CENWS-OD-TS-DMMO **2 JULY 2008**

MEMORANDUM FOR RECORD

SUBJECT: DMMP REVIEW OF SEDIMENT SAMPLING AND TESTING FOR PORT OF SEATTLE TERMINAL 18 DREDGING WITH PROPOSED UPLAND DISPOSAL

1. Introduction. This memorandum reflects the consensus review of the Dredged Material Management Program (DMMP agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the U.S. Environmental Protection Agency) regarding the sampling and testing of proposed dredged material from Port of Seattle's Terminal 18 at Seattle, King County, Washington. Disposal of the dredged material is proposed for an approved upland location.

2. Background. Terminal 18 is located on Harbor Island, at the south end of Elliott Bay at Seattle Washington. The facility is a marine industrial area, used for the transshipment of container cargo. Terminal 18 provides berthing areas for ocean-going, deep draft vessels. The project is within the boundaries of the Lower Duwamish Superfund Site. Previous sediment characterizations in the area have detected chemicals of concern well-above DMMP screening levels.

The Port is proposing to dredge and remove shoals to maintain -50 MLLW depth to accommodate deep-draft vessels.

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

Table 1. Project Summary

Project ranking	High
Proosed Dredging volume	6800 cubic yards
Proposed Dredging depth	-50 MLLW
SAP Received	10 April 2008
SAP Approved	29 April 2008
Sampling Dates	14 May 2008
Data report received	19 June 2008
DAIS Tracking Number	PST18-1-A-F-254
USACE Permit Application Number	NWS-2008-817-WRD
Recency Determination (High = 2 Years)	14 May 2010

4. Project Sampling. A diver-operated push corer was used to collect sediment samples from four locations. Sample locations were chosen in the field to maximize

sampling at areas of sediment accumulation. Sample locations are illustrated in Figure 1. The corer was advanced approximately 36 inches, or until refusal was reached. Material from the four core samples was composited for one analysis.

5. Sediment Chemical Analysis. Sediments were evaluated for the standard list of DMMP chemicals of concern. In addition, tributyltin (TBT) and dioxins/furans were analyzed. The Port also analyzed the sediment for TCLP metals to meet the analysis requirements of an upland disposal location. Sediment chemistry results are listed in Table 2 (DMMP guidelines) and Table 3 (SMS guidelines) and sediment conventional analyses are listed in Table 4. There were exceedances of DMMP screening levels for PCBs, hexachlorobenzene and TBT. The dioxin and furan TEQ was 21.7 ng/kg. Bioassays were not performed, since the material is scheduled for upland disposal.

6. Sediment Evaluation. The Port of Seattle must assess the new surface material exposed after dredging. The Port plans to do this following the dredging activity. Depending upon the new surface sediment quality, a number of management actions may be required, which are outlined in the 2008 DMMP clarification paper "Quality of Post-Dredge Sediment Surfaces." These actions must be coordinated with and approved by the DMMP agencies. Any actions must also be coordinated with EPA CERCLA and with the Washington Department of Ecology Toxics Clean-up Program. Failure to assess and manage the new surface material in line with the DMMP clarification paper may result in Department of the Army permit violations.

7. Agency Signatures.

Concur:

7/10/08
Date

Stephanie Stirling, Seattle District Corps of Engineers

7/10/08
Date

Erika Hoffman, Environmental Protection Agency

07/10/2008
Date

Laura Inouye, Ph.D., Washington Department of Ecology

July 10, 2008
Date

Courtney Wasson, Washington Department of Natural Resources

Copies Furnished:

DMMP Agencies
Ravi Sanga, EPA
Jim Green, Seattle District Regulatory
Paul Meyer, Port of Seattle
Tad Deshler, Windward Environmental

Table 2. Chemical results compared to DMMP guidelines.

CHEMICAL	SL	BT	ML	DMMU 1	
METALS (mg/kg dry)				conc	QL
Antimony	150	---	200	7	U
Arsenic	57	507	700	7	
Cadmium	5.1	11.3	14	0.3	U
Chromium	---	267	---	11.1	
Copper	390	1,027	1,300	42	
Lead	450	975	1,200	13	
Mercury	0.41	1.5	2.3	0.14	
Nickel	140	370	370	9	
Selenium	---	3.0	---	0.4	
Silver	6.1	6.1	8.4	0.4	U
Zinc	410	2,783	3,800	40	
ORGANOMETALLIC COMPOUNDS (ug/L interstitial water)					
Tributyltin (ion)	0.15	0.15	---	**1.2**	
LPAH (ug/kg dry)					
2-Methylnaphthalene	670	---	1,900	20	
Acenaphthene	500	---	2,000	46	
Acenaphthylene	560	---	1,300	23	
Anthracene	960	---	13,000	120	
Fluorene	540	---	3,600	52	
Naphthalene	2,100	---	2,400	73	
Phenanthrene	1,500	---	21,000	10	
Total LPAH	5,200	---	29,000	470	
HPAH (ug/kg dry)					
Benzo(a)anthracene	1,300	---	5,100	550	
Benzo(a)pyrene	1,600	---	3,600	430	
Benzo(g,h,i)perylene	670	---	3,200	96	
Benzofluoranthenes	3,200	---	9,900	1,070	
Chrysene	1,400	---	21,000	590	
Dibenzo(a,h)anthracene	230	---	1,900	46	
Fluoranthene	1,700	4,600	30,000	1,200	
Indeno(1,2,3-c,d)pyrene	600	---	4,400	130	
Pyrene	2,600	11,980	16,000	2,100	
Total HPAH	12,000	---	69,000	6,200	
CHLORINATED HYDROCARBONS (ug/kg dry)					
1,2,4-Trichlorobenzene	31	---	64	7.8	U
1,2-Dichlorobenzene	35	---	110	1.6	U
1,3-Dichlorobenzene	170	---	---	1.6	U
1,4-Dichlorobenzene	110	---	120	19	J
Hexachlorobenzene	22	168	230	4.9	U
PHTHALATES (ug/kg dry)					
Bis(2-ethylhexyl)phthalate	1,300	---	8,300	240	
Butyl benzyl phthalate	63	---	970	20	U
Di-n-butyl phthalate	1,400	---	5,100	20	U
Di-n-octyl phthalate	6,200	---	6,200	20	U
Diethyl phthalate	200	---	1,200	280	U
Dimethyl phthalate	71	---	1,400	20	

CHEMICAL	SL	BT	ML	DMMU 1	
PHENOLS (ug/kg dry)					
2 Methylphenol	63	---	77	20	U
2,4-Dimethylphenol	29	---	210	20	U
4 Methylphenol	670	---	3,600	20	U
Pentachlorophenol	400	504	690	98	U
Phenol	420	---	1,200	16	J
MISCELLANEOUS EXTRACTABLES (ug/kg dry)					
Benzoic acid	650	---	760	200	U
Benzyl alcohol	57	---	870	20	U
Dibenzofuran	540	---	1,700	42	U
Hexachlorobutadiene	29	---	270	4.9	U
Hexachloroethane	1,400	---	14,000	20	U
N-Nitrosodiphenylamine	28	---	130	20	U
VOLATILE ORGANICS (ug/kg dry)					
Ethylbenzene	10	---	50	3.6	
Tetrachloroethene	57	---	210	1.6	U
Total Xylene	40	---	160	36	
Trichloroethene	160	---	1,600	1.6	U
PESTICIDES AND PCBs (ug/kg dry)					
Aldrin	10	---	---	4.9	U
Chlordane	10	37	---	4.9	Y
Dieldrin	10	---	---	9.8	U
Heptachlor	10	---	---	4.9	U
Lindane	10	---	---	4.9	U
Total DDT	6.9	50	69	**9.8**	U
Total PCBs	130	---	3,100	**900**	
Total PCBs (mg/kg OC)		38			
DIOXINS AND FURANS (ng/kg dry)					
2,3,7,8-TCDD				0.367	J
1,2,3,7,8-PeCdd				1,11	UJ
1,2,3,4,7,8-HxCDD				3.32	
1,2,3,6,7,8-HxCDD				15.2	
1,2,3,7,8,9-HxCDD				4.62	
1,2,3,4,6,7,8-HpCDD				1,090	
OCDD				13,000	J
2,3,7,8-TCDF				2.11	
1,2,3,7,8-PeCDF				1.18	J
2,3,4,7,8-PeCDF				4.03	
1,2,3,4,7,8-HxCDF				6.01	
1,2,3,4,6,7,8-HxCDF				2.81	
1,2,3,7,8,9-HxCDF				1.35	J
2,3,4,6,7,8-HxCDF				3.65	
1,2,3,4,6,7,8-HpCDF				67.4	
1,2,3,4,7,8,9-HpCDF				6.18	
OCDF				341	
Dioxin and Furan TEQ				21.7	

J = estimated
U = undetected
QL = laboratory qualifier
OC = organic carbon

SL = screening level
BT = bioaccumulation trigger
ML = maximum level

Table 3. Chemical results compared to SMS regulatory guidelines.

CHEMICAL	SQS	CSL	DMMU 1	
METALS (mg/kg dry)			**conc**	**QL**
Arsenic	57	93	7	
Cadmium	5.1	6.7	0.3	U
Chromium	260	270	11.1	
Copper	390	390	42	
Lead	450	530	13	
Mercury	0.41	0.59	0.14	
Silver	6.1	6.1	0.4	U
Zinc	410	960	40	
LPAH (mg/kg OC)				
2-Methylnaphthalene	38	64	2	
Acenaphthene	16	57	4	
Acenaphthylene	66	66	2	
Anthracene	220	1200	11	
Fluorene	23	79	5	
Naphthalene	99	170	7	
Phenanthrene	100	480	1	
Total LPAH	370	780	44	
HPAH (mg/kg OC)				
Benzo(a)anthracene	110	270	51	
Benzo(a)pyrene	99	210	40	
Benzo(g,h,i)perylene	34	88	9	
Benzofluoranthenes	230	450	100	
Chrysene	110	460	55	
Dibenzo(a,h)anthracene	12	33	4	
Fluoranthene	160	1200	112	
Indeno(1,2,3-c,d)pyrene	34	88	12	
Pyrene	1000	1400	196	
Total HPAH	960	5300	579	
CHLORINATED HYDROCARBONS (mg/kg OC)				
1,2,4-Trichlorobenzene	0.81	1.8	0.73	U
1,2-Dichlorobenzene	2.3	2.3	0.1	U
1,4-Dichlorobenzene	3.1	9	1.8	J
Hexachlorobenzene	0.38	2.3	0.46	U
PHTHALATES (mg/kg OC)				
Bis(2-ethylhexyl)phthalate	47	78	22	
Butyl benzyl phthalate	4.9	64	2	U
Di-n-butyl phthalate	220	1700	2	U
Di-n-octyl phthalate	58	4500	2	U
Diethyl phthalate	61	110	26	U
Dimethyl phthalate	53	53	2	

CHEMICAL	SQS	CSL	DMMU 1	
PHENOLS (ug/kg dry)				
2 Methylphenol	63	63	20	U
2,4-Dimethylphenol	29	29	20	U
4 Methylphenol	670	670	20	U
Pentachlorophenol	360	690	98	U
Phenol	420	1200	16	J
MISCELLANEOUS EXTRACTABLES (ug/kg dry)				
Benzoic acid	650	650	200	U
Benzyl alcohol	57	73	20	U
MISCELLANEOUS EXTRACTABLES (mg/kg OC)				
Dibenzofuran	15	58	4	U
Hexachlorobutadiene	3.9	6.2	0.5	U
N-Nitrosodiphenylamine	11	11	2	U
PCBs (mg/kg OC)				
Total PCBs (mg/kg carbon)	12	65	84	

U = undetected
QL = laboratory qualifier
OC = organic carbon
SMS = Sediment Management Standards
SQS = sediment quality standard
CSL = cleanup screening level

Table 4. Sediment Conventional Data.

		DMMU 1
	DAIS ID:	C1
GRAIN SIZE	% Gravel:	5.0
	% Sand:	67.9
	% Silt:	18.4
	% Clay:	8.7
	% Fines (clay+silt):	27.1
	Total Solids (%):	69.53
	Total Organic Carbon (%):	1.07

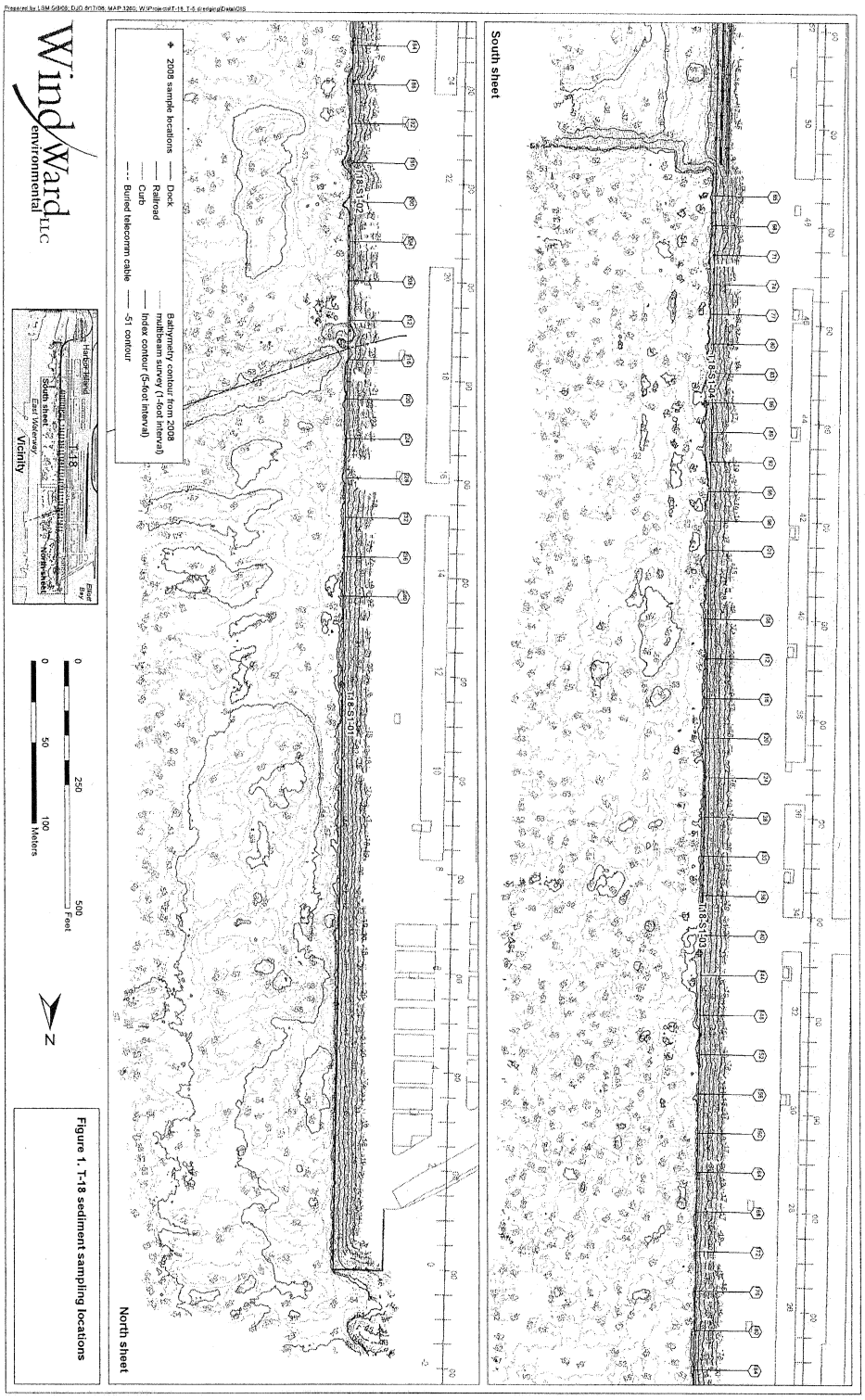

Figure 1. Sediment Sample locations, Port of Seattle, T18, DY09