CENWS-OD-TS-NR

MEMORANDUM FOR: RECORD June 5, 2014

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF A PORTION OF PROPOSED DREDGED MATERIAL FROM THE MUKILTEO MULTIMODAL PROJECT, MUKILTEO, WASHINGTON, EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR UNCONFINED OPEN-WATER DISPOSAL AT THE PORT GARDNER NON-DISPERSIVE DISPOSAL SITE, OR FOR IN-WATER BENEFICIAL USE.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington State Department of Ecology, Washington State Department of Natural Resources, and the Environmental Protection Agency) regarding the suitability of up to 21,000 cubic yards (cy) of dredged material from the Mukilteo Multimodal Project for open-water disposal at the Port Gardner non-dispersive site, or for in-water beneficial use.

2. Background. The Washington State Department of Transportation (WSDOT) Ferries Division proposes the Mukilteo Multimodal Project to improve the operations and facilities serving the mainland terminus of the Mukilteo-Clinton ferry route in Washington State. The project will include a new ferry berth, loading area, waiting area, and associated infrastructure to be located approximately 1,800 feet to the northeast of the existing Mukilteo ferry terminal. The project location is shown on the Vicinity Map and Site Plan (Figures 1 and 2).

   The project is located at the site of the Mukilteo Tank Farm and associated Tank Farm Pier. The project includes removing the pier and dredging through a sediment mound located beneath the pier to create a channel to accommodate the passage of ferry boats to and from the new terminal.

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

Table 1. Project Summary

Project ranking	Surface (0-4 ft) = Moderate Subsurface (> 4 ft) = High
Proposed dredging volume	21,000 cy
Proposed dredging depth	-30 ft MLLW (including 2 ft of overdredge)
1st draft SAP received	February 4, 2013
Comments provided on 1st draft SAP	February 22, 2013
2nd draft SAP received	March 13, 2013
Comments provided on 2nd draft SAP	April 1, 2013
Final SAP received	April 3, 2013
SAP approved	April 5, 2013
Sampling dates	November 6 -7, 2013
Draft data report received	January 31, 2014

Table 1. Project Summary

Comments provided on draft report	February 14, 2014 and April 8, 2014 via phone conference
Final data report received	April 21, 2014
DMMP Tracking #	MUKMU-1-A-F-347
EIM Study ID	MUKMU13
Recency Determination	Surface DMMUs = November 2018 Subsurface DMMUs = November 2016

4. Project Ranking and Sampling Requirements. Due to the amount of previous sampling in the area and the history of increased contamination with depth, the DMMP agencies gave the project a split ranking. The surface (0-4 ft) DMMUs were ranked moderate and the subsurface (>4 ft) DMMUs were ranked high. The number of samples and analyses were calculated for each rank using the following guidelines (DMMP, 2013):

Moderate rank:

- 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) = 16,000 cubic yards

High Rank:

- Maximum volume of sediment represented by each field sample = 4,000 cubic yards
- Maximum volume of sediment represented by each analysis in the subsurface portion of the dredging prism = 12,000 cubic yards

In order to capture the extent of the dredge prism it was divided into three subunits for sampling purposes. One core sample was planned for each subunit, with sediment composites from the appropriate depth interval for the analysis of each DMMU (Table 2).

Table 2. Planned and actual sampling scheme

DMMU	Material Represented	Rank	SAP vol. (cy)	SD vol. (cy)[1]	Samples required	Samples taken	Analyses required & taken
1	Upper 4-feet Surface Material	Mod	8,300	7,800	3	3	1
2	Subsurface material ranging from 4 to 8 feet below mudline on the south end to 4 to 5 feet below the mudline on the north end of the prism	High	6,100	4,000	2	3	1
3/3C[2]	From the bottom of DMMU-2 to the design depth plus 2 feet of overdredge allowance: -30 feet MLLW.	High	9,100	9,200	3	3	1
Totals			23,500	21,000	8	9	3

[1] Differences between SAP volume and SD volume due to intervening bathymetric survey that clarified dredge prism.

[2] DMMU 3C refers to additional sample volume from DMMU 3 submitted for analysis subsequent to new bathymetric survey.

5. Sampling. Sampling took place November 6 and 8th, 2013, using a diver-operated Vibracore sampler per the approved SAP. The final approved SAP was based on bathymetric data updated in October 2013 prior to the sampling event, showing that the mudline of the dredge prism ranged from about -12 to -25 ft MLLW, representing an approximate volume of 23,000 cy.

   The divers reported visible concrete, steel and timber debris at the sediment surface. The debris apparently extended below the surface and complicated sampling activities, especially in the most nearshore subunit. Cores were attempted in ten locations in and around the approved sampling locations. Sediment characterization samples were successfully collected from four vibracores (MMP-1, MMP-1B, MMP-2, and MMP-3) to depths ranging from approximately 7 feet to 10 feet below mudline (Figure 2). MMP-1 and MMP-1B were co-located at the reported location. Target sampling depths—based on October 2013 data--were reached at MMP-2 and MMP-3. The full target sampling depth was not achieved at MMP-1 or MMP-1B due to core refusal likely resulting from subsurface debris. Samples were composited to the extent possible in accordance with the SAP and then submitted for analysis.

   A new bathymetric survey was completed in January 2014 after draft characterization results were reported to the DMMP (BergerABAM, 2014a). The new bathymetry showed that the mudline of the dredge prism ranged from about -11 to -17 ft MLLW, with an estimated dredge volume of 21,000 cy. This change in bathymetry resulted in a changed thickness to DMMU-3, and showed that Z-layer depths were not achieved at any of the core locations (Table 3, Figure 3).

   Due to the sampling anomalies mentioned above, the data collected to date for this project are not sufficient to determine suitability for the entire project. Specifically, no sample was collected from the nearshore subunit of DMMU-3, and no samples were collected from the post-dredge surface. This memo documents only the suitability of those areas with sufficient data to make a determination of suitability for open-water disposal, or in-water beneficial use.

6. Chemical Analysis. The approved sampling and analysis plan (BergerABAM, 2014) was followed, with sampling exceptions noted above, and analysis exceptions noted below. Quality control guidelines specified by the DMMP program were generally met.

   Three composite samples were submitted for physical and chemical analysis to Analytical Resources Inc. (ARI) in Tukwila, Washington. The standard list of DMMP chemicals of concern, plus TBT and dioxins/furans, were analyzed for composite samples DMMU-1, DMMU-2 and DMMU-3. After bathymetric adjustments were made it was realized that archived material originally assumed to be from the post-dredge surface was actually from DMMU-3. This additional material (three feet from MMP-2 and one foot from MMP-3, see Table 3) was then composited and submitted for analysis as DMMU-3C. This composite was only analyzed for contaminants of concern that were detected in the upper DMMU-3 sample.

   There were no detected or undetected exceedances of any chemicals of concern compared to either DMMP (Table 4) or SMS (Table 5) guidelines, in any of the sampling/analyses that were accomplished for this characterization. For dioxins, the concentrations in the dredge prism were below 4 pptr TEQ, ensuring that dioxin concentrations were below the 10 pptr TEQ maximum

allowable at non-dispersive disposal sites, and clearly do not exceed the volume-weighted average concentration of 4 pptr dioxin in material from the entire dredging project (Table 6).

Table 3. Mukilteo Multimodal sampling coordinates and compositing information

Core	Sample Coordinates		Section	Target Sampling Elevation (ft/MLLW)	Sample Depth Below Mudline (ft)	Actual Sampling Elevation (ft/MLLW)	Analytical Composite Sample
	Lat.	Long.					
MMP 1 & MMP-1B	47.9508552°	-122.2977464°	A	-14 to -18	0-4	-14.8 to -18.8	DMMU-1
			B	-18 to -22	4-7	-18.8 to -21.5	DMMU-2
			C	-22 to -30	Not collected due to refusal		
			Z	-30 to -32			
MMP-2	47.9510902°	-122.2973857°	A	-16 to -20	0-4	-16.4 to -20.4	DMMU-1
			B	-20 to -21	4-5	-20.4 to -21.4	DMMU-2
			C	-21 to -30	5-7	-21.4 to -23.4	DMMU-3
					7-10	-23.4 to -26.3	DMMU-3C
			Z	-30 to -32	NA	Did not achieve Z-layer depth	
MMP-3	47.9514533°	-122.2968654°	A	-16 to -20	0-4	-15.9 to -19.9	DMMU-1
			B	-20 to -21	4-5	-19.9 to -20.9	DMMU-2
			C	-21 to -30	5-7	-20.9 to -22.9	DMMU-3
					7-8	-22.9 to -23.9	DMMU-3C
			Z	-30 to -32	NA	Did not achieve Z-layer depth	

Datum: MLLW = 0.0 (Everett, 1983 to 2001 Epoch) NAD 83

7. Sediment Exposed by Dredging. The sediment to be exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 1995) or the State's antidegradation standard (DMMP, 2008b). There were no detected SQS exceedances in the dredge prism sampled for this characterization and no dioxin exceedances of the 4 pptr TEQ management objective. Therefore, the DMMP agencies determined that Z-sample analysis was not required for the outer two subunits of this project.

   As demonstrated by the results of the above analysis, the sediment from the outer two subunits of DMMUs 1, 2 and 3, to be exposed by dredging, is not considered to be degraded relative to the currently exposed sediment surface. On this basis the DMMP agencies conclude for these areas the project is in compliance with the State of Washington anti-degradation policy. However, further testing of the nearshore subunit of DMMU-3 (and potentially the underlying Z-layer) is necessary to determine whether the exposed surface of this subunit is in compliance.

8. Additional Sampling in DMMU-3. Proposed dredged material (approximately 2,800 cy) from the nearshore (southern) subunit of DMMU-3 must be characterized according to DMMP guidelines before suitability and antidegradation for this portion of the dredged material prism can be determined. DMMU-3 should be sampled in the vicinity of MMP-1. Close coordination with DMMO must take place on sample placement and core depth; core location may be adjusted to avoid debris but must be coordinated in real time with DMMO.

9. Debris Management. In general, debris is not allowed to be disposed at the DMMP open-water sites. This includes all floatable debris and large non-floatable debris such as logs, piling, rip-rap and concrete. Project proponent must suggest a plan to confirm surface debris status and complete piling removal after the pier is removed. The dredging quality control plan should describe specific best management practices to ensure that large debris will not be disposed at the DMMP disposal site. During dredging, 2-ft by 2-ft steel mesh may be used during the dredging operation to remove larger pieces of debris. Pre- and post-disposal monitoring may be required at the disposal site, on a case-by-case basis, to verify the absence of problem debris.

10. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Mukilteo Multimodal project for open-water disposal at Port Gardner non-dispersive disposal site, or at an approved in-water beneficial use site. The approved sampling and analysis plan was generally followed, except for sampling deviations described above. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program for DMMU-1, DMMU-2, and the two outer subunits of DMMU-3. Further sampling is necessary to determine the suitability of material in the nearshore subunit of DMMU-3.

    In summary, based on the results of the previously described testing, the DMMP agencies conclude that the approximately 11,800 cy of proposed dredged material from DMMU-1 and DMMU-2, and approximately 6,400 cy of material from the outer (northern) two subunits of DMMU-3 of the Mukilteo Multimodal project are suitable for open-water disposal at the Port Gardner non-dispersive site or at an approved in-water beneficial use 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.

9. References.

BergerABAM, 2014a. Job Memorandum. Mukilteo Multimodal Project Dredged Material Characterization: Revised Plan and Report Based on January 2014 Bathymetry. Memo to Kelsey van der Elst, Corps of Engineers, Dredged Material Management Office. 19 March 2014.

BergerABAM, 2014b. Mukilteo Multimodal Project Dredge Material Characterization. Prepared for Washington State Department of Transportation, Ferries Division, Seattle, WA. 17 April 2014.

DMMP, 2013. *Dredged Material Evaluation and Disposal Procedures (User Manual)*. Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, July 2013.

DMMP, 2011. *Marine Sediment Quality Screening Levels: Adopting RSET Marine SLs for Use in DMMP.* A Clarification Paper prepared by Laura Inouye (Ecology) and David Fox (USACE) for the Dredged Material Management Program, June 2011.

DMMP, 2010. *Dredged Material Management Program New Interim Guidelines for Dioxins*. December 6, 2010.

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:

6/5/2014
Date

Lauran Warner - Seattle District Corps of Engineers

6/5/14
Date

Justine Barton - Environmental Protection Agency

6/5/2014
Date

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

6/5/2014
Date

Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Victoria England/BergerABAM

Table 4. Results of conventional and chemical analysis compared to DMMP marine guidelines.

CHEMICAL	DMMP Guidelines			DMMU 1		DMMU 2		DMMU 3		DMMU-3C	
	SL	BT	ML	Value	LQ	Value	LQ	Value	LQ	Value	LQ
CONVENTIONALS											
Gravel, %	---	---	---	16		33		43		--	
Sand, %	---	---	---	62		58		54		--	
Silt, %	---	---	---	12		5		<3.2		--	
Clay, %	---	---	---	10		5				--	
Fines (Silt + Clay), %	---	---	---	22		10		<3.2		--	
Total Solids, %	---	---	---	64.93		77.94		85.92		--	
Volatile Soilids, %	---	---	---	3.04		1.77		1.21		--	
Total Organic Carbon, %	---	---	---	3.81		2.86		2.05		0.824	
Total Sulfides, mg/kg	---	---	---	362		8.64		336		--	
Total Ammonia, mg N/kg	---	---	---	6.88		7.21		7.27		--	
METALS (mg/kg dry)											
Antimony	150	---	200	20	U	6	U	6	U	6	U
Arsenic	57	507	700	20	U	6	U	6	U	6	U
Cadmium	5.1	11.3	14.0	0.7	U	0.3	U	0.2	U	0.2	
Chromium	260	260	---	26		87.3		21		25.3	
Copper	390	1,027	1,300	28.4		22.1		11.1		11.3	
Lead	450	975	1,200	8		3		4		4	
Mercury	0.41	1.5	2.3	0.05		0.04		0.04		0.03	U
Selenium	---	3	---	0.8	U	0.7	U	0.6	U	0.6	U
Silver	6.1	6.1	8.4	1	U	0.4	U	0.3	U	0.3	U
Zinc	410	2,783	3,800	38		34		31		26	
ORGANOMETALLIC COMPOUNDS (µg/kg dry weight)											
Tributyltin		73	---	3.5	U	3.5	U	3.7	U	--	
PAHs (ug/kg dry)											
Total LPAH	5,200	---	29,000	538		364		154		88	
Naphthalene	2,100	---	2,400	93		88		40		20	
Acenaphthylene	560	---	1,300	54		24		19	U	5.3	
Acenaphthene	500	---	2,000	29		34		16	J	7.6	
Fluorene	540	---	3,600	42		32		18	J	9.1	
Phenanthrene	1,500	---	21,000	230		120		50		30	
Anthracene	960	---	13,000	90		66		20		16	
2-Methylnaphthalene	670	---	1,900	26		19		19	U	4.8	
Total HPAH	12,000	---	69,000	4,102		2,964		688		658	
Fluoranthene	1,700	4,600	30,000	380		230		55		54	
Pyrene	2,600	11,980	16,000	1,300		920		250		240	
Benzo(a)anthracene	1,300	---	5,100	190		160		32		28	
Chrysene	1,400	---	21,000	450		320		48		43	
Total benzofluoranthenes	3,200	---	9,900	980		740		170		160	
Benzo[a]pyrene	1,600	---	3,600	360		280		71		71	
Indeno(1,2,3-c,d)pyrene	600	---	4,400	180		130		26		24	
Dibenzo(a,h)anthracene	230	---	1,900	62		44		8.8		7.9	
Benzo(g,h,i)perylene	670	---	3,200	200		140		27		30	
CHLORINATED BENZENES (ug/kg dry)											
1,2-Dichlorobenzene	35	---	110	4.8	U	4.8	U	4.9	U	--	
1,4-Dichlorobenzene	110	---	120	4.8	U	4.8	U	4.9	U	--	
1,2,4-Trichlorobenzene	31	---	64	4.8	U	4.8	U	4.9	U	--	
Hexachlorobenzene	22	168	230	4.8	U	4.8	U	4.9	U	--	

Table 4. Results of conventional and chemical analysis compared to DMMP marine guidelines.

CHEMICAL	DMMP Guidelines			DMMU 1		DMMU 2		DMMU 3		DMMU-3C	
	SL	BT	ML	Value	LQ	Value	LQ	Value	LQ	Value	LQ
PHTHALATE ESTERS (ug/kg dry)											
Dimethyl phthalate	71	---	1,400	19	U	19	U	19	U	--	
Diethyl phthalate	200	---	1,200	100	B	24	B	53	B	--	
Di-n-butyl phthalate	1,400	---	5,100	19	U	19	U	19	U	--	
Butyl benzyl phthalate	63	---	970	19	U	19	U	19	U	--	
Bis(2-ethylhexyl)phthalate	1,300	---	8,300	48	U	48	U	49	U	--	
Di-n-octyl phthalate	6,200	---	6,200	19	U	19	U	19	U	--	
PHENOLS (ug/kg dry)											
Phenol	420	---	1,200	65		23		19	U	--	
2 Methylphenol	63	---	77	6.0		4.1	J	19	U	--	
4 Methylphenol	670	---	3,600	19	U	19	U	19	U	--	
2,4-Dimethylphenol	29	---	210	24	U	24	U	24	U	--	
Pentachlorophenol	400	504	690	96	U	97	U	97	U	--	
MISCELLANEOUS EXTRACTABLES (ug/kg dry)											
Benzoic acid	650	---	760	98	J	190	U	190	U	--	
Benzyl alcohol	57	---	870	19	U	19	U	19	U	--	
Dibenzofuran	540	---	1,700	40		31		16	J	8.8	
Hexachlorobutadiene	11	---	270	4.8	U	4.8	U	4.9	U	--	
Hexachloroethane	---	---	---	19	U	19	U	19	U	--	
N-Nitrosodiphenylamine	28	---	130	4.8	U	4.8	U	19	U	--	
PESTICIDES (ug/kg dry)											
Aldrin	10	---	---	0.48	U	0.47	U	0.53	Y	--	
Total Chlordane	3	37	---	0.48	U	0.47	U	0.49	U	--	
Dieldrin	2	---	---	0.96	U	0.94	U	0.97	U	--	
Heptachlor	2	---	---	0.48	U	0.47	U	0.49	U	--	
p,p'-DDE	9	---	---	0.96	U	0.94	U	0.97	U	--	
p,p'-DDD	16	---	---	0.96	U	1.2		0.97	U	--	
p,p'-DDT	5	---	---	0.96	U	0.94	U	0.97	U	--	
Total DDT		50	69	0.96	U	1.2		0.97	U	--	
PCBs (ug/kg dry)											
Arochlor 1016				9.1	U	9.1 U	U	9.7	U	--	
Arochlor 1221				9.1	U	9.1 U	U	9.7	U	--	
Arochlor 1232				14	Y	18 Y	Y	9.7	U	--	
Arochlor 1242				9.1	U	9.1 U	U	9.7	U	--	
Arochlor 1248				9.1	U	9.1 U	U	9.7	U	--	
Arochlor 1254				17	P	9.1 U	U	11		--	
Arochlor 1260				9.1	U	9.1 U	U	9.7	U	--	
Total PCBs	130	---	3,100	17	P	18	Y	11		--	
Total PCBs (mg/kg OC)	---	38	---	4.5	P	6.3	Y	5.4			

Notes:
-- = Not available or not applicable
U = Laboratory data qualifier indicating analyte undetected at given reporting limit
B = Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's reporting limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J = Estimated concentration when the value is less than ARI's established reporting limits.
Y = The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
P = The analyte was detected on both chromatographic columns but the quantified values differ by > RPD with no obvious chromotographic interference.
Bolded values were detected at the level given

Table 5. Chemical results compared to SMS regulatory guidelines.

CHEMICAL	SMS Guidelines		DMMU 1		DMMU 2		DMMU 3		DMMU-3C	
	SQS	CSL	Value	LQ	Value	LQ	Value	LQ	Value	LQ
Total Organic Carbon, %			3.81		2.86		2.05		0.824	
METALS (mg/kg dry)										
Arsenic	57	93	20	U	6	U	6	U	6	U
Cadmium	5.1	6.7	0.7	U	0.3	U	0.2	U	0.2	
Chromium	260	270	26		87.3		21		25.3	
Copper	390	390	28.4		22.1		11.1		11.3	
Lead	450	530	8		3		4		4	
Mercury	0.41	0.59	0.05		0.04		0.04		0.03	U
Silver	6.1	6.1	1	U	0.4	U	0.3	U	0.3	U
Zinc	410	960	38		34		31		26	
PAHs (mg/kg OC)										
Total LPAH	370	780	14.1		12.7		7.5		10.7	
Naphthalene	99	170	2.4		3.1		2.0		2.4	
Acenaphthylene	66	66	1.4		0.8		0.9	U	0.6	
Acenaphthene	16	57	0.8		1.2		0.8	U	0.9	
Fluorene	23	79	1.1		1.1		0.9	U	1.1	
Phenanthrene	100	480	6.0		4.2		2.4		3.6	
Anthracene	220	1200	2.4		2.3		1.0		1.9	
2-Methylnaphthalene	38	64	0.7		0.7		0.9	U	0.6	
Total HPAH	960	5300	107.7		103.6		33.6		79.9	
Fluoranthene	160	1200	10.0		8.0		2.7		6.6	
Pyrene	1000	1400	34.1		32.2		12.2		29.1	
Benzo(a)anthracene	110	270	5.0		5.6		1.6		3.4	
Chrysene	110	460	11.8		11.2		2.3		5.2	
Benzofluoranthenes	230	450	25.7		25.9		8.3		19.4	
Benzo(a)pyrene	99	210	9.4		9.8		3.5		8.6	
Indeno(1,2,3-c,d)pyrene	34	88	4.7		4.5		1.3		2.9	
Dibenzo(a,h)anthracene	12	33	1.6		1.5		0.4		1.0	
Benzo(g,h,i)perylene	34	88	5.2		4.9		1.3		3.6	
CHLORINATED BENZENES (mg/kg OC)										
1,2-Dichlorobenzene	2.3	2.3	0.1	U	0.2	U	0.2	U	---	
1,4-Dichlorobenzene	3.1	9	0.1	U	0.2	U	0.2	U	---	
1,2,4-Trichlorobenzene	0.81	1.8	0.1	U	0.2	U	0.2	U	---	
Hexachlorobenzene	0.38	2.3	0.1	U	0.2	U	0.2	U	---	
PHTHALATE ESTERS (mg/kg OC)										
Dimethyl phthalate	53	53	0.5	U	0.7	U	0.9	U	---	
Diethyl phthalate	61	110	2.6	B	0.8	B	2.6	B	---	
Di-n-butyl phthalate	220	1700	0.5	U	0.7	U	0.9	U	---	
Butyl benzyl phthalate	4.9	64	0.5	U	0.7	U	0.9	U	---	
Bis(2-ethylhexyl)phthalate	47	78	1.3	U	1.7	U	2.4	U	---	
Di-n-octyl phthalate	58	4500	0.5	U	0.7	U	0.9	U	---	

Table 5. Chemical results compared to SMS regulatory guidelines.

CHEMICAL	SMS Guidelines		DMMU 1		DMMU 2		DMMU 3		DMMU-3C	
	SQS	CSL	Value	LQ	Value	LQ	Value	LQ	Value	LQ
PHENOLS (ug/kg dry)										
Phenol	420	1200	65		23		19	U	---	
2 Methylphenol	63	63	6		4.1	J	19	U	---	
4 Methylphenol	670	670	19	U	19	U	19	U	---	
2,4-Dimethylphenol	29	29	24	U	24	U	24	U	---	
Pentachlorophenol	360	690	96	U	97	U	97	U	---	
MISCELLANEOUS EXTRACTABLES (mg/kg OC)										
Dibenzofuran	15	58	1.05		1.08		0.78	J	1.07	
Hexachlorobutadiene	3.9	6.2	0.13	U	0.17	U	0.24	U	---	
N-Nitrosodiphenylamine	11	11	0.13	U	0.17	U	0.93	U	---	
PCBs (mg/kg OC)										
Total PCBs (mg/kg carbon)	12	65	0.45	P	0.63	Y	0.54		---	
MISCELLANEOUS EXTRACTABLES (ug/kg dry)										
Benzyl alcohol	57	73	0.50	U	0.66	U	0.93	U	---	
Benzoic acid	650	650	2.57	J	6.64	U	9.27	U	---	

Notes:

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

Table 6. Dioxin results and TEQs

			DMMU 1				DMMU 2				DMMU 3			
		TEF	Lab result		TEC (U=0)	TEC (U= 1/2 RL)	Lab result		TEC (U=0)	TEC (U= 1/2 RL)	Lab result		TEC (U=0)	TEC (U= 1/2 RL)
2,3,7,8-TCDD	pg/g	1	0.365	u	0	0.1825	0.245	u	0	0.1225	0.172	u	0	0.086
1,2,3,7,8-PeCDD	pg/g	1	0.968		0.968	0.968	0.475	u	0	0.2375	0.315	u	0	0.1575
1,2,3,4,7,8-HxCDD	pg/g	0.1	0.956		0.0956	0.0956	0.366		0.0366	0.0366	0.196		0.0196	0.0196
1,2,3,6,7,8-HxCDD	pg/g	0.1	3.59		0.359	0.359	1.36		0.136	0.136	0.655		0.0655	0.0655
1,2,3,7,8,9-HxCDD	pg/g	0.1	2.17		0.217	0.217	0.898		0.0898	0.0898	0.475		0.0475	0.0475
1,2,3,4,6,7,8-HpCDD	pg/g	0.01	83.2		0.832	0.832	24		0.24	0.24	9.34		0.0934	0.0934
OCDD	pg/g	0.0003	652		0.1956	0.1956	169		0.0507	0.0507	59		0.0177	0.0177
2,3,7,8-TCDF	pg/g	0.1	2.48		0.248	0.248	0.679		0.0679	0.0679	0.283	u	0	0.01415
1,2,3,7,8-PeCDF	pg/g	0.03	0.418		0.01254	0.01254	0.214		0.00642	0.00642	0.18	u	0	0.0027
2,3,4,7,8-PeCDF	pg/g	0.3	0.566		0.1698	0.1698	0.309		0.0927	0.0927	0.208		0.0624	0.0624
1,2,3,4,7,8-HxCDF	pg/g	0.1	0.727		0.0727	0.0727	0.447		0.0447	0.0447	0.228	u	0	0.0114
1,2,3,6,7,8-HxCDF	pg/g	0.1	0.546	U	0	0.0273	0.313		0.0313	0.0313	0.194		0.0194	0.0194
2,3,4,6,7,8-HxCDF	pg/g	0.1	0.821		0.0821	0.0821	0.269	u	0	0.01345	0.214		0.0214	0.0214
1,2,3,7,8,9-HxCDF	pg/g	0.1	0.249		0.0249	0.0249	0.109		0.0109	0.0109	0.0699		0.007	0.00699
1,2,3,4,6,7,8-HpCDF	pg/g	0.01	12.9		0.129	0.129	7.23		0.0723	0.0723	4.12		0.0412	0.0412
1,2,3,4,7,8,9-HpCDF	pg/g	0.01	0.687		0.00687	0.00687	0.396		0.00396	0.00396	0.178	u	0	0.00089
OCDF	pg/g	0.0003	38.9		0.01167	0.01167	16		0.0048	0.0048	8.33		0.0025	0.0025
Total TEQ (pptr)					3.42	3.63			0.89	1.26			0.40	0.67

Figure 1 - Vicinity Map

Mukilteo Multimodal Project
DMMP Sampling and Analysis Plan

N

0 250 500 1,000 1,500 Feet

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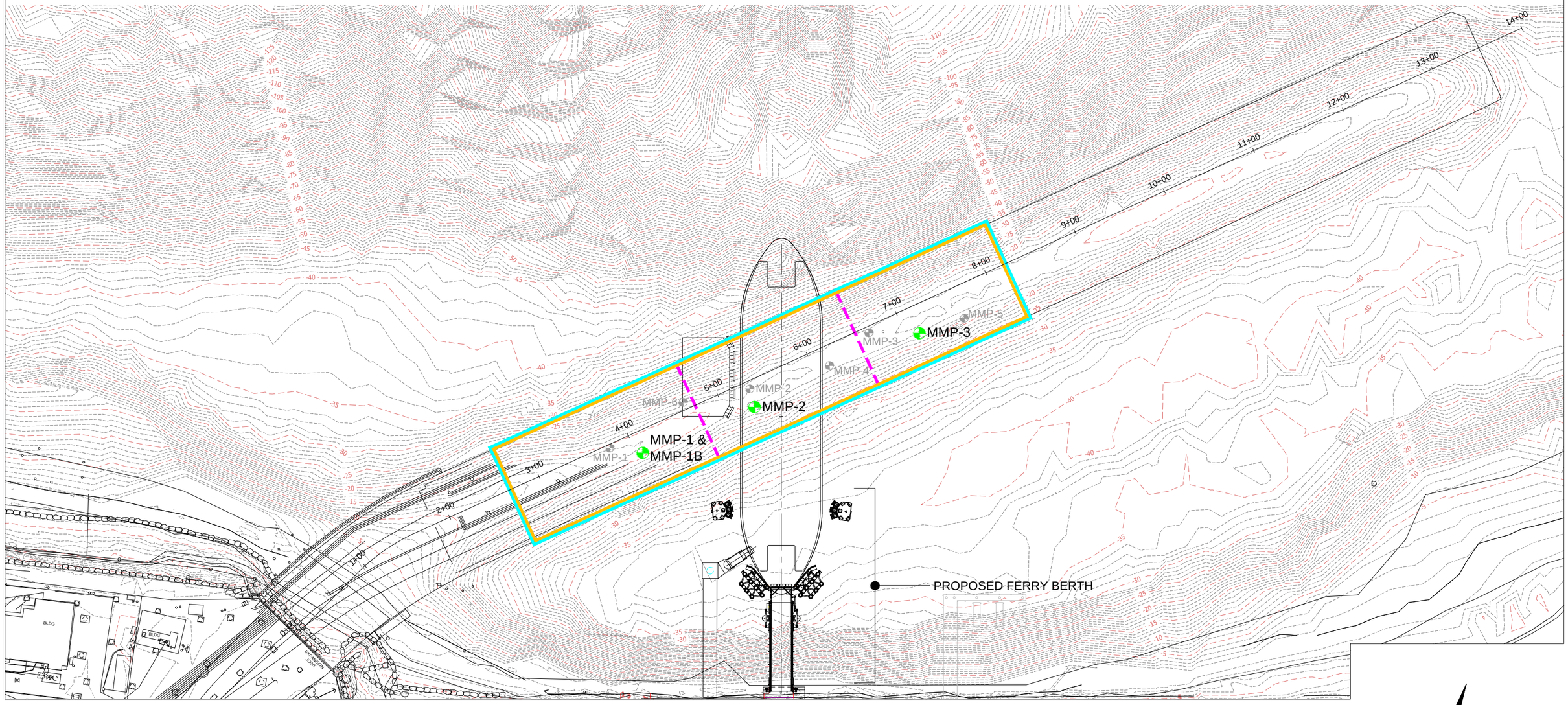

NOTES:

1. THE LOCATION OF FEATURES SHOWN ARE APPROXIMATE
2. THIS FIGURE IS FOR INFORMATION PURPOSES AND IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN THE ATTACHED DOCUMENT

SURFACE DMMU BOUNDARY

DMMU SUBUNIT BOUNDARY

BOUNDARY OF DREDGE PRISM

MMP-1 LOCATION OF NOVEMBER 2013 VIBRACORE

MMP-1 PROPOSED VIBRACORE LOCATIONS FROM APPROVED DMMP SAP (2013)

50 0 50 100
scale feet

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MUKILTEO MULTIMODAL PROJECT: DREDGED MATERIAL CHARACTERIZATION

FIGURE 2: SITE PLAN - DREDGE PRISM AND VIBRACORE LOCATIONS

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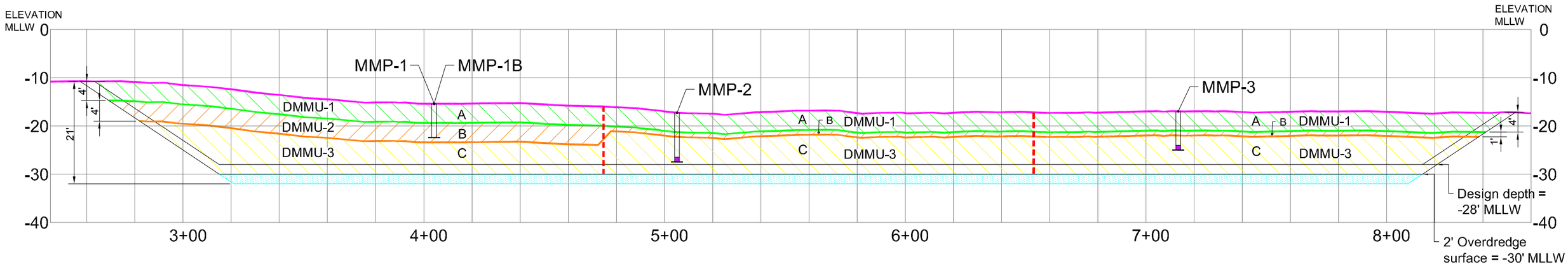

SCALE: HORIZONTAL: 1"=40'
VERTICAL: 1"=20'

20 0 20 40
scale feet

NOTES:

1. THE LOCATION OF FEATURES SHOWN ARE APPROXIMATE.
2. THIS FIGURE IS FOR INFORMATION PURPOSES AND IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN THE ATTACHED DOCUMENT.
3. THE DREDGE PRISM IS ~550 FEET LONG BY ~120 FEET WIDE WITH A DESIGN DEPTH OF -30 FEET MLLW, INCLUDING 2 FEET OF OVERDREDGE.

LEGEND

- MUDLINE
- DMMU-1 (MODERATE RANKING SURFACE MATERIAL)
- DMMU-2 (HIGH RANKING SUBSURFACE MATERIAL)
- DMMU-3 (HIGH RANKING SUBSURFACE MATERIAL)
- POST-DREDGED SURFACE MATERIAL
- DMMU-3C
- DMMU SUBUNIT BOUNDARY

MLLW	MEAN LOWER LOW WATER
DMMU-1	DREDGED MATERIAL MANAGEMENT UNIT
MMP-1	APPROXIMATE VIBRACORE LOCATION
A	SUBUNIT IDENTIFICATION

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MUKILTEO MULTIMODAL PROJECT: DREDGED MATERIAL CHARACTERIZATION

FIGURE 3: SCHEMATIC DMMU PLAN

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