomplish these objectives.

Sampling and Analysis Objectives

Characterize sediments in accordance with the regional dredge material-testing manual, the DMEF.



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- Gravity-core samples are planned for this sampling event. The sediment type, silt, is well suited for gravity coring and no difficulty collecting cores is anticipated.
- Collect, handle and analyze representative sediment of the proposed dredging prism, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Characterize sediments, to be dredged, for evaluation of environmental impact during disposal.
- Conduct physical and chemical characterization only, for this sediment evaluation, unless further characterization is required.

PREVIOUS STUDIES

In 1980 two (2) sediment samples were collected in Depot Slough. Physical analyses describe Depot Slough sediments as loosely compacted, very porous, with high amounts of organic material, silt and clay. The 1980 chemical report indicates that Depot Slough sediments contain insoluble heavy metals and soluble iron, manganese and phenols. When compared to the 1998 DMEF screening levels, the 1980 reported values are within acceptable levels for inwater disposal of tested material.

The 1994 sediment sampling report indicates Depot Slough material to contain a mean of 6-9% sand, 67% silt and 23-27% clay, with 12% volatile solids. Chemical analyses of the sampled material indicated material is suitable for inwater placement (1998 DMEF, Tier IIB).

On August 12, 2003, Portland District Corps of Engineers, in addition to the five (5) samples collected for Corps maintenance dredging, collected three (3) samples, which were analyzed by the Port of Toledo for their proposed dredging. All samples were submitted for physical and chemical analyses. The Port analyses include, metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs), total and pore water organotin and dioxin/furan. Some of the Ports analyses had higher than desirable detection limits, but no DMEF screening levels were exceeded in this sampling event.

CURRENT SAMPLING EVENT/DISCUSSION

A total of five (5) gravity-core sediment samples were collected along the length of the authorized channel at Depot Slough, on August 12, 2003 (see figure 2). All samples were submitted for physical analyses including total volatile solids and were, also, analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbon, dioxin/furan, and for both total and pore-water tributyltin.

The physical analyses resulted in mean values of 0.0% gravel, 4.71% sand (2.40%-6.06% range), and 95.3% silt/clay (93.94%-97.60% range), with 10.5% volatile solids (9.43%-11.85% range). Mean grain-size for all the samples is 0.042mm; this material is classified as silt.



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The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF SLs. No pesticides, PCBs, low molecular weight PAHs, or tributyltin were detected in any of the samples. Several high molecular weight PAHs, dioxin/furans and phthalates were detected, but at very low levels. Detection levels were sufficiently low enough to evaluate material proposed for dredging.

Sediments represented by all samples in this sampling event are determined to be suitable for unconfined, in-water placement without further characterization.

Gravity-core sample recovery lengths were as follows: DEPS-GC-01=56", DESP-GC-02=48", DESP-GC-03=47", DESP-GC-04=46", DESP-GC-05=45".

Table 1. Sample Location Coordinates (NAD 83, Oregon State Plane South)

DEPS-GC-01	44° 36' 57.8"	DEPS-GC-02	44° 37' 00.8"
	123° 56' 20.8"		123° 56' 16.5"
DEPS-GC-03	44° 37' 05.1"	DEPS-GC-04	44° 37' 08.4"
	123° 56' 16.8"		123° 56' 18.9"
DEPS-GC-05	44° 37' 09.2"		
	123° 56' 22.0"		

RESULTS

Physical and Volatile Solids (ASTM methods)

Five (5) samples were submitted for testing, with data presented in Table 2. All samples were classified as "silt" with 4 of the 5 samples designated "elastic silt". The physical analyses resulted in mean values of 0.0% gravel, 4.71% sand (2.40%-6.06% range), and 95.3% silt/clay (93.94%-97.60% range), with 10.5% volatile solids (9.43%-11.85% range). Mean grain-size for all the samples is 0.042mm; this material is classified as silt.

Metals (EPA method 6020/7471), Total Organic Carbon (EPA method 9060)

Five (5) samples were submitted for testing, with data presented in Table 3. The TOC ranged from 35700 to 40300 mg/kg in the samples.

Low levels of As, Cd, Cu, Pb and Zn were detected in all samples, Hg was detected in 1 sample, but no levels approach their respective DMEF SL.

Pesticides/PCBs (EPA method 8081A/8082), Phenols, Phthalates and Miscellaneous Extractables (EPA method 8270)



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Five (5) samples were submitted for pesticides/PCBs testing, with data presented in Table 4. No PCBs were found at the MDL in any of the samples. No pesticides (including DDT) were detected in any of the samples. Phthalate compound, Bis(2-Ethylhexyl) was detected, at very low levels in all the samples, with Butyl benzyl phthalate detected in 2 samples, also at very low levels. The values were well below their respective DMEF SLs. Low-level contamination was present in the method blank for Di-n-octylphthalate and Butylbenzylphthalate.

Polynuclear Aromatic Hydrocarbons (EPA method 8270C)

Five (5) samples were submitted for PAHs, with data presented in Table 5. No “low molecular weight” PAHs were detected in any of the 5 samples at low detection levels. Five (5) of the 10, “High molecular weight” PAHs analyzed, were present in most of the samples, but at levels well below screening levels. All values ranged at or below 2% of their respective SLs.

Tributyltin [Total (Bulk) & Pore-Water]

Five (5) samples were submitted for total (bulk) tributyltin and pore-water tributyltin, with data presented in Table 6. No tributyltin was detected at low detection levels.

Dioxins/Furans (Method SW846 8290)

Five (5) samples were submitted for dioxin/furans, with data presented in Table 7. Dioxin (2,3,7,8-TCDD) was not found at the MDL for any of the samples. The total toxic equivalent concentration value for the samples was well below the guidance concentration value.

CONCLUSION

Collection and evaluation of the sediment data was completed using guidelines from the DMEF. The DMEF is a regional manual developed jointly with regional EPA, Corps, Oregon Department of Environmental Quality and Washington Departments of Ecology and Natural Resources. This document is guidance for implementing the Marine Protection, Research, and Sanctuaries Act and Clean Water Act (40 CFR 230), Section 404 (b)(1). The screening levels used are those adopted for use in the DMEF, final November 1998. The DMEF uses a tiered testing approach that requires 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.

A total of five (5) gravity-core sediment samples were collected along the length of the authorized channel at Depot Slough, on August 12, 2003 (see figure 2). All samples were submitted for physical analyses including total volatile solids and were, also, analyzed for metals (9 inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbon, dioxin/furan, and for both total and pore-water tributyltin.

The physical analyses resulted in mean values of 0.0% gravel, 4.71% sand (2.4%-6.1% range), and 95.3% silt/clay (94.4%-97.6% range), with 10.5% volatile solids (9.4%-11.9% range). Mean grain-size for all the samples is 0.042mm; this material is classified as silt.



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The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF SLs. No pesticides, PCBs, low molecular weight PAHs, or tributyltin were detected in any of the samples. Several high molecular weight PAHs, dioxin/furans and phthalates were detected, but at very low levels. Detection levels were sufficiently low enough to evaluate material proposed for dredging. The analytical results of this characterization are consistent with historical data.

Sediments represented by all samples in this sampling event are determined to be suitable for unconfined, in-water placement without further characterization.



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REFERENCES

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Table 2: Physical Analysis and Volatile Solids

Sample I.D.	Grain Size (mm)		Percent			
	Median	Mean	Gravel	Sand	Silt/Clay	Volatile Solids
DEPS-GC-01	0.016	0.0394	0.00	6.06	93.94	9.43
DEPS-GC-02	0.012	0.0415	0.00	2.40	97.60	9.49
DEPS-GC-03	0.012	0.0422	0.00	4.49	95.51	11.80
DEPS-GC-04	0.014	0.0449	0.00	5.61	94.39	9.78
DEPS-GC-05	0.013	0.0435	0.00	5.01	94.99	11.85
Mean	0.013	0.0423	0.00	4.71	95.29	10.47
Minimum	1.012	0.0394	0.00	2.40	94.39	9.43
Maximum	0.016	0.0449	0.00	6.06	97.60	11.85



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Table 3: Inorganic Metals and TOC

Sample I.D.	As	Cd	Sb	Cu	Pb	Ni	Ag	Zn	Hg	TOC
	mg/kg (ppm)									
DEPS-GC-01	10	<0.609	<0.609	30.6	16	29.1	<0.609	101	<0.0249	35800
DEPS-GC-02	10.7	<0.701	<4.2	36	17	31.5	<0.701	116	<0.0265	35700
DEPS-GC-03	11	<0.663	<3.98	35.9	17.4	32.2	<0.663	118	<0.027	40300
DEPS-GC-04	10.1	<0.715	<4.29	35.9	17.1	31.2	<0.715	117	<0.0265	38300
DEPS-GC-05	10.7	<0.729	<4.37	34.8	17.6	32.2	<0.729	117	0.0313	40100
Screening level (SL)	57	5.1	150	390	450	140	6.1	410	0.41	
J = Estimated value (reported values are above the MDL, but below the PQL). Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).										



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Table 4: Pesticides, PCBs, Phenols, Phthalates & Misc. Extractable

Sample I.D.	Pesticides				Phthalates	
	µg/kg (ppb)					
	4,4'- DDD	4,4'- DDE	4,4'- DDT	Total DDT	bis(2-Ethylhexyl) phthalate	Butyl benzyl-phthalate
DEPS-GC-01	<1.36	<1.36	<1.36	ND	34.6 J B1	<40.4
DEPS-GC-02	<1.35	<1.35	<1.35	ND	37.7 J B1	<40.4
DEPS-GC-03	<1.21	<1.21	<1.21	ND	35.9 J B1	38.6 J
DEPS-GC-04	<1.44	<1.44	<1.44	ND	46.3 J B1	62.9 J
DEPS-GC-05	<1.57	<1.57	<1.57	ND	52.8 J B1	<40.4
Screening Level (SL)				6.9	8300	970

J = Estimated value (reported values are above the MDL, but below the PQL).
 B1 = 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).
 No PCB Aroclors detected at method reporting limit (MRL) < SL of 130 total PCBs.



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Table 5: Polynuclear Aromatic Hydrocarbons (PAHs) Low Molecular Weight

Polynuclear Aromatic Hydrocarbons (PAHs) Low Molecular Weight Analytes µg/kg (ppb)								
Sample I.D.	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	2-Methyl naphthalene	Naphthalene	Phen- anthrene	Total Low PAHs
DEPS-GC-01	<6.75	<6.75	<6.75	<6.75	<6.75	<6.75	<6.75	ND
DEPS-GC-02	<7.3	<7.3	<7.3	<7.3	<7.3	<7.3	<7.3	ND
DEPS-GC-03	<7.26	<7.26	<7.26	<7.26	<7.26	<7.26	<7.26	ND
DEPS-GC-04	<7.08	<7.08	<7.08	<7.08	<7.08	<7.08	<7.08	ND
DEPS-GC-05	<8.09	<8.09	<8.09	<8.09	<8.09	<8.09	<8.09	ND
Screen level (SL)	500	560	960	540	670	2100	1500	5200
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit)								



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Table 5 (cont'd): Polynuclear Aromatic Hydrocarbons (PAHs) High Molecular Weight

Polynuclear Aromatic Hydrocarbons (PAHs) High Molecular Weight Analytes µg/kg (ppb)										
Sample I.D.	Benzo(a)-anthracene	Benzo-fluoro-anthenes	Benzo-(g,h,i)-perylene	Chrysene	Pyrene	Benzo(a)-pyrene	Indeno-(1,2,3-cd)-pyrene	Dibenz(a,h)anthracene	Fluor-anthene	Total High PAHs
DEPS-GC-01	<6.75	<6.75	<6.75	<6.75	7.09 J	<6.75	<6.75	<6.75	<6.75	7.09
DEPS-GC-02	<7.3	14.5 J	<7.3	28.3	19.8	<7.3	<7.3	<7.3	15.8	78.4
DEPS-GC-03	9.5 J	12.2 J	<7.26	11.5 J	15.9	<7.26	<7.26	<7.26	17.5	66.6
DEPS-GC-04	<7.08	12.9 J	<7.08	8.2 J	14.6	<7.08	<7.08	<7.08	15.7	51.4
DEPS-GC-05	<8.09	<8.09	<8.09	<8.09	8.63 J	<8.09	<8.09	<8.09	<8.09	8.6
Screen level (SL)	1300	3200	670	1400	2600	1600	600	230	1700	12000
<p>J = Estimated value (reported values are above the MDL, but below the PQL). Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).</p>										



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Table 6: Total and Pore-water Organotin

Total & Pore-Water Tributyltin		
Sample I.D.	Total (Bulk) Tributyltin ug/kg	Pore-water Tributyltin ug/L
DEPS-GC-01	<2.55	<0.004
DEPS-GC-02	<2.71	<0.004
DEPS-GC-03	<2.71	<0.004
DEPS-GC-04	<2.59	<0.004
DEPS-GC-05	<2.9	<0.004
Screen level (SL)	73	0.15
<p>Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).</p>		



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Table 7: Dioxins/Furans (ng/kg, pptr)

Sample I.D.	Dioxin/Furan	Result	½ MDL	TEF	TEQ	Guidance*
DEPS-GC-01 - Dioxin	2,3,7,8-TCDD	<0.65	<0.33	1.0	0.33	A bulk sediment 2,3,7,8-tetrachlorodibenzo-p-dioxin concentration of 5 ng/kg, or a total toxic equivalent concentration of 15 ng/kg will trigger the requirement to perform bioaccumulation testing.
	1,2,3,7,8-PeCDD	<2.0	<1.0	0.5	0.5	
	1,2,3,4,7,8-HxCDD	<1.3	<0.65	0.1	0.065	
	1,2,3,6,7,8-HxCDD	<4.8	<2.4	0.1	0.24	
	1,2,3,7,8,9-HxCDD	<2.5	<2.5	0.1	0.25	
	1,2,3,4,6,7,8-HpCDD	79		0.01	0.79	
	OCDD	770		0.001	0.77	
	DEPS-GC-01 - Furan	2,3,7,8-TCDF	<1.7	<0.85	0.1	
1,2,3,7,8-PeCDF		<0.71	<0.36	0.05	0.018	
2,3,4,7,8-PeCDF		<0.71	<0.36	0.05	0.018	
1,2,3,4,7,8-HxCDF		<1.7	<0.85	0.1	0.085	
1,2,3,6,7,8-HxCDF		<1.1	<0.56	0.1	0.056	
2,3,4,6,7,8-HxCDF		<3.1	<1.55	0.1	0.155	
1,2,3,7,8,9-HxCDF		<0.82	<0.41	0.1	0.041	
1,2,3,4,6,7,8-HpCDF		13 J		0.01	0.13	
1,2,3,4,7,8,9-HpCDF	<0.95	<0.48	0.01	0.0048		
OCDF	37 J		0.001	0.037		
DEPS-GC-01 - Totals	Total TCDF	4.3		0	0	
	Total PeCDF	<3.7	<1.85	0	0	
	Total HxCDF	23		0	0	
	Total HpCDF	49		0	0	
	Total TCDD	3.7		0	0	
	Total PeCDD	<2.0	<1.0	0	0	
	Total HxCDD	32		0	0	
	Total HpCDD	210		0	0	
Total Dioxins/Furans TEQ					3.5748 ng/kg	<15 ng/kg

J Estimate result. Result is < reporting limit.

MDL = Method Detection Limit

TEQ = Toxicity Equivalency Quotient

TEF = Toxicity Equivalency Factors

CON = Confirmation Analysis

*Guidance = Puget Sound Dredged Disposal Analysis (PSDDA) Program (Feb 2000) and U.S. EPA Toxicity Equivalency Factors (U.S. EPA 1989; Ahlborg et al. 1994)



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Table 7 (cont'd): Dioxins/Furans (ng/kg, pptr)

Sample I.D.	Dioxin/Furan	Result	½ MDL	TEF	TEQ	Guidance*	
DEPS-GC-02 - Dioxin	2,3,7,8-TCDD	<0.84	<0.42	1.0	0.42	A bulk sediment 2,3,7,8-tetrachlorodibenzo-p-dioxin concentration of 5 ng/kg, or a total toxic equivalent concentration of 15 ng/kg will trigger the requirement to perform bioaccumulation testing.	
	1,2,3,7,8-PeCDD	<1.7	<0.85	0.5	0.425		
	1,2,3,4,7,8-HxCDD	<1.4	<0.7	0.1	0.07		
	1,2,3,6,7,8-HxCDD	<4.2	<2.1	0.1	0.21		
	1,2,3,7,8,9-HxCDD	<2.6	<1.3	0.1	0.13		
	1,2,3,4,6,7,8-HpCDD	70		0.01	0.7		
	OCDD	540		0.001	0.540		
	DEPS-GC-02 - Furan	2,3,7,8-TCDF	<0.71	<0.355	0.1		0.0355
		1,2,3,7,8-PeCDF	<0.87	<0.435	0.05		0.02175
2,3,4,7,8-PeCDF		<0.87	<0.435	0.05	0.02175		
1,2,3,4,7,8-HxCDF		<1.8	<0.9	0.1	0.09		
1,2,3,6,7,8-HxCDF		<0.71	<0.355	0.1	0.0355		
2,3,4,6,7,8-HxCDF		<0.87	<0.435	0.1	0.0435		
1,2,3,7,8,9-HxCDF		<0.99	<0.495	0.1	0.0495		
1,2,3,4,6,7,8-HpCDF		9.1 J		0.01	0.091		
1,2,3,4,7,8,9-HpCDF		<1.1	<0.55	0.01	0.0055		
OCDF	23 J		0.001	0.023			
DEPS-GC-02 - Totals	Total TCDF	<0.71		0	0		
	Total PeCDF	<2.6		0	0		
	Total HxCDF	16		0	0		
	Total HpCDF	46		0	0		
	Total TCDD	2.1		0	0		
	Total PeCDD	<2.9		0	0		
	Total HxCDD	43		0	0		
	Total HpCDD	240		0	0		
Total Dioxins/Furans TEQ					2.9125ng/kg	<15 ng/kg	
J Estimate result. Result is < reporting limit. MDL = Method Detection Limit TEQ = Toxicity Equivalency Quotient TEF = Toxicity Equivalency Factors CON = Confirmation Analysis *Guidance = Puget Sound Dredged Disposal Analysis (PSDDA) Program (Feb 2000) and U.S. EPA Toxicity Equivalency Factors (U.S. EPA 1989; Ahlborg et al. 1994)							



DEPOT SLOUGH SEDIMENT QUALITY EVALUATION

Sampled August 12, 2003

Table 7 (cont'd): Dioxins/Furans (ng/kg, pptr)

Sample I.D.	Dioxin/Furan	Result	½ MDL	TEF	TEQ	Guidance*
DEPS-GC-03 - Dioxin	2,3,7,8-TCDD	<0.58	<0.29	1.0	0.29	A bulk sediment 2,3,7,8-tetrachlorodibenzo-p-dioxin concentration of 5 ng/kg, or a total toxic equivalent concentration of 15 ng/kg will trigger the requirement to perform bioaccumulation testing.
	1,2,3,7,8-PeCDD	<1.0	<0.5	0.5	0.25	
	1,2,3,4,7,8-HxCDD	<1.1	<0.55	0.1	0.055	
	1,2,3,6,7,8-HxCDD	<5.2	<2.6	0.1	0.26	
	1,2,3,7,8,9-HxCDD	<3.6	<1.8	0.1	0.18	
	1,2,3,4,6,7,8-HpCDD	86		0.01	0.86	
	OCDD	770		0.001	0.77	
	DEPS-GC-03 - Furan	2,3,7,8-TCDF	<0.55	<0.275	0.1	
1,2,3,7,8-PeCDF		<1.2	<0.6	0.05	0.03	
2,3,4,7,8-PeCDF		<2.9	<1.45	0.05	0.0725	
1,2,3,4,7,8-HxCDF		<1.5	<0.75	0.1	0.075	
1,2,3,6,7,8-HxCDF		<1.1	<0.55	0.1	0.055	
2,3,4,6,7,8-HxCDF		<1.5	<0.75	0.1	0.075	
1,2,3,7,8,9-HxCDF		<1.1	<0.55	0.1	0.055	
1,2,3,4,6,7,8-HpCDF		17 JA		0.01	0.17	
1,2,3,4,7,8,9-HpCDF		<1.7	<0.85	0.01	0.0085	
OCDF		46		0.001	0.046	
DEPS-GC-03 - Totals	Total TCDF	<0.76		0	0	
	Total PeCDF	<4.1		0	0	
	Total HxCDF	42		0	0	
	Total HpCDF	81		0	0	
	Total TCDD	2.0		0	0	
	Total PeCDD	<3.2		0	0	
	Total HxCDD	38		0	0	
	Total HpCDD	240		0	0	
Total Dioxins/Furans TEQ				3.2795ng/kg	3.5748 ng/kg	<15 ng/kg
<p>J Estimate result. Result is < reporting limit. MDL = Method Detection Limit TEQ = Toxicity Equivalency Quotient TEF = Toxicity Equivalency Factors CON = Confirmation Analysis *Guidance = Puget Sound Dredged Disposal Analysis (PSDDA) Program (Feb 2000) and U.S. EPA Toxicity Equivalency Factors (U.S. EPA 1989; Ahlborg et al. 1994)</p>						



DEPOT SLOUGH SEDIMENT QUALITY EVALUATION

Sampled August 12, 2003

Table 7 (cont'd): Dioxins/Furans (ng/kg, pptr)

Sample I.D.	Dioxin/Furan	Result	½ MDL	TEF	TEQ	Guidance*	
DEPS-GC-04 - Dioxin	2,3,7,8-TCDD	<0.62	<0.31	1.0	0.31	A bulk sediment 2,3,7,8-tetrachlorodibenzo-p-dioxin concentration of 5 ng/kg, or a total toxic equivalent concentration of 15 ng/kg will trigger the requirement to perform bioaccumulation testing.	
	1,2,3,7,8-PeCDD	<1.7	<0.85	0.5	0.425		
	1,2,3,4,7,8-HxCDD	<0.89	<0.445	0.1	0.0445		
	1,2,3,6,7,8-HxCDD	<5.2	<2.6	0.1	0.26		
	1,2,3,7,8,9-HxCDD	<2.9	<1.45	0.1	0.145		
	1,2,3,4,6,7,8-HpCDD	78		0.01	0.78		
	OCDD	570		0.001	0.57		
	DEPS-GC-04 - Furan	2,3,7,8-TCDF	<1.0	<0.5	0.1		0.5
		1,2,3,7,8-PeCDF	<0.77	<0.385	0.05		0.01925
		2,3,4,7,8-PeCDF	<1.0	<0.5	0.05		0.025
1,2,3,4,7,8-HxCDF		<2.2	<1.1	0.1	0.11		
1,2,3,6,7,8-HxCDF		<0.98	<0.49	0.1	0.049		
2,3,4,6,7,8-HxCDF		<0.98	<0.49	0.1	0.049		
1,2,3,7,8,9-HxCDF		<1.0	<0.5	0.1	0.05		
1,2,3,4,6,7,8-HpCDF		13 J		0.01	0.13		
1,2,3,4,7,8,9-HpCDF		<1.6	<0.8	0.01	0.008		
OCDF	32		0.001	0.032			
DEPS-GC-04 - Totals	Total TCDF	<1.0		0	0		
	Total PeCDF	<2.7		0	0		
	Total HxCDF	26		0	0		
	Total HpCDF	66		0	0		
	Total TCDD	1.7		0	0		
	Total PeCDD	<1.7		0	0		
	Total HxCDD	44		0	0		
	Total HpCDD	230		0	0		
Total Dioxins/Furans TEQ					3.50675 ng/kg	<15 ng/kg	
<p>J Estimate result. Result is < reporting limit. MDL = Method Detection Limit TEQ = Toxicity Equivalency Quotient TEF = Toxicity Equivalency Factors CON = Confirmation Analysis *Guidance = Puget Sound Dredged Disposal Analysis (PSDDA) Program (Feb 2000) and U.S. EPA Toxicity Equivalency Factors (U.S. EPA 1989; Ahlborg et al. 1994)</p>							



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Table 7 (cont'd): Dioxins/Furans (ng/kg, pptr)

Sample I.D.	Dioxin/Furan	Result	½ MDL	TEF	TEQ	Guidance*
DEPS-GC-05 - Dioxin	2,3,7,8-TCDD	<0.91	<0.455	1.0	0.455	A bulk sediment 2,3,7,8-tetrachlorodibenzo-p-dioxin concentration of 5 ng/kg, or a total toxic equivalent concentration of 15 ng/kg will trigger the requirement to perform bioaccumulation testing.
	1,2,3,7,8-PeCDD	<1.3	<0.65	0.5	0.326	
	1,2,3,4,7,8-HxCDD	<6.1	<3.05	0.1	0.305	
	1,2,3,6,7,8-HxCDD	10 J		0.1	1.0	
	1,2,3,7,8,9-HxCDD	<6.9	<3.45	0.1	0.345	
	1,2,3,4,6,7,8-HpCDD	160		0.01	1.6	
	OCDD	1200		0.001	1.2	
	DEPS-GC-05 - Furan	2,3,7,8-TCDF	<1.5 CON	<0.75	0.1	
1,2,3,7,8-PeCDF		<0.81	<0.405	0.05	0.02025	
2,3,4,7,8-PeCDF		<1.1	<0.55	0.05	0.0275	
1,2,3,4,7,8-HxCDF		<2.3	<1.15	0.1	0.115	
1,2,3,6,7,8-HxCDF		<1.2	<0.6	0.1	0.06	
2,3,4,6,7,8-HxCDF		<0.84	<0.42	0.1	0.042	
1,2,3,7,8,9-HxCDF		<1.1	<0.55	0.1	0.055	
1,2,3,4,6,7,8-HpCDF		17		0.01	0.17	
1,2,3,4,7,8,9-HpCDF	<1.6	<0.8	0.01	0.008		
OCDF	40	20	0.001	0.02		
DEPS-GC-05 - Totals	Total TCDF	<1.5	0.75	0	0	
	Total PeCDF	<4.6	2.3	0	0	
	Total HxCDF	40		0	0	
	Total HpCDF	80		0	0	
	Total TCDD	17		0	0	
	Total PeCDD	22		0	0	
	Total HxCDD	100		0	0	
	Total HpCDD	400		0	0	
Total Dioxins/Furans TEQ					5.82375 ng/kg	<15 ng/kg

J Estimate result. Result is < reporting limit. CON =
MDL = Method Detection Limit
TEQ = Toxicity Equivalency Quotient
TEF = Toxicity Equivalency Factors
CON = Confirmation Analysis

*Guidance = Puget Sound Dredged Disposal Analysis (PSDDA) Program (Feb 2000) and U.S. EPA Toxicity Equivalency Factors (U.S. EPA 1989; Ahlborg et al. 1994)

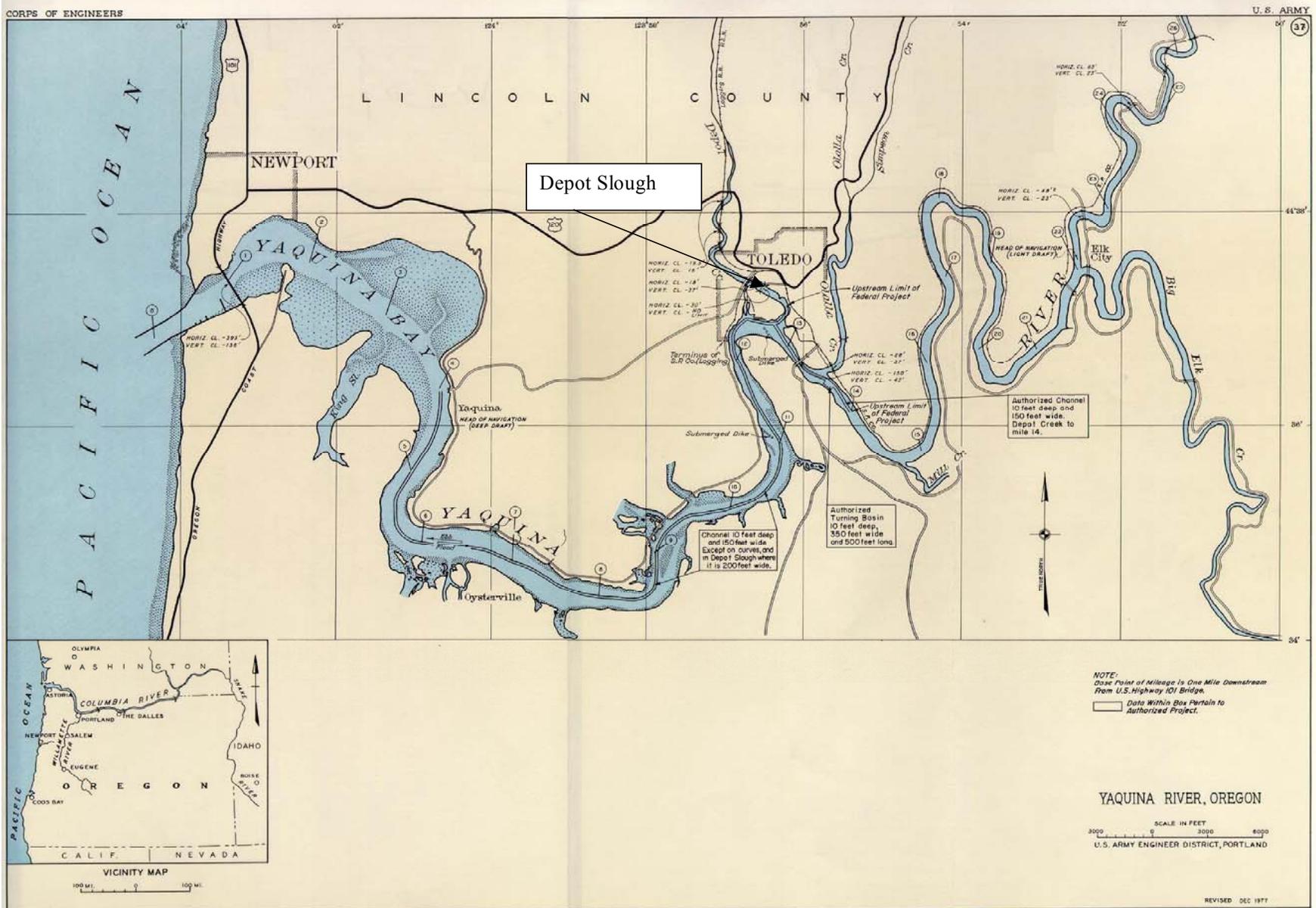


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DEPOT SLOUGH SEDIMENT QUALITY EVALUATION

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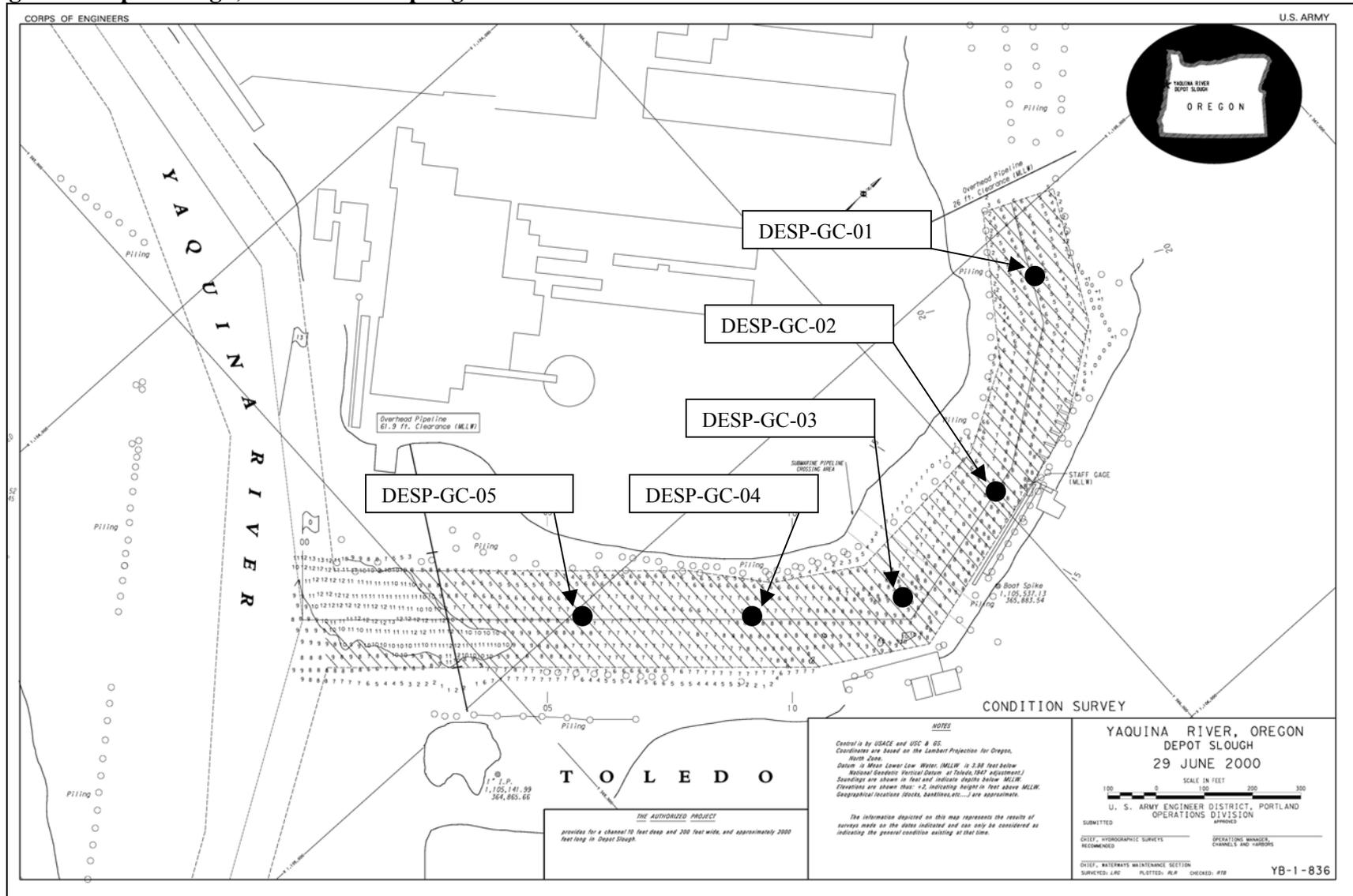
Figure 1, Depot Slough Vicinity Map



DEPOT SLOUGH SEDIMENT QUALITY EVALUATION

Sampled August 12, 2003

Figure 2: Depot Slough, Sediment Sampling Station Locations



Depot Slough Sediment Sampling Pictures

