CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD January 2, 2009

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE WEYERHAEUSER PROPERTY, LONGVIEW, WASHINGTON, FOR FLOW-LANE DISPOSAL IN THE COLUMBIA RIVER, OR FOR BENEFICIAL USE.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Environmental Protection Agency, and Washington Departments of Ecology and Natural Resources) regarding the suitability of up to 110,000 cubic yards (cy) of dredged material from the Weyerhaeuser property in Longview for beneficial use or for flow-lane disposal in the Columbia River.

2. Background. The Mount Coffin Ship Access Channel in the Columbia River and areas adjacent to the Weyerhaeuser property require routine maintenance dredging to ensure navigation depths for ocean-going vessels and river barges that are shipping mill products and raw materials to existing Weyerhaeuser facilities. The Mount Coffin Ship Channel provides ship access from the federal navigation channel to the docks and turning basin. The areas originally proposed for maintenance dredging, shown in Figure 1, are as follows (Integral, 2008a):

   • Salt Dock – at river mile (RM) 64.0. Maintain to 38 ft Columbia River Datum (CRD) for deep-draft shipping.
   • Cargo Dock and Turning Basin – at RM 64.5. Maintain to 38 ft CRD for deep-draft shipping.
   • Export Dock – at RM 65.5. Maintain to 38 ft CRD for deep-draft shipping.
   • Chip Barge Slip – at RM 65.0. Maintain to 14 ft CRD for chip barge handling.
   • Mount Coffin Ship Access Channel – at RM 63.4. Maintain to 42 ft CRD.

   The sampling and analysis plan (SAP) allocated dredged material management units (DMMUs) and field samples to each of these proposed dredging areas. However, during field sampling it was determined that little or no sediment accumulation had occurred above the maintenance depth for the Salt Dock, Cargo Dock, Turning Basin or Export Dock. Only the Chip Barge Slip and Mount Coffin Access Channel required dredging. The remainder of this suitability determination addresses these two portions of the project only.

3. Project Summary. Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Low-moderate
Characterized volume	Total: 110,000 cy Chip Barge Slip: 10,000 cy Access Channel: 100,000 cy
Maintenance depth	Chip Barge Slip: 14 ft. CRD Access Channel: 42 ft. CRD
Draft SAP received	August 18, 2008

Draft SAP returned for revisions	August 28, 2008
SAP revisions completed	August 29, 2008
SAP revisions approved	September 1, 2008
Sampling date	September 2, 2008
Final data report received	December 14, 2008
DAIS Tracking number	WEYLO-1-A-F-265
USACE Permit Application Number	Chip Barge Slip: 1999-2-00191 Access Channel: 200200105
Recency Determination (low-moderate rank = 6 years)	September 2014*

*Chip Barge Slip and Access Channel only; the Salt Dock, Cargo Dock/Turning Basin and Export Dock will require sediment characterization prior to the next dredging cycle.

4. Project Ranking and Sampling Requirements. The Weyerhaeuser property in Longview is ranked "low-moderate" (Integral, 2008a). In low-moderate-ranked areas with homogeneous sediment, the minimum numbers of field samples and dredged material management units (DMMUs) are calculated using the following guidelines (DMMP, 2008b):
   - Maximum volume of sediment represented by each field sample = 8,000 cubic yards
   - Maximum volume of sediment represented by each DMMU = 40,000 cubic yards.

   Based on these guidelines, the following numbers of field samples and DMMUs were required:

Dredging Area	Volume (cy)	field samples	DMMUs
Chip Barge Slip	10,000	2	1
Access Channel	100,000	13	3

5. Sampling. Sampling took place September 2-4, 2008 using a van Veen sampler (in areas with homogeneous sediment, surface grab samples are deemed adequate to represent the sediment – DMMP, 2008b). Only minor problems were encountered during sampling for the Access Channel and Chip Barge Slip. The target locations for G8-4 and G10-4 in the Access Channel and G6-2 in the Chip Barge Slip did not have sediment accumulated above the maintenance dredging depth. Therefore, the actual sampling stations were moved to locations with adequate sediment depth.

   In addition to grab samples, core samples were required for collection of z-samples to represent the sediment surface to be exposed by dredging. Weyerhaeuser agreed to collect z-samples in two layers: 0-1' and 1-2' below the proposed dredging depth. A vibracore was used to collect these samples.

   See Figure 2 (Access Channel) and Figure 3 (Chip Barge Slip) for target and actual grab and core sampling locations. Table 2 presents this information in tabular form.

6. Chemical Analysis. The approved sampling and analysis plan was followed and quality control guidelines specified by the PSEP and DMMP programs were met, with only minor quality control deviations (Integral, 2008b). The data were considered sufficient and acceptable for regulatory decision-making under the DMMP program.

   Sediment conventional results (Table 3) show that the proposed dredged material in the Access

Channel is predominantly sand, while that in Chip Barge Slip is sandy silt. The total organic carbon content is less than 0.1 percent in the Access Channel and 0.52 percent in the Chip Barge Slip.

For this project, the DMMP agencies agreed to use the SEF freshwater guidelines (RSET, 2006), supplemented by the DMMP marine guidelines (DMMP, 2008b) for those chemicals of concern for which freshwater guidelines do not exist. The chemical results indicated that there were no exceedances of SEF freshwater or DMMP marine screening levels (Table 4).

In addition to routine DMMP chemicals of concern, analysis of resin acids and guaiacols was required at the Chip Barge Slip due to the probable presence of woody debris associated with unloading operations at that facility. Table 5 includes data for the resin acids and guaiacols, all of which were either undetected or detected at very low concentrations. The detected concentrations were compared to those found in projects in Grays Harbor for which bioassays were conducted. The Weyerhaeuser concentrations were far below concentrations associated with bioassays that passed open-water dispersive suitability guidelines in Grays Harbor.

The analysis of dioxins/furans was required for DMMU 8 and its corresponding z-samples, due to its proximity to potential upland sources of dioxin, including a Kraft batch digestor and a Kaymr continuous Kraft digestor (see Figure 4). The dioxin/furan toxic equivalence (TEQ) concentrations (Table 6) were very low for the three samples tested and are well below the range of concentrations (0.65 to 2.387 pptr) compiled by the Department of Ecology for freshwater samples taken downstream of Puget Island (see Table 7). This range of values can be considered background for the lower Columbia River, therefore the Weyerhaeuser dioxin/furan concentrations are below background.

Based on the overall evaluation of the chemical data, bioassay testing was not required for the dredged material. All four DMMUs met suitability guidelines, based on chemistry alone, for flow-lane disposal in the Columbia River.

7. Sediment Exposed by Dredging. Sediment to be exposed by dredging must be evaluated in accordance with the DMMP antidegradation guidelines (DMMP 2008a). Vibracore samples were taken from 0-1 feet and 1-2 feet below project overdepth for DMMUs 6, 8, 9 and 10. Other than the requirement to test the z-samples from DMMU 8 for dioxins/furans, there were no requirements for immediate testing of the sediment to be exposed by dredging. However, the analytical lab inadvertently tested all z-samples for routine chemicals of concern.

   None of the z-samples exceeded SEF freshwater or DMMP marine guidelines except for the 1-2 foot z-sample associated with DMMU 10. Dimethyl phthalate was detected at 350 ug/kg, exceeding the SEF freshwater guideline of 46 ug/kg. However, as phthalates are common laboratory contaminants and the detected concentration was an order of magnitude higher than the concentration detected in any other project sample, archived sediment for this z-sample was sent to another laboratory for verification. Two subsamples of the archived sediment were extracted and analyzed. Dimethyl phthalate was undetected in both samples. Based on the retest data, the DMMP agencies agreed to set aside the original results. The sediment to be exposed by dredging is deemed to have met the DMMP antidegradation guidelines.

8. Beneficial-Use Analysis. The proposed dredged material had no exceedances of the State of Washington numerical Sediment Quality Standards (see Table 8). (It should be noted that the organic carbon content for DMMUs 8, 9 and 10 was too low to permit carbon normalization. However, the dry-weight concentrations for those chemicals for which the SQS is carbon-normalized were well below the SEF freshwater or DMMP marine guidelines.) Based on the comparison to SQS and agency best professional judgment regarding acceptable dioxin/furan and resin acid/guaiacol concentrations in beneficial use material, sediment from this project may be used for beneficial use in a freshwater or marine environment.

   To assess the suitability for upland beneficial use, the chemical results were compared to the Model Toxics Control Act (MTCA) guidelines (Ecology, 2005). Table 9 indicates that the reported concentration of 1.0 mg/kg for arsenic in DMMU 6 exceeds the Method B guideline for carcinogens for unrestricted use. Therefore, it is possible that DMMU 6 may be unsuitable for some types of upland use. Ecology, DNR and the local health department should be consulted if upland beneficial use is contemplated for this management unit. The other three DMMUs are all suitable for upland beneficial use.

9. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Weyerhaeuser property in Longview for flow-lane disposal or beneficial use. The approved sampling and analysis plan was followed (with the exceptions noted previously) and the data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

   Based on the results of the previously described testing, the DMMP agencies conclude that all 110,000 cubic yards are suitable for flow-lane disposal in the Columbia River or in-water beneficial use. DMMUs 8, 9 and 10 are also suitable for upland beneficial use. However, upland beneficial use of DMMU 6 would require further consultation with Ecology, DNR and the local health department.

   This suitability determination applies only to the Access Channel and Chip Barge Slip. Sediment from the Salt Dock, Cargo Dock, Turning Basin and Export Dock must be characterized prior to any dredging from those areas.

   A pre-dredge conference call with DNR, Ecology and the Corps of Engineers will be required. A dredging quality control plan must be developed and submitted to the Corps of Engineers Regulatory Branch Project Manager for this project at least 7 days prior to the pre-dredge conference call. A DNR site use authorization must also be acquired.

10. References.

DMMP, 2008a. Quality of Post-Dredge Sediment Surfaces (Updated). A Clarification Paper Prepared by David Fox (USACE), Erika Hoffman (EPA) and Tom Gries (Ecology) for the Dredged Material Management Program, June 2008.

DMMP, 2008b. *Dredged Material Evaluation and Disposal Procedures (Users Manual)*. Dredged Material Management Program, July 2008.

Ecology, 1995. *Sediment Management Standards – Chapter 173-204 WAC*. Washington State Department of Ecology, December 1995.

Ecology, 2005. *Model Toxics Control Act – Chapter 70.105D RCW and Cleanup Regulation - Chapter 173-340 WAC*. Washington State Department of Ecology, October 2005.

Integral, 2008a. *Sampling and Analysis Plan, Sediment Characterization, Weyerhaeuser Property, Longview, Washington.* Prepared by Integral Consulting Inc. for Weyerhaeuser Company. September 2008.

Integral, 2008b. *Sediment Characterization Report, Weyerhaeuser Property, Longview, Washington.* Prepared by Integral Consulting Inc. for Weyerhaeuser Company. December 2008.

RSET, 2006. *Northwest Regional Sediment Evaluation Framework, Interim Final.* Northwest Regional Sediment Evaluation Team, September 2006.

11. Agency Signatures.

Concur:

1/2/09 — David F. Fox
Date — David Fox, P.E. - Seattle District Corps of Engineers

1/8/09 — Erika Hoffman
Date — Erika Hoffman - Environmental Protection Agency

01/08/09 — Laura Inouye
Date — Laura Inouye, Ph.D. - Washington Department of Ecology

9-Jan-09 — Courtney Wasson
Date — Courtney Wasson - Washington Department of Natural Resources

Copies furnished:

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Sandy Browning, Integral Consulting
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Figure 1.
Weyerhaeuser, Longview, WA
Site Vicinity

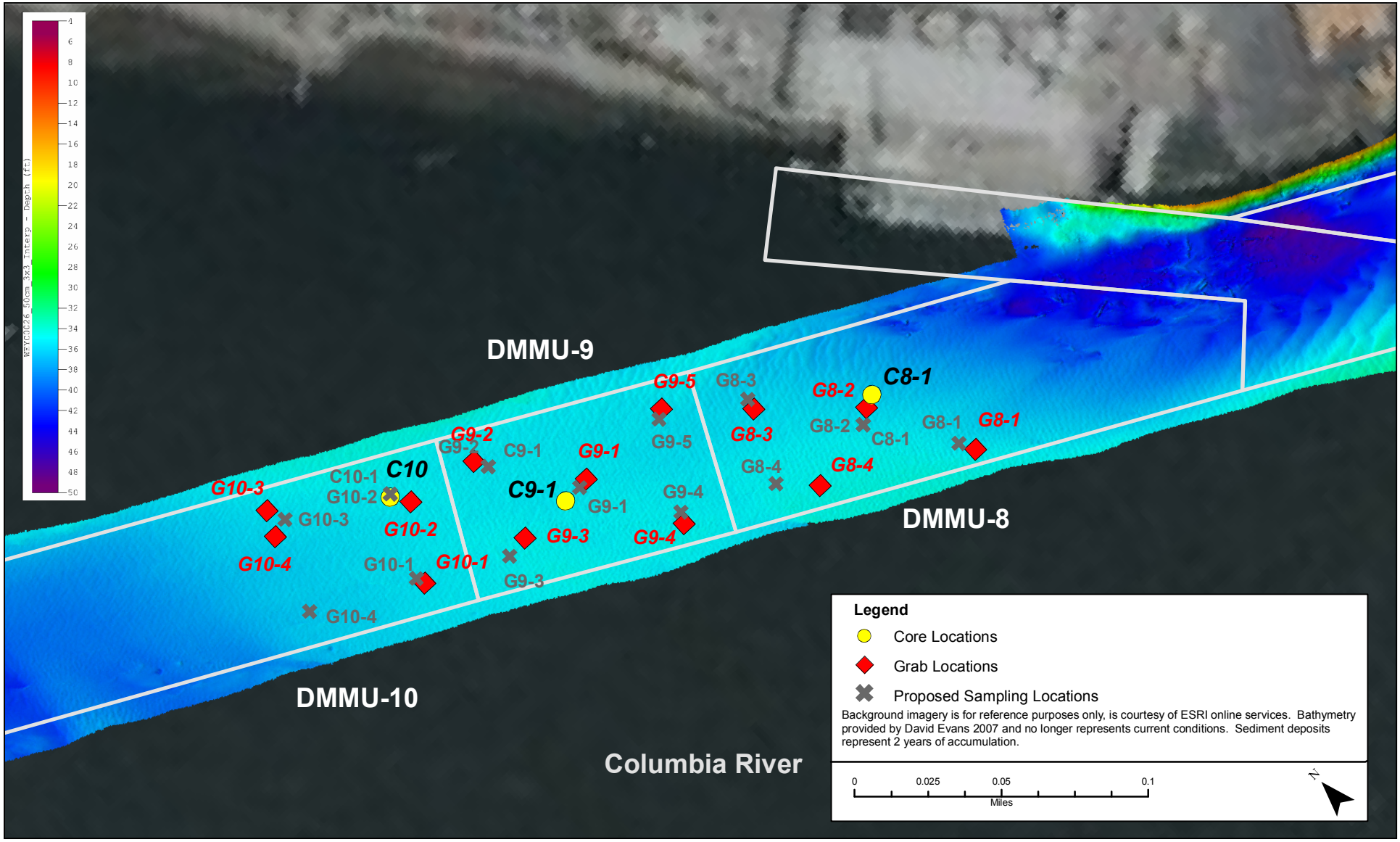

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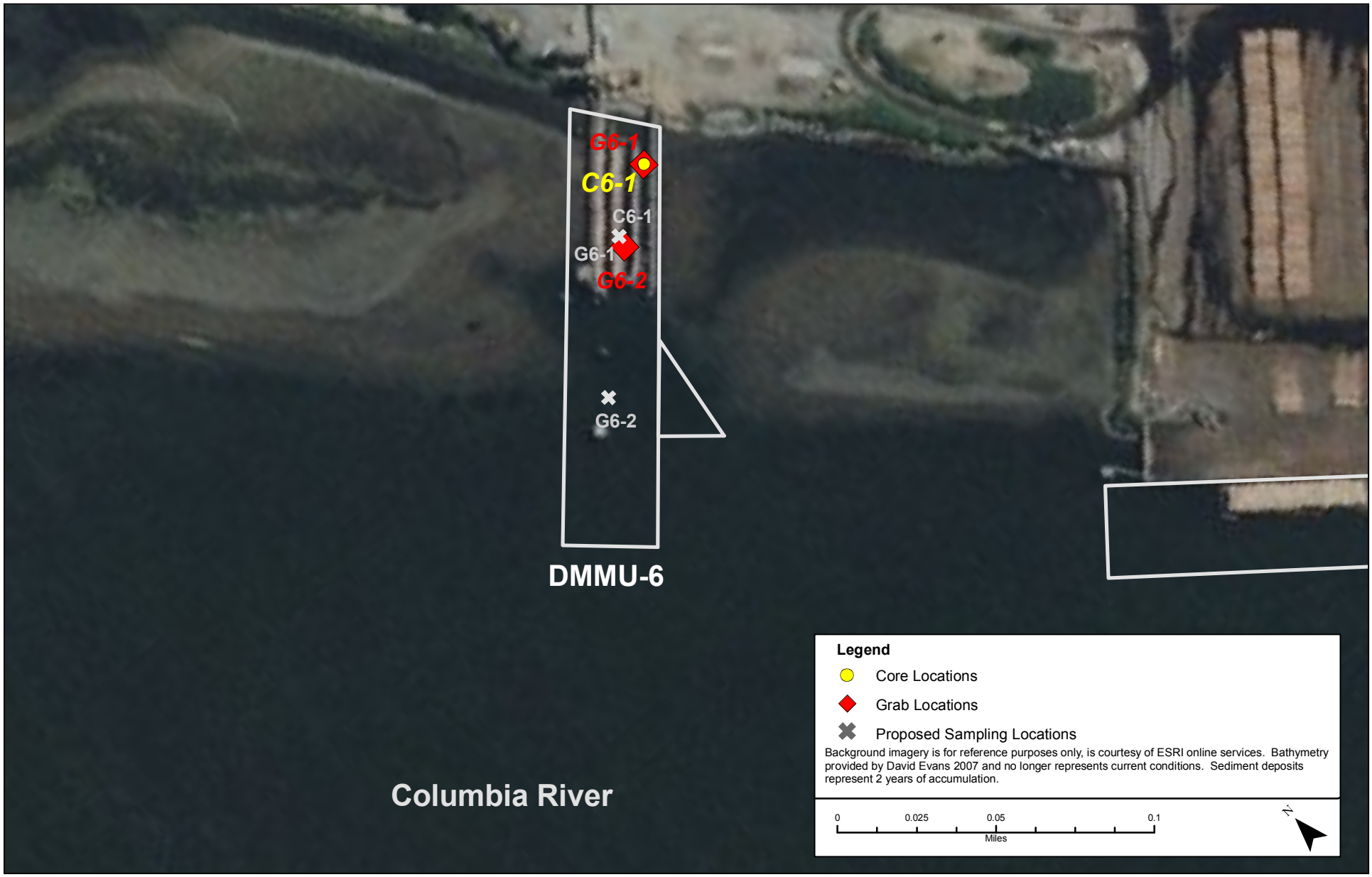
Figure 2.
Weyerhaeuser, Longview, WA
Ship Access Channel Sampling Locations



Map Document: (O:\Projects\C457_Weyerhaeuser_2008_SP\Working_MXDs\ChipBarge_ExportDock_WASouthProj.mxd) - 10/2/2008 -- 3:13:19 PM

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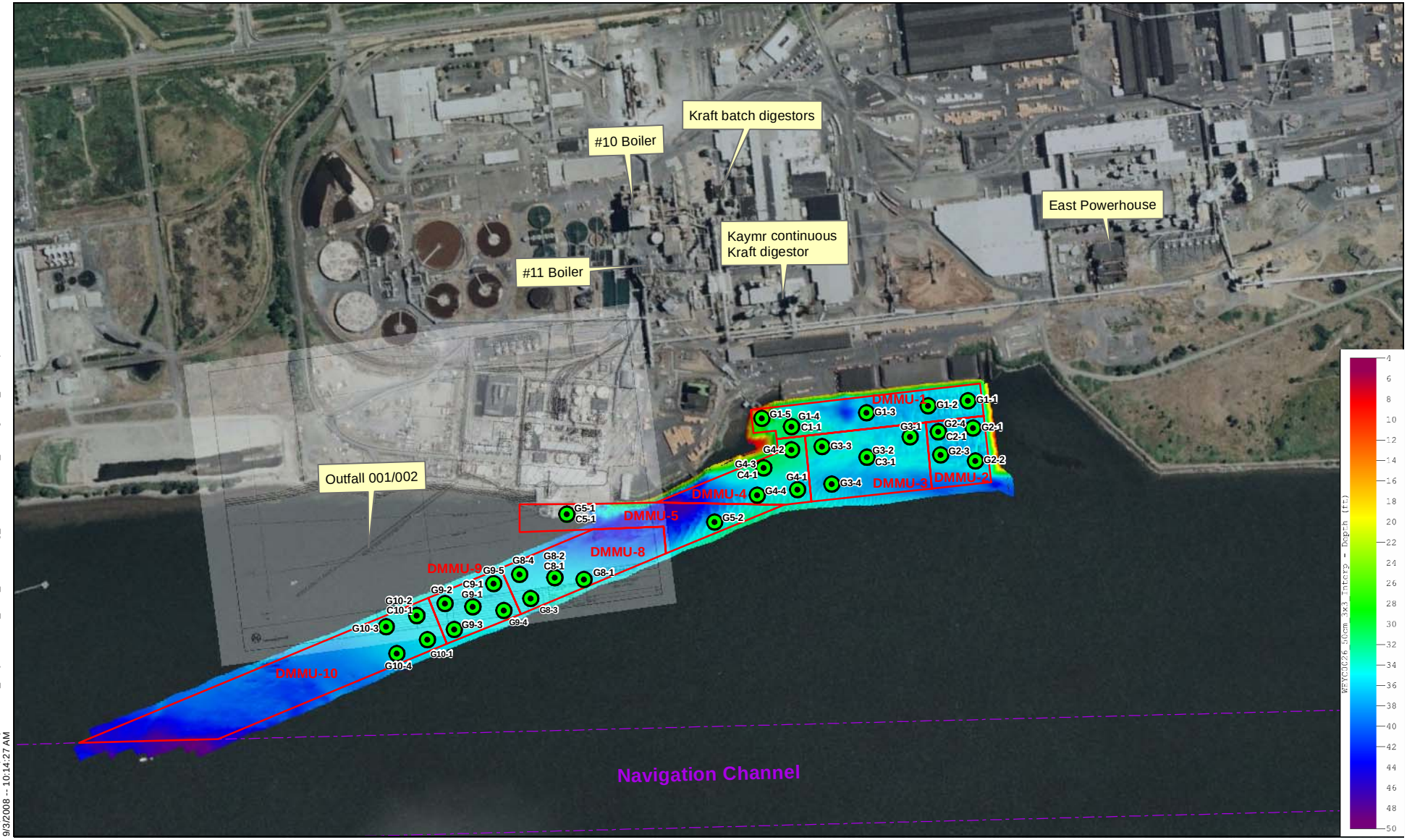
Figure 3.
Weyerhaeuser, Longview, WA
Chip Barge Area Sampling Locations



0 0.0375 0.075 0.15
Miles

Background imagery is for reference purposes only, is courtesy of ESRI online services. Bathymetry provided by David Evans 2007 and no longer represents current conditions. Sediment deposits represent 2 years of accumulation.

Proposed Sampling Locations
DMMUs
Navigation Channel

Figure 4.
Weyerhaeuser, Longview, WA
Cargo/Salt Docks, Turning Basin, and Ship Access Channel
Proposed Sampling Locations

Note: DMMUs 1-5 were eliminated due to lack of sediment above the maintenance depth.

Table 2. Sampling Coordinates and Sample Designations.

Location	Sample Designation	Sample Type	Actual Sample Locations		Proposed Sample Locations		Difference (ft)	Location Designations
			Easting	Northing	Easting	Northing		
DMMU-6 Chip Barge	DMMU-6-C6	Grab	1015482.152	294034.887	1015370.117	293974.6236	127	G6-1
		Grab	1015365.47	293956.3319	1015173.769	293789.868	254	G6-2
Z sample 0'-1' Z sample 1'-2'	C6-Z(0-1) C6-Z(1-2)	Core	1015482.871	294034.916	1015370.117	293974.6236	128	C6-1
DMMU-8 Mt. Coffin Channel	DMMU-8-C8	Grab	1008815.868	299674.7229	1008801.859	299703.3857	32	G8-1
		Grab	1008723.62	299863.049	1008698.706	299844.1494	31	G8-2
		Grab	1008574.357	299999.6481	1008578.162	300019.7876	20	G8-3
		Grab	1008567.493	299817.393	1008511.607	299874.0442	80	G8-4
Z sample 0'-1' Z sample 1'-2'	C8-Z(0-1) C8-Z(1-2)	Core	1008746.65	299873.6862	1008698.706	299844.1494	56	C8-1
DMMU-9 Mt. Coffin Channel	DMMU-9-C9	Grab	1008268.036	300112.7717	1008249.718	300109.7508	19	G9-1
		Grab	1008142.511	300272.8878	1008155.439	300249.0967	27	G9-2
		Grab	1008115.71	300109.9063	1008073.004	300105.2551	43	G9-3
		Grab	1008342.885	299934.1878	1008352.223	299952.9677	21	G9-4
		Grab	1008452.791	300113.0537	1008436.95	300102.1219	19	G9-5
Z sample 0'-1' Z sample 1'-2'	C9-Z(0-1) C9-Z(1-2)	Core	1008214.156	300109.7425	1008155.439	300249.0967	151	C9-1
DMMU-10 Mt. Coffin Channel	DMMU-10-C10	Grab	1007928.889	300173.5503	1007923.32	300190.423	18	G10-1
		Grab	1008010.031	300297.9373	1007992.734	300332.9558	39	G10-2
		Grab	1007810.938	300462.1912	1007823.664	300428.6089	36	G10-3
		Grab	1007789.47	300417.8326	1007742.944	300277.9513	147	G10-4
Z sample 0'-1' Z sample 1'-2'	C10-Z(0-1) C10-Z(1-2)	Core	1007988.354	300329.0101	1007992.734	300332.9558	6	C10-1

Table 3. Sediment Conventional Data.

		Chip Barge Slip	Access Channel		
Lab ID:		DMMU-6-C6	DMMU-8-C8	DMMU-9-C9	DMMU-10-C10
DAIS ID:		C1	C2	C3	C4
DMMU #:		DMMU 6	DMMU 8	DMMU 9	DMMU 10
GRAIN SIZE	% Gravel:	2.1	0.7	0.2	0.0
	% Sand:	43.7	98.2	99.8	98.4
	% Silt:	54.2	1.1	0.0	1.6
	% Clay:	0.0	0.0	0.0	0.0
	% Fines (clay+silt):	54.2	1.1	0.0	1.6
Total Solids (%):		62.2	75.5	67.6	67.9
Volatile Solids (%):		2.1	0.5	0.5	0.6
Total Organic Carbon (%):		0.52	0.05	0.02 u	0.08
Total Sulfides (mg/kg):		17.8	0.8 u	0.9 u	0.9 u
Total Ammonia (mg N/kg):		18.3	.006 u	1.6	.006 u

Table 4. Chemical results compared to DMMP regulatory guidelines.

						Barge Slip		Access Channel					
					Lab ID:	DMMU-6-C6		DMMU-8-C8		DMMU-9-C9		DMMU-10-C10	
					DAIS ID:	C1		C2		C3		C4	
	SEF Freshwater		DMMP Marine			DMMU 6		DMMU 8		DMMU 9		DMMU 10	
CHEMICAL	SL1	SL2	SL	BT	ML								
METALS (mg/kg dry)						conc	QL	conc	QL	conc	QL	conc	QL
Antimony	---	---	150	---	200	0.05	B	0.04	U	0.05	U	0.05	U
Arsenic	20	51	NA	507	NA	1		0.54	B	0.61	B	0.59	B
Cadmium	1.1	1.5	NA	11.3	NA	0.13		0.022	B	0.028		0.033	
Chromium	95	100	---	267	---	4.1		1.89		2.59		2.33	
Copper	80	830	NA	1,027	NA	17		6.35		7.74		7.04	
Lead	340	430	NA	975	NA	2.9		0.74		0.85		0.87	
Mercury	0.28	0.75	NA	1.5	NA	0.032		0.002	U	0.002	U	0.003	U
Nickel	60	70	NA	370	NA	5.13		4.01		5.8		5.72	
Selenium	---	---	---	3.0	---	0.4	U	0.4	U	0.5	U	0.5	U
Silver	2	2.5	NA	6.1	NA	0.04		0.03		0.03		0.03	
Zinc	130	400	NA	2,783	NA	22.3		10.6		13.3		13.1	
LPAH (ug/kg dry)													
2-Methylnaphthalene	470	560	NA	---	NA	3.9	J	2.2	U	2.2	U	2.5	U
Acenaphthene	1,100	1,300	NA	---	NA	13		1.4	U	1.4	U	1.6	U
Acenaphthylene	470	640	NA	---	NA	1.8	J	1.2	U	1.2	U	1.4	U
Anthracene	1,200	1,600	NA	---	NA	6.8	J	1.6	U	1.6	U	1.8	U
Fluorene	1,000	3,000	NA	---	NA	14		1.1	U	1.1	U	1.3	U
Naphthalene	500	1,300	NA	---	NA	2.3	U	2.3	U	2.3	U	2.6	U
Phenanthrene	6,100	7,600	NA	---	NA	75		1.9	J	1.4	U	1.6	U
Total LPAH	6,600	92,00	NA	---	NA	110	J	1.9	J	2.3	U	2.6	U
HPAH (ug/kg dry)													
Benzo(a)anthracene	4,300	5,800	NA	---	NA	37		1.7	U	1.7	U	1.9	U
Benzo(a)pyrene	3,300	4,800	NA	---	NA	23		1.7	U	1.7	U	1.9	U
Benzo(g,h,i)perylene	4,000	5,200	NA	---	NA	13		1.5	U	1.5	U	1.7	U
Benzofluoranthenes	600	4,000	NA	---	NA	63		1.4	U	1.4	U	1.6	U
Chrysene	5,900	6,400	NA	---	NA	49		1.5	U	1.5	U	1.7	U
Dibenzo(a,h)anthracene	800	840	NA	---	NA	8.7	J	1.5	U	1.5	U	1.7	U
Fluoranthene	11,000	15,000	NA	4,600	NA	90		2.5	J	1.6	U	1.8	U
Indeno(1,2,3-c,d)pyrene	4,100	5,300	NA	---	NA	21		1.5	U	1.5	U	1.7	U
Pyrene	8,800	16,000	NA	11,980	NA	100		1.5	U	1.5	U	1.7	U
Total HPAH	31,000	55,000	NA	---	NA	404.7	J	2.5	J	1.7	U	1.9	U
CHLORINATED HYDROCARBONS (ug/kg dry)													
1,2,4-Trichlorobenzene	---	---	31	---	64	2.6	U	2.6	U	2.6	U	2.9	U
1,2-Dichlorobenzene	---	---	35	---	110	2.9	U	2.9	U	2.9	U	3.3	U
1,3-Dichlorobenzene	---	---	170	---	---	3	U	3	U	3	U	3.4	U
1,4-Dichlorobenzene	---	---	110	---	120	2.9	U	2.9	U	2.9	U	3.3	U
Hexachlorobenzene	---	---	22	168	230	1.2	U	1.2	U	1.2	U	1.4	U

						Barge Slip		Access Channel					
					Lab ID:	DMMU-6-C6		DMMU-8-C8		DMMU-9-C9		DMMU-10-C10	
					DAIS ID:	C1		C2		C3		C4	
	SEF Freshwater		DMMP Marine			DMMU 6		DMMU 8		DMMU 9		DMMU 10	
CHEMICAL	SL1	SL2	SL	BT	ML								
PHTHALATES (ug/kg dry)													
Bis(2-ethylhexyl)phthalate	220	320	NA	---	NA	12	J	7.4	J	10	J	8.4	J
Butyl benzyl phthalate	260	370	NA	---	NA	3.2	U	6.3	J	7.7	J	5.1	J
Di-n-butyl phthalate	---	---	1,400	---	5,100	14	J	21		25		19	J
Di-n-octyl phthalate	26	45	NA	---	NA	1.7	U	1.7	U	1.7	U	1.9	U
Diethyl phthalate	---	---	200	---	1,200	2.6	J	3.3	J	3.4	J	2.3	J
Dimethyl phthalate	46	440	NA	---	NA	1	U	28		17		1.2	U
PHENOLS (ug/kg dry)													
2 Methylphenol	---	---	63	---	77	1.5	U	1.5	U	1.5	U	1.7	U
2,4-Dimethylphenol	---	---	29	---	210	5.5	U	5.5	U	5.5	U	6.2	U
4 Methylphenol	---	---	670	---	3,600	1.5	U	1.5	U	1.5	U	1.7	U
Pentachlorophenol	---	---	400	504	690	20	U	20	U	20	U	23	U
Phenol	---	---	420	---	1,200	2	U	2	U	2	U	2.3	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)													
Benzoic acid	---	---	650	---	760	96	U	96	U	96	U	110	U
Benzyl alcohol	---	---	57	---	870	2.1	U	18	J	16	J	2.4	U
Dibenzofuran	400	440	NA	---	NA	7.7	J	1.2	U	1.2	U	1.4	U
Hexachlorobutadiene	---	---	29	---	270	2.5	U	2.5	U	2.5	U	2.8	U
Hexachloroethane	---	---	1,400	---	14,000	3.1	U	3.1	U	3.1	U	3.5	U
N-Nitrosodiphenylamine	---	---	28	---	130	1.6	U	1.6	U	1.6	U	1.8	U
PESTICIDES AND PCBs (ug/kg dry)													
Aldrin	---	---	10	---	---	0.16	U	0.16	U	0.16	U	0.16	U
Chlordane	---	---	10	37	---	0.12	U	0.12	U	0.12	U	0.12	U
Dieldrin	---	---	10	---	---	0.14	U	0.14	U	0.14	U	0.14	U
Heptachlor	---	---	10	---	---	0.12	U	0.12	U	0.12	U	0.12	U
Lindane	---	---	10	---	---	0.08	U	0.08	U	0.08	U	0.08	U
Total DDT	---	---	6.9	50	69	0.17	U	0.17	U	0.17	U	0.17	U
Total PCBs	60	120	NA	---	NA	2.1	U	2.1	U	2.1	U	2.1	U
Total PCBs (mg/kg OC)	---	---	---	38	---	0.4	U	NA		NA		NA	

B = detected in the blank
J = estimated concentration
U = undetected
QL = laboratory qualifier
OC = organic carbon

SL = screening level
BT = bioaccumulation trigger
ML = maximum level
NA = not applicable

Table 5. Resin acid and guaiacol data.

	Barge Slip	
Lab ID:	DMMU-6-C6	
DAIS ID:	C1	
CHEMICAL	DMMU 6	
RESIN ACIDS (mg/kg dry)	conc	QL
Linoleic acid	0.027	U
Oleic acid	0.15	J
Pimaric acid	0.029	J
Isopimaric acid	0.49	
Dehydroabietic acid	1.6	
Abietic acid	0.33	
9,10-Dichlorostearic acid	0.03	U
12-Chlorodehdroabietic acid	0.0092	U
14-Chlorodehdroabietic acid	0.0083	U
Dichlorodehydroabietic acid	0.017	U
Sandracopimaric acid	0.056	
Neoabietic acid	0.045	U
Palustric acid	0.045	UJ
GUAIACOLS (ug/L)		
4-Chloroguaiacol	1.25	U
3,4-Dichloroguaiacol	2.5	U
4,5-Dichloroguaiacol	2.5	U
4,6-Dichloroguaiacol	2.5	U
3,4,5-Trichloroguaiacol	2.5	U
3,4,6-Trichloroguaiacol	2.5	U
4,5,6-Trichloroguaiacol	2.5	U
Tetrachloroguaiacol	5	U

J = estimated concentration
U = undetected
QL = laboratory qualifier

Table 6. Dioxin/Furan data.

		Access Channel											
	Lab ID:	DMMU-8-C8				C8-Z(0-1)				C8-Z(1-2)			
	DAIS ID:	C2				S3				S4			
CHEMICAL	TEF	DMMU 8				DMMU 8 - Z (0-1 ft)				DMMU 8 - Z (1-2 ft)			
DIOXINS (ng/kg dry)		conc	QL	TEQ (U=½ DL)	TEQ (U=0)	conc	QL	TEQ (U=½ DL)	TEQ (U=0)	conc	QL	TEQ (U=½ DL)	TEQ (U=0)
2,3,7,8-TCDD	1	0.0722	U	0.0361	0	0.0453	U	0.02265	0	0.0393	U	0.01965	0
1,2,3,7,8-PeCDD	1	0.0738	U	0.0369	0	0.0464	U	0.0232	0	0.0462	U	0.0231	0
1,2,3,4,7,8-HxCDD	0.1	0.0572	U	0.00286	0	0.0306	U	0.00153	0	0.0472	U	0.00236	0
1,2,3,6,7,8-HxCDD	0.1	0.0997	U	0.004985	0	0.0435	JKU	0.002175	0	0.0644	U	0.00322	0
1,2,3,7,8,9-HxCDD	0.1	0.0705	U	0.003525	0	0.0325	U	0.001625	0	0.0636	JKU	0.00318	0
1,2,3,4,6,7,8-HpCDD	0.01	0.871	JU	0.004355	0	0.26	BJU	0.0013	0	0.464	BJU	0.00232	0
OCDD	0.0003	7.33	J	0.002199	0.002199	1.35	BJU	0.000203	0	3.03	BJU	0.000455	0
2,3,7,8-TCDF	0.1	0.0765	U	0.003825	0	0.0332	U	0.00166	0	0.0419	U	0.002095	0
1,2,3,7,8-PeCDF	0.03	0.0489	U	0.000734	0	0.0196	U	0.000294	0	0.026	U	0.00039	0
2,3,4,7,8-PeCDF	0.3	0.0507	U	0.007605	0	0.0193	U	0.002895	0	0.0267	U	0.004005	0
1,2,3,4,7,8-HxCDF	0.1	0.0458	U	0.00229	0	0.0256	U	0.00128	0	0.0221	U	0.001105	0
1,2,3,6,7,8-HxCDF	0.1	0.0476	U	0.00238	0	0.0247	U	0.001235	0	0.0215	U	0.001075	0
1,2,3,7,8,9-HxCDF	0.1	0.0536	U	0.00268	0	0.0279	U	0.001395	0	0.0221	U	0.001105	0
2,3,4,6,7,8-HxCDF	0.1	0.0505	U	0.002525	0	0.0273	U	0.001365	0	0.0225	U	0.001125	0
1,2,3,4,6,7,8-HpCDF	0.01	0.233	J	0.00233	0.00233	0.0898	J	0.000898	0.000898	0.107	JKU	0.000535	0
1,2,3,4,7,8,9-HpCDF	0.01	0.0467	U	0.000234	0	0.0389	U	0.000195	0	0.0326	U	0.000163	0
OCDF	0.0003	0.758	JU	0.000114	0	0.301	JKU	4.52E-05	0	0.385	J	0.000116	0.000116
TOTAL TEQ:				0.116	0.005			0.064	0.001			0.066	0.000

J = estimated concentration
K = ion abundance ratio out of range
U = undetected
QL = laboratory qualifier
TEF = toxic equivalency factor (WHO 2005 mammalian)
TEQ = toxic equivalency

Table 7. Columbia River Dioxin/Furan background data from EIM.

User_Study_ID	Study_Location_Name	Field_Activity_Start_Date	Sample_ID	Sample_Source	sum TEQ	Latitude	Longitude
WPRT0698	WP-GC-13	06/04/1998	WP-GC-13	Freshwater Sediment	0.65	46.1461	-123.384
LCBWRS93	RM59	06/25/1993	7-S	Freshwater Sediment	2.87	46.1696	-123.072
LCBWRS93	RM14	06/28/1993	1-S	Freshwater Sediment	2.36	46.1655	-123.829
LCBWRS93	RM29	06/26/1993	5-S	Freshwater Sediment	1.89	46.2236	-123.553
LCBWRS93	RM26	06/26/1993	4-S	Freshwater Sediment	1.64	46.2	-123.588
LCBWRS93	RM36	06/25/1993	6-S	Freshwater Sediment	1.21	46.2244	-123.402
LCBWRS93	RM23	06/27/1993	3-S	Freshwater Sediment	1.19	46.1747	-123.666
LCBWRS93	RM21	06/27/1993	2-S	Freshwater Sediment	1.14	46.1767	-123.701
COLWLR90	CR17/18	05/10/1990	CR17/18	Freshwater Sediment	1.53	46.1924	-123.425
COLWLR90	CR-VC-12	05/10/1990	CRVC12AB	Freshwater Sediment	1.28	46.1461	-123.385
COLWLR90	CR-GC-16	05/10/1990	CR-GC-16	Freshwater Sediment	1.21	46.1686	-123.416
COLWLR90	CR-GC-15	05/10/1990	CR-GC-15	Freshwater Sediment	1.11	46.1699	-123.416

EIM = Environmental Information Management system

Table 8. Chemical results compared to SMS regulatory guidelines.

			Barge Slip		Access Channel					
		Lab ID:	DMMU-6-C6		DMMU-8-C8		DMMU-9-C9		DMMU-10-C10	
		DAIS ID:	C1		C2		C3		C4	
CHEMICAL	SQS	CSL	DMMU 6		DMMU 8		DMMU 9		DMMU 10	
METALS (mg/kg dry)			conc	QL	conc	QL	conc	QL	conc	QL
Arsenic	57	93	1		0.54	B	0.61	B	0.59	B
Cadmium	5.1	6.7	0.13		0.022	B	0.028		0.033	
Chromium	260	270	4.1		1.89		2.59		2.33	
Copper	390	390	17		6.35		7.74		7.04	
Lead	450	530	2.9		0.74		0.85		0.87	
Mercury	0.41	0.59	0.032		0.002	U	0.002	U	0.003	U
Silver	6.1	6.1	0.04		0.03		0.03		0.03	
Zinc	410	960	22.3		10.6		13.3		13.1	
LPAH (mg/kg OC)										
2-Methylnaphthalene	38	64	0.7	J	NA		NA		NA	
Acenaphthene	16	57	2.5		NA		NA		NA	
Acenaphthylene	66	66	0.3	J	NA		NA		NA	
Anthracene	220	1200	1.3	J	NA		NA		NA	
Fluorene	23	79	2.7		NA		NA		NA	
Naphthalene	99	170	0.4	U	NA		NA		NA	
Phenanthrene	100	480	14.4		NA		NA		NA	
Total LPAH	370	780	21.2	J	NA		NA		NA	
HPAH (mg/kg OC)										
Benzo(a)anthracene	110	270	7.1		NA		NA		NA	
Benzo(a)pyrene	99	210	4.4		NA		NA		NA	
Benzo(g,h,i)perylene	34	88	2.5		NA		NA		NA	
Benzofluoranthenes	230	450	12.1		NA		NA		NA	
Chrysene	110	460	9.4		NA		NA		NA	
Dibenzo(a,h)anthracene	12	33	1.7	J	NA		NA		NA	
Fluoranthene	160	1200	17.3		NA		NA		NA	
Indeno(1,2,3-c,d)pyrene	34	88	4.0		NA		NA		NA	
Pyrene	1000	1400	19.2		NA		NA		NA	
Total HPAH	960	5300	77.8	J	NA		NA		NA	
CHLORINATED HYDROCARBONS (mg/kg OC)										
1,2,4-Trichlorobenzene	0.81	1.8	0.50	U	NA		NA		NA	
1,2-Dichlorobenzene	2.3	2.3	0.6	U	NA		NA		NA	
1,4-Dichlorobenzene	3.1	9	0.6	U	NA		NA		NA	
Hexachlorobenzene	0.38	2.3	0.23	U	NA		NA		NA	

			Barge Slip		Access Channel					
		Lab ID:	DMMU-6-C6		DMMU-8-C8		DMMU-9-C9		DMMU-10-C10	
		DAIS ID:	C1		C2		C3		C4	
CHEMICAL	SQS	CSL	DMMU 6		DMMU 8		DMMU 9		DMMU 10	
PHTHALATES (mg/kg OC)										
Bis(2-ethylhexyl)phthalate	47	78	2.3	J	NA		NA		NA	
Butyl benzyl phthalate	4.9	64	0.6	U	NA		NA		NA	
Di-n-butyl phthalate	220	1700	2.7	J	NA		NA		NA	
Di-n-octyl phthalate	58	4500	0.3	U	NA		NA		NA	
Diethyl phthalate	61	110	0.5	J	NA		NA		NA	
Dimethyl phthalate	53	53	0.2	U	NA		NA		NA	
PHENOLS (ug/kg dry)										
2 Methylphenol	63	63	1.5	U	1.5	U	1.5	U	1.7	U
2,4-Dimethylphenol	29	29	5.5	U	5.5	U	5.5	U	6.2	U
4 Methylphenol	670	670	1.5	U	1.5	U	1.5	U	1.7	U
Pentachlorophenol	360	690	20	U	20	U	20	U	23	U
Phenol	420	1200	2	U	2	U	2	U	2.3	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)										
Benzoic acid	650	650	96	U	96	U	96	U	110	U
Benzyl alcohol	57	73	2.1	U	18	J	16	J	2.4	U
MISCELLANEOUS EXTRACTABLES (mg/kg OC)										
Dibenzofuran	15	58	1.5	J	NA		NA		NA	
Hexachlorobutadiene	3.9	6.2	0.5	U	NA		NA		NA	
N-Nitrosodiphenylamine	11	11	0.3	U	NA		NA		NA	
PCBs (mg/kg OC)										
Total PCBs (mg/kg carbon)	12	65	0.4	U	NA		NA		NA	

B = detected in the blank
J = estimated concentration
U = undetected
QL = laboratory qualifier
OC = organic carbon
SMS = Sediment Management Standards
SQS = sediment quality standard
CSL = cleanup screening level
NA = not applicable; organic carbon content is too low to normalize

Table 9. Chemical results compared to MTCA regulatory guidelines.

			Barge Slip		Access Channel					
		Lab ID:	DMMU-6-C6		DMMU-8-C8		DMMU-9-C9		DMMU-10-C10	
		DAIS ID:	C1		C2		C3		C4	
CHEMICAL	Method A[1]	Method B[2]	DMMU 6		DMMU 8		DMMU 9		DMMU 10	
METALS (mg/kg dry)			conc	QL	conc	QL	conc	QL	conc	QL
Arsenic, inorganic	20	0.67	1		0.54	B	0.61	B	0.59	B
Cadmium	2	---	0.13		0.022	B	0.028		0.033	
Chromium (total)	---	---	4.1		1.89		2.59		2.33	
Chromium VI	19	---	---		---		---		---	
Copper	---	---	17		6.35		7.74		7.04	
Lead	250	---	2.9		0.74		0.85		0.87	
Mercury	2	---	0.032		0.002	U	0.002	U	0.003	U
Silver	---	---	0.04		0.03		0.03		0.03	
Zinc	---	---	22.3		10.6		13.3		13.1	
LPAH (ug/kg dry)										
Acenaphthene	---	---	13		1.4	U	1.4	U	1.6	U
Anthracene	---	---	6.8	J	1.6	U	1.6	U	1.8	U
Fluorene	---	---	14		1.1	U	1.1	U	1.3	U
Naphthalene	5,000	---	2.3	U	2.3	U	2.3	U	2.6	U
HPAH (ug/kg dry)										
Benzo(a)anthracene	---	140	37		1.7	U	1.7	U	1.9	U
Benzo(a)pyrene	100	140	23		1.7	U	1.7	U	1.9	U
Benzo(b,k)fluoranthenes	---	---	63		1.4	U	1.4	U	1.6	U
Benzo(b)fluoranthene	---	140	48		1.2	U	1.2	U	1.4	U
Benzo(k)fluoranthenes	---	140	15		1.4	U	1.4	U	1.6	U
Chrysene	---	140	49		1.5	U	1.5	U	1.7	U
Dibenzo(a,h)anthracene	---	140	8.7	J	1.5	U	1.5	U	1.7	U
Fluoranthene	---	---	90		2.5	J	1.6	U	1.8	U
Indeno(1,2,3-c,d)pyrene	---	140	21		1.5	U	1.5	U	1.7	U
Pyrene	---	---	100		1.5	U	1.5	U	1.7	U
CHLORINATED HYDROCARBONS (ug/kg dry)										
1,2,4-Trichlorobenzene	---	---	2.6	U	2.6	U	2.6	U	2.9	U
1,2-Dichlorobenzene	---	---	2.9	U	2.9	U	2.9	U	3.3	U
1,4-Dichlorobenzene	---	42,000	2.9	U	2.9	U	2.9	U	3.3	U
Hexachlorobenzene	---	630	1.2	U	1.2	U	1.2	U	1.4	U
PHTHALATES (ug/kg dry)										
Bis(2-ethylhexyl)phthalate	---	71,000	12	J	7.4	J	10	J	8.4	J
Butyl benzyl phthalate	---	---	3.2	U	6.3	J	7.7	J	5.1	J

			Barge Slip		Access Channel					
		Lab ID:	DMMU-6-C6		DMMU-8-C8		DMMU-9-C9		DMMU-10-C10	
		DAIS ID:	C1		C2		C3		C4	
CHEMICAL	Method A[1]	Method B[2]	DMMU 6		DMMU 8		DMMU 9		DMMU 10	
Di-n-butyl phthalate	---	---	14	J	21		25		19	J
Di-n-octyl phthalate	---	---	1.7	U	1.7	U	1.7	U	1.9	U
Diethyl phthalate	---	---	2.6	J	3.3	J	3.4	J	2.3	J
Dimethyl phthalate	---	---	1	U	28		17		1.2	U
PHENOLS (ug/kg dry)										
2,4-Dimethylphenol	---	---	5.5	U	5.5	U	5.5	U	6.2	U
Pentachlorophenol	---	8,300	20	U	20	U	20	U	23	U
Phenol	---	---	2	U	2	U	2	U	2.3	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)										
Benzoic acid	---	---	96	U	96	U	96	U	110	U
Benzyl alcohol	---	---	2.1	U	18	J	16	J	2.4	U
Dibenzofuran	---	---	7.7	J	1.2	U	1.2	U	1.4	U
Hexachlorobutadiene	---	13,000	2.5	U	2.5	U	2.5	U	2.8	U
N-Nitrosodiphenylamine	---	200,000	1.6	U	1.6	U	1.6	U	1.8	U
PESTICIDES AND PCBs (ug/kg dry)										
Aldrin	---	59	0.16	U	0.16	U	0.16	U	0.16	U
Chlordane	---	2,900	0.12	U	0.12	U	0.12	U	0.12	U
Dieldrin	---	63	0.14	U	0.14	U	0.14	U	0.14	U
Heptachlor	---	220	0.12	U	0.12	U	0.12	U	0.12	U
Heptachlor epoxide	---	110	---		---		---		---	
Lindane	10	770	0.08	U	0.08	U	0.08	U	0.08	U
Total DDT	---	---	0.17	U	0.17	U	0.17	U	0.17	U
DDT	3,000	2,900	0.17	U	0.17	U	0.17	U	0.17	U
DDE	---	2,900	0.11	U	0.11	U	0.11	U	0.11	U
Total PCBs	1,000	500	2.1	U	2.1	U	2.1	U	2.1	U

[1]Soil, Method A, Unrestricted Land Use, Table Value

[2]Soil, Method B, Carcinogen, Standard Formula Value, Direct Contact (ingestion only), unrestricted land use

B = detected in the blank

J = estimated concentration

U = undetected

QL = laboratory qualifier