CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD **April 1, 2010**

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE PORT OF EVERETT PACIFIC TERMINAL, EVERETT, SNOHOMISH COUNTY, FOR UNCONFINED OPEN-WATER DISPOSAL AT THE PORT GARDNER NONDISPERSIVE SITE.

1. **Introduction**. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of up to 10,192 cubic yards (cy) of dredged material from Pacific Terminal for disposal at the Port Gardner nondispersive open-water site.

2. **Background**. Pacific Terminal, located in East Waterway, Everett (see Figure 1), is located on the site of a nearshore confined disposal facility (CDF) constructed in 1997. The Port of Everett needs to conduct maintenance dredging in the Pacific Terminal berthing area for the first time since construction of the CDF.

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

Table 1. Project Summary

Project ranking	High
Proposed dredging volume	10,192 cubic yards
Proposed dredging depth	-40 feet MLLW plus 2 feet overdepth
Final SAP received	September 24, 2009
SAP approved	October 6, 2009
Sampling date	December 1-2, 2009
Final data report received	March 25, 2010
DAIS Tracking number	POEPT-1-A-F-286
USACE Permit Application Number	NWS-2010-872
Recency Determination (high rank = 2 years)	December 2011

4. **Project Ranking and Sampling Requirements**. In a high-ranked area the number of samples and analyses are calculated using the following guidelines (DMMP, 2008a):
   - Maximum volume of sediment represented by each field sample = 4,000 cubic yards
   - Maximum volume of sediment represented by each analysis in the upper 4-feet of the dredging prism (surface sediment) = 4,000 cubic yards
   - Maximum volume of sediment represented by each analysis in the subsurface portion of the dredging prism = 12,000 cubic yards

The dredging prism included sediment as deep as 10 feet, but the majority of the shoaling was located at the wharf face, sloping steeply waterward from there. It would not have been practicable to dredge the upper 4-feet of material separately from the underlying sediment. Therefore, for the purpose of this characterization, all sediment was considered surface material. The dredging prism was divided into three dredged material management units (DMMUs), each represented by a composite of sediment from two core samples.

5. Sampling. Sampling took place December 1-2, 2009 using a vibracore sampler. Table 2 includes the coordinates of the sampling locations. The sampling plan called for sediment from mudline to -42 ft MLLW to be collected to represent the dredge prism and overdepth. However, in the case of sample D1SD02, the predicted tidal stage used to determine the mudline elevation deviated from the actual tidal stage and the sample was taken 1.8 feet deeper (mudline to -43.8 ft MLLW) than planned. In the case of D3SD02, rip rap was encountered at the target coordinates, so the sampling station was moved approximately 20 feet. The mudline elevation at the new location was 2.0 feet deeper than at the original target location. Rather than adjust the sediment sampling depth to account for the change in mudline elevation, the field crew mistakenly collected the sample from the same depth interval (relative to mudline) called for in the sampling plan. This resulted in the sample being taken 2.0 feet deeper (mudline to -44.0 ft MLLW) than planned.

Table 2. Sampling Coordinates

DMMU	Volume (cy)	Sampling Location	Longitude	Latitude
1	3,702	D1SD01	-122.224674	47.976974
		D1SD02	-122.224387	47.977205
2	3,237	D2SD01	-122.223906	47.977510
		D2SD02	-122.224156	47.977376
3	3,253	D3SD01	-122.223024	47.978106
		D3SD02	-122.223540	47.977760

6. Chemical Analysis. The approved analysis plan (CH2M Hill, 2009) was followed - with the exception of dioxin (see below) - and quality control guidelines specified by the PSEP and DMMP programs were generally met. The sediment conventional and chemistry results can be found in Table 3. The three DMMUs can be identified in Table 3 as follows. The other entries in the table are for individual core samples that made up the composites.

D1SD38-42-100 = DMMU 1
D1SD38-42-200 = DMMU 1 (field duplicate)
D2SD37-42-100 = DMMU 2
D3SD37-42-100 = DMMU 3

The grain-size data show that the proposed dredged material is predominantly sand, with the fines fraction ranging from 10 to 21 percent. The total organic carbon concentration (TOC) ranged from 0.17 to 0.69 percent. The chemical results indicated that there were no exceedances of screening levels for the standard DMMP chemicals of concern. The DMMP agencies also required tributyltin (TBT) and resin acids to be analyzed. Due to the coarse-grained nature of the dredged material, porewater extraction for TBT analysis was not possible. Bulk TBT was analyzed instead, with

concentrations ranging from 1.1 to 7.9 parts per billion (ppb). These were all well below the bulk-sediment screening level of 73.2 ppb. A number of resin acids were detected, but were below concentrations that would be expected to cause toxicity in benthic organisms (CH2M Hill, 2010). Because all chemicals were below screening levels or were present at concentrations not expected to cause toxicity, bioassays were not required.

Dioxins were also analyzed, with concentrations ranging from 0.36 to 1.74 parts per trillion (pptr) toxicity equivalents (TEQ, with undetects = ½ detection limit). It should be noted that EPA method 8290 was used for the dioxin analysis instead of EPA method 1613b as called for in the analysis plan. Also, the standard reference material NIST 1944 was to be analyzed, but due to a communication failure within the lab, this analysis was not conducted. However, the dioxin data underwent level 3 validation by the CH2M Hill QA officer and all QA results were within acceptable ranges. So despite the deviations from the analysis plan, the DMMP agencies deemed the dioxin data acceptable for use in decision-making.

7. Sediment Exposed by Dredging. Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 1995) or the State's antidegradation standard (DMMP, 2008b). Comparison of the proposed dredged material to SQS serves as a first-tier indicator for this purpose. Table 3 shows that there were no detected exceedances of SQS. However - while undetected - the reporting limits for 1,2,4-trichorobenzene and hexachlorobenzene exceeded SQS for DMMU 3. But given that the TOC content for DMMU 3 was only 0.17 percent, and that the Department of Ecology does not recommend carbon-normalization when TOC is below 0.5 percent, the DMMP agencies believe the probability that these chemicals are actually present at concentrations above SQS is low. Therefore, the reporting-limit exceedances were deemed insignificant and the agencies agreed that there was no need for analysis of Z-samples for this project. The sediment that will be exposed by dredging is not anticipated to have any exceedances of SQS and is, therefore, in compliance with the State of Washington anti-degradation policy.

8. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from Pacific Terminal for open-water disposal. The approved sampling and analysis plan was followed, with the exceptions noted previously. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

   There were no SL exceedances for standard DMMP chemicals of concern or TBT. Therefore, with respect to these chemicals, the dredged material is suitable for open-water disposal. Resin acid concentrations were also below levels of concern. With regard to dioxin, in 2007 the DMMP agencies formulated interim disposal guidelines for each of the nondispersive disposal sites in Puget Sound. The interim guidelines include a maximum concentration for each site. Any DMMU with a concentration above this maximum value is considered unsuitable for open-water disposal. The interim guidelines also include a mean concentration for each site. The mean concentration of all DMMUs proposed for disposal from a project must be less than the site mean. For the Port Gardner site, the maximum concentration is 5.2 pptr TEQ and the mean concentration is 4.1 pptr TEQ. The dioxin concentrations for the Pacific Terminal DMMUs were all below both the mean and maximum concentration for the Port Gardner site. Therefore, with respect to dioxin, the dredged material is suitable for disposal at the Port Gardner site.

The sampling of deeper material at D1SD02 and D3SD02 is not likely to have affected the characterization significantly. In both DMMUs 1 and 3, approximately 80 percent of the sample was taken from within the dredge prism. The remaining 20% was from sediment beyond the dredge prism. Assuming that the material beyond the dredge prism was pristine (i.e. zero concentration of chemicals of concern) the actual chemical concentrations in the dredged material would be 1.25 times the concentrations found in Table 3. Application of this multiplier results in concentrations that are still far below the DMMP screening levels.

In summary, based on the results of the previously described testing, the DMMP agencies conclude that all 10,192 cubic yards from the Pacific Terminal project are suitable for open-water disposal at the Port Gardner non-dispersive site.

This suitability determination does ***not*** constitute final agency approval of the project. During the public comment period that follows a public notice, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

A pre-dredge meeting with DNR, Ecology and the Corps of Engineers is required at least 7 days prior to dredging. A dredging quality control plan must be developed and submitted to the Regulatory Branch of the Seattle District Corps of Engineers at least 7 days prior to the pre-dredge meeting. A DNR site use authorization must also be acquired. Disposal at the Port Gardner site must be by bottom-dump barge.

9. References.

CH2M Hill, 2009. *Sampling and Analysis Plan for Dredged Material Characterization – Port of Everett Pacific Terminal.* Prepared by CH2M Hill, Portland, Oregon for the Port of Everett, September 2009.

CH2M Hill, 2010. *Dredged Material Characterization Report – Pacific Terminal.* Prepared by CH2M Hill, Portland, Oregon for the Port of Everett, March 2010.

DMMP, 2008a. *Dredged Material Evaluation and Disposal Procedures (Users Manual)*. Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, July 2008.

DMMP, 2008b. *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.

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

10. Agency Signatures.

Concur:

4/1/10 David F. Fox
Date David Fox - Seattle District Corps of Engineers

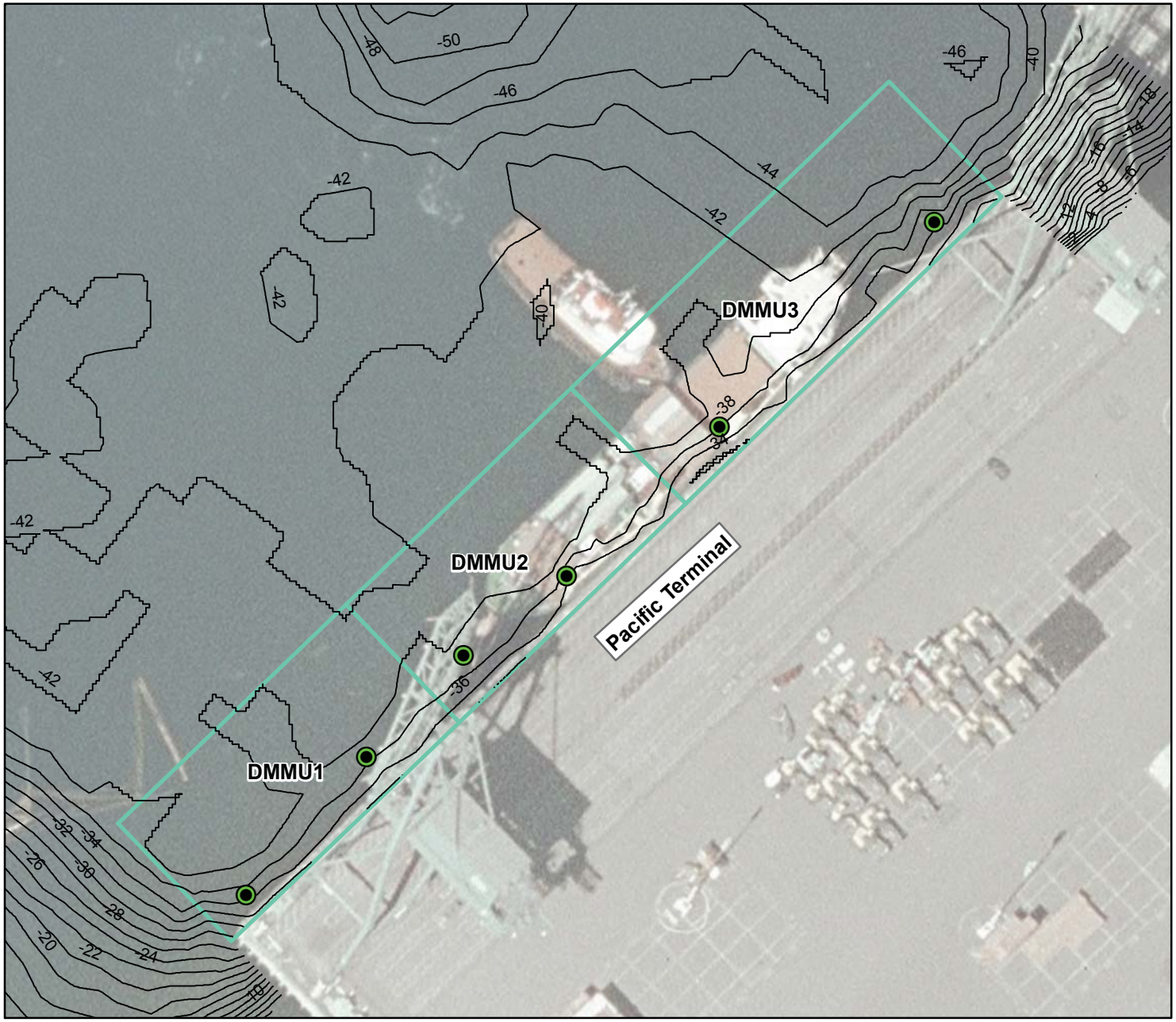
4/1/10 Justine S. Barton
Date Justine Barton - Environmental Protection Agency

04/01/10 Laura Inouye
Date Laura Inouye, Ph.D. - Washington Department of Ecology

4/1/2010 David Vagt
Date David Vagt - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Erin Legge – Seattle District Regulatory
Carrie Andrews – CH2M Hill
Graham Anderson – Port of Everett



VICINITY MAP

LEGEND

- Core Location
- 2-foot Bathymetric Contour
- Proposed Dredging Boundary
- USA Prime Imagery

N

0 50 100 Feet

FIGURE 1

Pacific Terminal Dredge Material Management Units and Core Location

Port of Everett, Washington

Everett, Washington

UPI#644477-09-01

CH2MHILL

\\ROSA\PROJ\EVERETTWAPORTOF\356933\GIS\MAPFILES\DREDGEMMU_CORELOCS.MXD PGRONLI 3/18/2010 13:43:14

TABLE 3 (Table 6-1 from CH2M Hill, 2010)

Analytical Results for Sediment Samples
Port of Everett

Chem	Screening Criteria[1] SL	BT	ML	SQS	D1SD01-3742-101	D1SD01-3742-201	D1SD01-4243-101	D1SD01-4243-201	D1SD02-3842-102	D1SD02-4243-102	D1SD3842-100		D1SD3842-200		D2SD01-3742-101	D2SD01-4243-101	D2SD02-3742-102
Sample ID:					D1SD01-3742-101	D1SD01-3742-201	D1SD01-4243-101	D1SD01-4243-201	D1SD02-3842-102	D1SD02-4243-102	D1SD3842-100		D1SD3842-200		D2SD01-3742-101	D2SD01-4243-101	D2SD02-3742-102
Sample Type:*					N	FD	N	FD	N	N	N	OC-normalized**	FD	OC-normalized**	N	N	N
Date Collected:					12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009		12/2/2009		12/1/2009	12/1/2009	12/1/2009
CONVENTIONAL																	
Percent Solids (%)	--	--	--	--							**73**		**73.6**				
Total Volatile Solids (%)	--	--	--	--							**2.3**		**2.9**				
Total Organic Carbon (%)	--	--	--	--							**0.549**		**0.792**				
Percent Solids (%)	--	--	--	--	**72.8**	**68.7**	**79.3**	**76.5**	**82.8**	**67.8**	**73**		**74.1**		**76.4**	**80.3**	**62.4**
Sulfide (mg/kg)	--	--	--	--	**28.4**	**63.2**	**10.2**	**2.42**	**2.42**	**16.1**	**37**		**6.8**		**15.6**	**10.6**	**322**
Ammonia-N (mg/kg)	--	--	--	--	**1.52**	**1.73**	**1.01**	**1.04**	**2.89**	**0.86**	**1.57**		**1.64**		**1.59**	**0.60 J**	**5.92**
GRAIN SIZE (percent passing)																	
Gravel - Seive size: No. 3/4" (19.0 mm)	--	--	--	--							**100**		**100**				
Gravel - Seive size: No. 3/8" (9.50 mm)	--	--	--	--							**100**		**100**				
Gravel, Medium - Seive size: No. 4 (4.75 mm)	--	--	--	--							**99.5**		**99.2**				
Gravel, Fine - Seive size: No. 10 (2.00 mm)	--	--	--	--							**99.2**		**98.8**				
Sand, Very Coarse - Seive size: No. 20 (0.850 mm)	--	--	--	--							**98.2**		**97.5**				
Sand, Coarse - Seive size: No. 40 (0.425 mm)	--	--	--	--							**94**		**90.7**				
Sand, Medium - Seive size: No. 60 (0.250 mm)	--	--	--	--							**59.1**		**51.6**				
Sand, Fine - Seive size: No. 140 (0.106 mm)	--	--	--	--							**20.8**		**18.1**				
Sand, Very Fine - Seive size: No. 200 (0.0750 mm)	--	--	--	--							**14.7**		**13**				
Silt - Particle diameter: 0.074 mm	--	--	--	--							**14.9**		**13.1**				
Clay - Particle diameter: 00.005 mm	--	--	--	--							**5.42**		**3.77**				
Clay - Particle diameter: 00.001 mm	--	--	--	--							**0**		**0**				
METALS (mg/kg)																	
Antimony	150	--	200	--							**0.036**	**J**	**0.045**	**J**			
Arsenic	57	507.1	700	57							**3.11**	**J**	**3.10**	**J**			
Cadmium	5.1	11.3	14	5.1							**0.168**	**J**	**0.155**	**J**			
Chromium	--	267	--	260							**21.7**		**20.1**				
Copper	390	1,027	1,300	390							**12.2**		**12.3**				
Lead	450	975	1,200	450							**3.530**		**3.570**				
Mercury	0.41	1.5	2.3	0.41							**0.014**	**J**	**0.012**	**J**			
Nickel	140	370	370	--							**24.7**		**23.9**				
Selenium	--	3	--	--							**0.2**	**J**	0.2	U			
Silver	6.1	6.1	8.4	6.1							**0.035**		**0.028**				
Zinc	410	2,783	3,800	410							**27.6**	**J**	**29.5**	**J**			
ORGANOMETALLIC COMPOUNDS (µg/kg)																	
Tri-n-butyltin Cation	73.2	--	--	--							**2.2**	**P**	**1.7**				
ORGANICS (µg/kg)																	
Total LPAH (sum of LPAH chems)	5,200	--	29,000	370,000**							**156.1**	**28,434**	**91.3**	**11,528**			
Naphthalene	2,100	--	2,400	99,000**							**40**	**7,286**	**22**	**2,778**			
Acenaphthylene	560	--	1,300	66,000**							**8.1**	**1,475**	**3.7**	**467 J**			
Acenaphthene	500	--	2,000	16,000**							**14**	**2,550**	**9.6**	**1,212**			
Fluorene	540	--	3,600	23,000**							**18**	**3,279**	**11**	**1,389**			
Phenanthrene	1,500	--	21,000	100,000**							**51**	**9,290**	**32**	**4,040**			
Anthracene	960	--	13,000	220,000**							**25**	**4,554**	**13**	**1,641**			
2-Methylnaphthalene	670	--	1,900	38,000**							**13**	**2,368**	**6.7**	**846**			
Total HPAH (sum of HPAH chems)	12,000	--	69,000	960,000**							**650.7**	**118,525**	**211.9**	**26,755**			
Fluoranthene	1,700	4,600	30,000	160,000**							**200**	**36,430 J**	**47**	**5,934 J**			
Pyrene	2,600	11,980	16,000	1,000,000**							**160**	**29,144 J**	**58**	**7,323 J**			
Benzo (A) Anthracene	1,300	--	5,100	110,000**							**47**	**8,561**	**19**	**2,399**			
Chrysene	1,400	--	21,000	110,000**							**87**	**15,847**	**27**	**3,409**			
Total Benzofluoranthenes[2]	3,200	--	9,900	230,000**							**88**	**16,029**	**29.8**	**3,763**			
Benzo (a) Pyrene	1,600	--	3,600	99,000**							**31**	**5,647 J**	**13**	**1,641 J**			
Indeno (1,2,3-C,D) Pyrene	600	--	4,400	34,000**							**17**	**3,097 J**	**8.1**	**1,023 J**			
Dibenzo (a,h) Anthracene	230	--	1,900	12,000**							**4.7**	**856 J**	**2.7**	**341 J**			
Benzo(g,h,i) Perylene	670	--	3,200	31,000**							**16**	**2,914**	**7.3**	**922**			
CHLORINATED HYDROCARBONS (ug/kg)																	
1,2-Dichlorobenzene	35	--	110	2,300**							2.9	528 U	2.9	366 U			
1,3-Dichlorobenzene	170	--	--	--							3.0	U	3.0	U			
1,4-Dichlorobenzene	110	--	120	3,100**							2.9	528 U	2.9	366 U			
1,2,4-Trichlorobenzene	31	--	64	810**							2.6	474 U	2.6	328 U			
Hexachlorobenzene	22	168	230	380**							1.2	219 U	1.2	152 U			
PHTHALATES (ug/kg)																	
Dimethyl Phthalate	71	--	1,400	53,000**							**1.8**	**328 J**	**1.5**	**189 J**			
Diethyl Phthalate	200	--	1,200	61,000**							1.3	237 U	1.3	164 U			
DI-N-Butylphthalate	1,400	--	5,100	220,000**							7.9	1,439 U	7.9	997 U			
Butyl Benzylphthalate	63	--	970	4,900**							3.2	583 U	**4.6**	**581 J**			

TABLE 3 (Table 6-1 from CH2M Hill, 2010)

Analytical Results for Sediment Samples
Port of Everett

Sample ID:					D1SD01-3742-101	D1SD01-3742-201	D1SD01-4243-101	D1SD01-4243-201	D1SD02-3842-102	D1SD02-4243-102	D1SD3842-100		D1SD3842-200		D2SD01-3742-101	D2SD01-4243-101	D2SD02-3742-102
Sample Type:*					N	FD	N	FD	N	N	N	OC-normalized**	FD	OC-normalized**	N	N	N
Date Collected:					12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009		12/2/2009		12/1/2009	12/1/2009	12/1/2009
	Screening Criteria[1]																
Chem	SL	BT	ML	SQS													
Bis (2-Ethylhexyl) Phthalate	1,300	--	8,300	47,000**							**10**	**1,821 J**	**13**	**1,641 J**			
DI-N-Octylphthalate	6,200	--	6,200	58,000**							1.7	310 UJ	1.7	215 UJ			
PHENOLS (ug/kg)																	
Phenol	420	--	1,200	420							**7.1**	**J**	**4.7**	**J**			
2-Methylphenol	63	--	77	63							1.5	U	1.5	U			
4-Methylphenol	670	--	3,600	670							**11**		**4.8**	**J**			
2,4-Dimethylphenol	29	--	210	29							5.5	U	5.5	U			
Pentachlorophenol	400	504	690	360							20	UJ	20	UJ			
MISCELLANEOUS EXTRACTABLES (ug/kg)																	
Benzyl Alcohol	57	--	870	57							2.1	UJ	2.1	UJ			
Benzoic Acid	650	--	760	650							**98**	**J**	96	UJ			
Dibenzufuran	540	--	1,700	15,000**							**18**	**3,279**	**11**	**1,389**			
Hexachloroethane	1,400	--	14,000	--							3.1	U	3.1	U			
Hexachlorobutadiene	29	--	270	3,900**							2.5	455 U	2.5	316 U			
N-Nitrosodiphenylamine	28	--	130	11,000**							1.6	291 U	1.6	202 U			
VOLATILE ORGANICS (ug/kg)																	
Trichloroethene (TCE)	160	--	1,600	--							0.32	U	0.34	U			
Tetrachloroethene (PCE)	57	--	210	--							0.31	U	0.33	U			
Ethylbenzene	10	--	50	--							0.26	U	0.28	U			
Toluene	--	--	--	--							0.22	U	0.23	U			
Total Xylene (sum of o-, m-, p-)	40	--	160	--							**0.44**		**0.46**				
PESTICIDES & PCBs (ug/kg)																	
Total DDT (sum of 4,4-DDD, 4,4-DDE, and 4,4-DDT)[3]	6.9	50	69	--							**0.17**		**0.99**				
2,4'-DDE	--	--	--	--							0.16	U	0.99	Ui			
O,P'-DDD	--	--	--	--							0.13	U	0.13	U			
O,P'-DDT	--	--	--	--							0.12	Ui	0.18	Ui			
Aldrin	10	--	--	--							0.16	U	0.16	U			
Total Chlordane[2]	10	37	--	--							**0.12**		**0.99**				
Dieldrin	10	--	--	--							0.14	U	0.14	U			
Heptachlor	10	--	--	--							0.12	U	0.12	U			
Gamma-BHC (Lindane)	10	--	--	--							0.080	U	0.99	Ui			
Total PCBs[3]	130	38,000**	3,100	12,000**							**2.1**	**383**	**2.1**	**265**			
RESIN AND FATTY ACIDS (mg/kg)																	
12-Chlorodehydroabietic Acid	--	--	--								**0.012**	**J**	0.0097	U			
14-Chlorodehydroabietic Acid	--	--	--								0.0088	U	0.0087	U			
3,4,5-Trichloroguaiacol	--	--	--								0.017	U	0.017	U			
4,5,6-Trichloroguaiacol	--	--	--								0.2	U	0.2	U			
9,10-Dichlorostearic Acid	--	--	--								0.032	U	0.032	U			
Abietic Acid	--	--	--								**0.75**		**0.17**				
Dehydroabietic Acid	--	--	--								**0.77**		**0.39**				
Dichlorodehydroabietic Acid	--	--	--								0.018	U	0.018	U			
Isopimaric Acid	--	--	--								**0.048**	**J**	**0.045**	**J**			
Linoleic Acid	--	--	--								**0.049**	**J**	0.028	U			
Neoabietic Acid	--	--	--								0.05	U	0.05	U			
Oleic Acid/Linolenic Acid	--	--	--								**0.32**		**0.30**				
Palustric Acid	--	--	--								0.05	U	0.05	U			
Pimaric Acid	--	--	--								0.02	U	0.02	U			
Sandracopimaric Acid	--	--	--								0.05	U	0.05	U			
DIOXINS (ng/kg)																	
2,3,7,8-TCDD	--	--	--	--							0.0239	U	0.0211	U			
1,2,3,7,8-PECDD	--	--	--	--							**0.0851**	**J**	**0.174**	**JK**			
1,2,3,4,7,8-HXCDD	--	--	--	--							**0.0646**	**JK**	**0.175**	**JK**			
1,2,3,6,7,8-HXCDD	--	--	--	--							**0.293**	**J**	**0.473**	**J**			
1,2,3,7,8,9-HXCDD	--	--	--	--							**0.213**	**JK**	**0.398**	**JK**			
1,2,3,4,6,7,8-HPCDD	--	--	--	--							**5.98**	**B**	**12.6**	**B**			
1,2,3,4,6,7,8,9-OCDD	--	--	--	--							**43.6**	**B**	**103**	**B**			
2,3,7,8-TCDF	--	--	--	--							**0.953**	**J**	**1.57**				
1,2,3,7,8-PECDF	--	--	--	--							**0.0369**	**JK**	**0.212**	**JP**			
2,3,4,7,8-PECDF	--	--	--	--							**0.0369**	**JK**	**0.275**	**J**			
1,2,3,4,7,8-HXCDF	--	--	--	--							**0.126**	**J**	**0.282**	**J**			
1,2,3,6,7,8-HXCDF	--	--	--	--							**0.0573**	**JK**	**0.165**	**J**			
2,3,4,6,7,8-HXCDF	--	--	--	--							0.0299	U	**0.178**	**JK**			
1,2,3,7,8,9-HXCDF	--	--	--	--							0.0328	U	0.0509	U			

TABLE 3 (Table 6-1 from CH2M Hill, 2010)

Analytical Results for Sediment Samples
Port of Everett

Sample ID:					D1SD01-3742-101	D1SD01-3742-201	D1SD01-4243-101	D1SD01-4243-201	D1SD02-3842-102	D1SD02-4243-102	D1SD3842-100		D1SD3842-200		D2SD01-3742-101	D2SD01-4243-101	D2SD02-3742-102
Sample Type:*					N	FD	N	FD	N	N	N	OC-normalized**	FD	OC-normalized**	N	N	N
Date Collected:					12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009	12/2/2009		12/2/2009		12/1/2009	12/1/2009	12/1/2009
	Screening Criteria[1]																
Chem	SL	BT	ML	SQS													
1,2,3,4,6,7,8-HPCDF	--	--	--	--							**0.696**	**J**	**1.53**	**J**			
1,2,3,4,7,8,9-HPCDF	--	--	--	--							0.0471	U	0.0747	U			
Octachlorodibenzofuran (OCDF)	--	--	--	--							**1.45**	**J**	**5.29**	**J**			
TETRACHLORODIBENZO-P-DIOXINS (TCDD), TOTAL	--	--	--	--							**4.71**		**7.01**				
PENTACHLORODIBENZO-P-DIOXIN (PECDD), TOTAL	--	--	--	--							**3.92**		**5.43**				
HEXACHLORODIBENZO-P-DIOXINS (HXCDD), TOTAL	--	--	--	--							**4.86**		**7.8**				
HEPTACHLORODIBENZO-P-DIOXINS (HPCDD), TOTAL	--	--	--	--							**23.7**		**47.3**				
TETRACHLORODIBENZOFURANS (TCDF), TOTAL	--	--	--	--							**2.74**		**8.12**				
PENTACHLORODIBENZOFURANS (PECDF), TOTAL	--	--	--	--							0.0207	U	**2.33**	**J**			
HEXACHLORODIBENZOFURANS (HXCDF), TOTAL	--	--	--	--							**1.07**	**J**	**2.46**	**J**			
HEPTACHLORODIBENZOFURANS (HPCDF), TOTAL	--	--	--	--							**2.08**	**J**	**5.37**				
TEQ (non-detected = 1/2 detection limit)[4]	--	4.1/5.2[5]	--	--							**0.364**		**0.774**				
TEQ (non-detected = 0)*	--	4.1/5.2[5]	--	--							**0.348**		**0.761**				

TABLE 3 (Table 6-1 from CH2M Hill, 2010)

Analytical Results for Sediment Samples
Port of Everett

Sample ID:					D2SD02-4243-102	D2SD3742-100		D3SD01-3742-101	D3SD01-4243-101	D3SD02-3742-102	D3SD02-4243-102	D3SD3742-100		REF1SP01-01
Sample Type:*					N	N	OC-normalized**						OC-normalized**	
Date Collected:					12/1/2009	12/1/2009		12/1/2009	12/1/2009	12/1/2009	12/1/2009	12/1/2009		12/2/2009
	Screening Criteria[1]													
Chem	SL	BT	ML	SQS										
CONVENTIONAL														
Percent Solids (%)	--	--	--	--		**68.7**						**76.3**		
Total Volatile Solids (%)	--	--	--	--		**2.4**						**3.8**		**80.8**
Total Organic Carbon (%)	--	--	--	--		**0.692**						**0.174**		**0.379**
Percent Solids (%)	--	--	--	--	**79.1**	**73**		**78.6**	**87.8**	**79.6**	**83.7**	**72.7**		**72.7**
Sulfide (mg/kg)	--	--	--	--	**13.7**	**87**		**4.61**	**4.93**	**7.69**	**7.68**	**27**		**9.8**
Ammonia-N (mg/kg)	--	--	--	--	**0.88**	**12.1**		**1.66**	**1.13**	**2.50**	**0.83**	**3.02**		**1.5**
GRAIN SIZE (percent passing)														
Gravel - Seive size: No. 3/4" (19.0 mm)	--	--	--	--		**100**						**100**		**100**
Gravel - Seive size: No. 3/8" (9.50 mm)	--	--	--	--		**100**						**96**		**100**
Gravel, Medium - Seive size: No. 4 (4.75 mm)	--	--	--	--		**99.6**						**95.7**		**100**
Gravel, Fine - Seive size: No. 10 (2.00 mm)	--	--	--	--		**98**						**91.7**		**100**
Sand, Very Coarse - Seive size: No. 20 (0.850 mm)	--	--	--	--		**89.8**						**78.5**		**99.2**
Sand, Coarse - Seive size: No. 40 (0.425 mm)	--	--	--	--		**66**						**44.4**		**85.3**
Sand, Medium - Seive size: No. 60 (0.250 mm)	--	--	--	--		**36.9**						**12.9**		**46.3**
Sand, Fine - Seive size: No. 140 (0.106 mm)	--	--	--	--		**15.5**						**5.56**		**13.2**
Sand, Very Fine - Seive size: No. 200 (0.0750 mm)	--	--	--	--		**12.1**						**4.75**		**9.25**
Silt - Particle diameter: 0.074 mm	--	--	--	--		**11.6**						**5.71**		**12.1**
Clay - Particle diameter: 00.005 mm	--	--	--	--		**2.24**						**4.28**		**8.55**
Clay - Particle diameter: 00.001 mm	--	--	--	--		**0**						**3.43**		**6.45**
METALS (mg/kg)														
Antimony	150	--	200	--		**0.029**	**J**					**0.035**	**J**	
Arsenic	57	507.1	700	57		**3.67**	**J**					**2.05**	**J**	
Cadmium	5.1	11.3	14	5.1		**0.218**	**J**					**0.084**	**J**	
Chromium	--	267	--	260		**20.6**						**21.8**		
Copper	390	1,027	1,300	390		**13**						**13.8**		
Lead	450	975	1,200	450		**8.900**						**2.170**		
Mercury	0.41	1.5	2.3	0.41		**0.021**						**0.008**	**J**	
Nickel	140	370	370	--		**23.5**						**24.0**		
Selenium	--	3	--	--		**0.2**	**J**					0.2	U	
Silver	6.1	6.1	8.4	6.1		**0.036**						**0.017**	**J**	
Zinc	410	2,783	3,800	410		**28.6**	**J**					**27.0**	**J**	
ORGANOMETALLIC COMPOUNDS (µg/kg)														
Tri-n-butyltin Cation	73.2	--	--	--		**7.9**						**1.1**	**J**	
ORGANICS (µg/kg)														
Total LPAH (sum of LPAH chems)	5,200	--	29,000	370,000**		**235.6**	**34,046**					**55.1**	**31,667**	
Naphthalene	2,100	--	2,400	99,000**		**44**	**6,358**					**7.5**	**4,310**	
Acenaphthylene	560	--	1,300	66,000**		**8.6**	**1,243**					**2.7**	**1,552 J**	
Acenaphthene	500	--	2,000	16,000**		**22**	**3,179**					**3.5**	**2,011 J**	
Fluorene	540	--	3,600	23,000**		**30**	**4,335**					**5.4**	**3,103**	
Phenanthrene	1,500	--	21,000	100,000**		**83**	**11,994**					**25**	**14,368**	
Anthracene	960	--	13,000	220,000**		**48**	**6,936**					**11**	**6,322**	
2-Methylnaphthalene	670	--	1,900	38,000**		**17**	**2,457**					**3**	**1,724 J**	
Total HPAH (sum of HPAH chems)	12,000	--	69,000	960,000**		**713.6**	**103,121**					**205.1**	**117,874**	
Fluoranthene	1,700	4,600	30,000	160,000**		**180**	**26,012 J**					**57**	**32,759 J**	
Pyrene	2,600	11,980	16,000	1,000,000**		**190**	**27,457 J**					**55**	**31,609 J**	
Benzo (A) Anthracene	1,300	--	5,100	110,000**		**68**	**9,827**					**17**	**9,770**	
Chrysene	1,400	--	21,000	110,000**		**100**	**14,451**					**29**	**16,667**	
Total Benzofluoranthenes[2]	3,200	--	9,900	230,000**		**92**	**13,295**					**26.8**	**15,402**	
Benzo (a) Pyrene	1,600	--	3,600	99,000**		**41**	**5,925 J**					**10**	**5,747 J**	
Indeno (1,2,3-C,D) Pyrene	600	--	4,400	34,000**		**20**	**2,890 J**					**5.5**	**3,161 J**	
Dibenzo (a,h) Anthracene	230	--	1,900	12,000**		**4.6**	**665 J**					1.5	862 U	
Benzo(g,h,i) Perylene	670	--	3,200	31,000**		**18**	**2,601**					**4.8**	**2,759 J**	
CHLORINATED HYDROCARBONS (ug/kg)														
1,2-Dichlorobenzene	35	--	110	2,300**		2.9	419 U					2.9	1,667 U	
1,3-Dichlorobenzene	170	--	--	--		3.0	U					3	U	
1,4-Dichlorobenzene	110	--	120	3,100**		2.9	419 U					2.9	1,667 U	
1,2,4-Trichlorobenzene	31	--	64	810**		2.6	376 U					2.6	1,494 U	
Hexachlorobenzene	22	168	230	380**		1.2	173 U					1.2	690 U	
PHTHALATES (ug/kg)														
Dimethyl Phthalate	71	--	1,400	53,000**		**1.7**	**246 J**					**1.9**	**1,092 J**	
Diethyl Phthalate	200	--	1,200	61,000**		1.3	188 U					1.3	747 U	
DI-N-Butylphthalate	1,400	--	5,100	220,000**		7.9	1,142 U					7.9	4,540 U	
Butyl Benzylphthalate	63	--	970	4,900**		3.2	462 U					3.2	1,839 U	

TABLE 3 (Table 6-1 from CH2M Hill, 2010)

Analytical Results for Sediment Samples
Port of Everett

Sample ID:					D2SD02-4243-102	D2SD3742-100		D3SD01-3742-101	D3SD01-4243-101	D3SD02-3742-102	D3SD02-4243-102	D3SD3742-100		REF1SP01-01
Sample Type:*					N	N	OC-normalized**						OC-normalized**	
Date Collected:					12/1/2009	12/1/2009		12/1/2009	12/1/2009	12/1/2009	12/1/2009	12/1/2009		12/2/2009
	Screening Criteria[1]													
Chem	SL	BT	ML	SQS										
Bis (2-Ethylhexyl) Phthalate	1,300	--	8,300	47,000**		**20**	**2,890 J**					**11**	**6,322 J**	
DI-N-Octylphthalate	6,200	--	6,200	58,000**		1.7	246 UJ					**1.7**	977 UJ	
PHENOLS (ug/kg)														
Phenol	420	--	1,200	420		**7.4**	**J**					**4.4**	**J**	
2-Methylphenol	63	--	77	63		1.5	U					1.5	U	
4-Methylphenol	670	--	3,600	670		**14**						1.5	U	
2,4-Dimethylphenol	29	--	210	29		5.5	U					5.5	U	
Pentachlorophenol	400	504	690	360		20	UJ					20	UJ	
MISCELLANEOUS EXTRACTABLES (ug/kg)														
Benzyl Alcohol	57	--	870	57		2.1	UJ					2.1	UJ	
Benzoic Acid	650	--	760	650		96	UJ					96	UJ	
Dibenzufuran	540	--	1,700	15,000**		**27**	**3,902**					**4.8**	**2,759 J**	
Hexachloroethane	1,400	--	14,000	--		3.1	U					3.1	U	
Hexachlorobutadiene	29	--	270	3,900**		2.5	361 U					2.5	1,437 U	
N-Nitrosodiphenylamine	28	--	130	11,000**		1.6	231 U					1.6	920 U	
VOLATILE ORGANICS (ug/kg)														
Trichloroethene (TCE)	160	--	1,600	--		0.35	U					0.34	U	
Tetrachloroethene (PCE)	57	--	210	--		0.34	U					0.33	U	
Ethylbenzene	10	--	50	--		0.29	U					0.28	U	
Toluene	--	--	--	--		0.24	U					0.23	U	
Total Xylene (sum of o-, m-, p-)	40	--	160	--		**0.48**						**0.47**		
PESTICIDES & PCBs (ug/kg)														
Total DDT (sum of 4,4-DDD, 4,4-DDE, and 4,4-DDT)[3]	6.9	50	69	--		**1.0**						**0.17**		
2,4'-DDE	--	--	--	--		0.16	U					0.16	U	
O,P'-DDD	--	--	--	--		0.13	U					0.13	U	
O,P'-DDT	--	--	--	--		1.0	Ui					0.058	U	
Aldrin	10	--	--	--		0.16	U					0.16	U	
Total Chlordane[2]	10	37	--	--		**1.0**						**0.12**		
Dieldrin	10	--	--	--		0.14	U					0.14	U	
Heptachlor	10	--	--	--		0.12	U					0.12	U	
Gamma-BHC (Lindane)	10	--	--	--		1.0	Ui					0.08	U	
Total PCBs[3]	130	38,000**	3,100	12,000**		**2.1**	**303**					**2.1**	**1,207**	
RESIN AND FATTY ACIDS (mg/kg)														
12-Chlorodehydroabietic Acid	--	--	--			**0.017**	**J**					0.0098	U	
14-Chlorodehydroabietic Acid	--	--	--			0.0086	U					0.0088	U	
3,4,5-Trichloroguaiacol	--	--	--			0.017	U					0.017	U	
4,5,6-Trichloroguaiacol	--	--	--			0.2	U					0.2	U	
9,10-Dichlorostearic Acid	--	--	--			0.032	U					0.032	U	
Abietic Acid	--	--	--			**1.8**						**0.068**		
Dehydroabietic Acid	--	--	--			**2.5**	**D**					**0.16**		
Dichlorodehydroabietic Acid	--	--	--			0.018	U					0.018	U	
Isopimaric Acid	--	--	--			**0.12**						**0.019**	**J**	
Linoleic Acid	--	--	--			**0.051**						**0.047**	**J**	
Neoabietic Acid	--	--	--			0.049	U					0.05	U	
Oleic Acid/Linolenic Acid	--	--	--			**0.61**						**0.18**	**J**	
Palustric Acid	--	--	--			0.049	U					0.05	U	
Pimaric Acid	--	--	--			0.02	U					0.02	U	
Sandracopimaric Acid	--	--	--			**0.082**						0.05	U	
DIOXINS (ng/kg)														
2,3,7,8-TCDD	--	--	--	--		**0.206**	**JK**					**0.0656**	**JK**	
1,2,3,7,8-PECDD	--	--	--	--		**0.414**	**J**					**0.0889**	**JK**	
1,2,3,4,7,8-HXCDD	--	--	--	--		**0.391**	**J**					0.0757	U	
1,2,3,6,7,8-HXCDD	--	--	--	--		**0.961**	**J**					**0.162**	**JK**	
1,2,3,7,8,9-HXCDD	--	--	--	--		**1.06**	**J**					0.0717	U	
1,2,3,4,6,7,8-HPCDD	--	--	--	--		**22.9**	**B**					**4.83**	**B**	
1,2,3,4,6,7,8,9-OCDD	--	--	--	--		**159**	**B**					**35.5**	**B**	
2,3,7,8-TCDF	--	--	--	--		**2.53**						**0.774**	**J**	
1,2,3,7,8-PECDF	--	--	--	--		**0.462**	**J**					**0.0776**	**J**	
2,3,4,7,8-PECDF	--	--	--	--		**0.654**	**J**					0.0318	U	
1,2,3,4,7,8-HXCDF	--	--	--	--		**0.488**	**J**					**0.0885**	**JK**	
1,2,3,6,7,8-HXCDF	--	--	--	--		**0.218**	**JK**					**0.0537**	**JK**	
2,3,4,6,7,8-HXCDF	--	--	--	--		**0.316**	**J**					0.0307	U	
1,2,3,7,8,9-HXCDF	--	--	--	--		0.0345	U					0.0338	U	

TABLE 3 (Table 6-1 from CH2M Hill, 2010)

Analytical Results for Sediment Samples
Port of Everett

Sample ID:					D2SD02-4243-102	D2SD3742-100		D3SD01-3742-101	D3SD01-4243-101	D3SD02-3742-102	D3SD02-4243-102	D3SD3742-100		REF1SP01-01
Sample Type:*					N	N	OC-normalized**						OC-normalized**	
Date Collected:					12/1/2009	12/1/2009		12/1/2009	12/1/2009	12/1/2009	12/1/2009	12/1/2009		12/2/2009
	Screening Criteria[1]													
Chem	SL	BT	ML	SQS										
1,2,3,4,6,7,8-HPCDF	--	--	--	--		**3.21**						**0.441**		**JK**
1,2,3,4,7,8,9-HPCDF	--	--	--	--		**0.218**	**J**					0.0636		U
Octachlorodibenzofuran (OCDF)	--	--	--	--		**5.72**						**1.13**		**JK**
TETRACHLORODIBENZO-P-DIOXINS (TCDD), TOTAL	--	--	--	--		**9.91**						**1.33**		
PENTACHLORODIBENZO-P-DIOXIN (PECDD), TOTAL	--	--	--	--		**9.41**						**1.03**		**J**
HEXACHLORODIBENZO-P-DIOXINS (HXCDD), TOTAL	--	--	--	--		**15.7**						**2.97**		**J**
HEPTACHLORODIBENZO-P-DIOXINS (HPCDD), TOTAL	--	--	--	--		**92.4**						**21**		
TETRACHLORODIBENZOFURANS (TCDF), TOTAL	--	--	--	--		**13.2**						**1.15**		**J**
PENTACHLORODIBENZOFURANS (PECDF), TOTAL	--	--	--	--		**5.57**						**0.261**		**J**
HEXACHLORODIBENZOFURANS (HXCDF), TOTAL	--	--	--	--		**3.49**						**0.283**		**J**
HEPTACHLORODIBENZOFURANS (HPCDF), TOTAL	--	--	--	--		**9.27**						**1.04**		**J**
TEQ (non-detected = 1/2 detection limit)[4]	--	4.1/5.2[5]	--	--		**1.741**						**0.344**		
TEQ (non-detected = 0)[4]	--	4.1/5.2[5]	--	--		**1.74**						**0.328**		

Notes:
ng/Kg = nanograms per kilogram
*Sample type: N = normal, FD = field duplicate
**Organic carbon normalized concentration.
B = Indicates the associated analyte is found in the method blank as well as in the sample.
D = Result is from a dilution.
i = The method detection limit (MDL) has been elevated because of a matrix interference.
J = indicates an estimated value - used when the analyte concentration is below the method reporting limit and above the estimated detection limit.
K = When the ion abundance ratios associated with a particular compound are outside the QC limits, samples are flagged with a 'K' flag. A 'K' flag compound. indicates an estimated maximum possible concentration for the associated
P (butyltin) = The GC or HPLC confirmation criteria were exceeded. The relative percent difference is greater than 40 percent between the two analytical results.
P (dioxin) = Indicates chlorodephenyl ether interference present at the retention time of the target compound.
U = Indicates the compound was analyzed and not detected (value reported is the method detection limit).
[1]Screening Criteria: *U.S. Army Corps of Engineers Dredged Material Evaluation and Disposal Procedures (Users' Manual)*, Table 6.1.
Screening Level (SL), Bioaccumulation Trigger (BT) and Maximum Level (ML) Marine Guideline Chemistry Values, dated July 2008.
Washington State Department of Ecology Sediment Management Standards (SMS), Chapter 173-204 WAC, Revised December 1995.
Table I Marine Sediment Quality Standards.
PSDDA BT for tributyltin in bulk sediment
[2]Total benzofluoranthenes include b and k only (j results were not analyzed). Total chlordane does not include results for trans-chlordane, results were not analyzed.
[3]Sums are determined by adding the detected values only. Where every individual compound/isomer is undetected, the highest detection limit shall represent the sum.
[4]Total Toxicity Equivalency Quotient (TEQ) summary results for each sample have been calculated by the lab to include the "2005 World Health Organization Reevaluation of Human Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds" (M. Van den Bert et al., 2006. *Toxicological Sciences*. 93(2):223-241).
[5]Mean/maximum concentration for Port Gardner nondispersive site (USACE, 2008).
-- = Not established
Bold values indicate result detected above the method detection limit.