

**SUBJECT: DETERMINATION ON THE SUITABILITY OF SUPPLEMENTAL CHARACTERIZATION OF PROPOSED MAINTENANCE DREDGED MATERIAL FROM HARBOUR VILLAGE MARINA DREDGING PROJECT IN LAKE WASHINGTON EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR OPEN-WATER DISPOSAL AT A DMMP NON-DISPERSIVE OPEN-WATER DISPOSAL SITE**

1. The following summary reflects the suitability determination memorandum on the characterization conducted at the Harbour Village Marina, and 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) on the suitability of an estimated 7,427 cy of maintenance material at Harbour Village Marina evaluated for open-water unconfined disposal at the Elliott Bay non-dispersive open-water disposal site in Seattle, Washington.

Table 1. Project DMMP Tracking Details

JARPA APPLICATION NO.	
Initial SAP submitted:	October 22, 2010
Revised SAP submitted:	April 28, 2011
Revised SAP approved	May 16, 2011
Sampling dates: modified California sampler (3-inch, outside-diameter)	June 7, 2011 (3-DMMUs, 7 stations)
Initial data characterization report submitted:	September 23, 2011
Revised data characterization report submitted:	October 6, 2011
Recency Determination: High Concern (2 years)	June 2013
DAIS reference number:	HVMLW-1-A-F-313

2. **Background.** This project is located in a High Concern area along the northern shoreline of Lake Washington in Kenmore, King County, Washington. The Harbour Village Marina is bounded by the open waters of Lake Washington to the south, by covered docks belonging to the North Lake Marina on the east, by office and condominium buildings with associated paved parking lots on the north, and by Tracy Owen Station (Log Boom) Park on the west. The marina is located approximately 1,200 feet northwest of the mouth of the Sammamish River flowing into Lake Washington (see **Figure 1**, site vicinity). The elevation within the topographically flatter portion of the Marina ranges from approximately -6 to -10 feet Ordinary High Water (OHW) along the north side and approximately -10 to -11 feet OHW along the south side. The currently proposed project includes the dredging of the existing marina slips and channels to a depth of -9 or -10 feet below OHW, which would include dredging approximately 7,500 cy of dredged material within the marina.
3. **Sampling and Analysis Plan.** The initial sampling and analysis plan (SAP) was submitted for DMMP review on October 22, 2010. The initial SAP was revised and resubmitted to the DMMP agencies on April 28, 2011. The DMMP approved the SAP with revisions on May 16, 2011.
4. **Sampling.** The sampling commenced on June 7, 2011 and initially planned to use a small Acker drill (with 4.25-inch, outside-diameter, hollow-stem auger), but an alternative coring device, a modified California sampler (3-inch, outside-diameter) was utilized for sampling due to the extremely soft sediments observed throughout the marina. **Table 2** and **Figure 2** depicts the stations, and Dredged Material Management Unit (DMMU)

<sup>1</sup> fixes errors in Table 2 elevations

compositing strategy for the three DMMUs, which consisted of three composited samples for DMMU-C1, and two stations composited for DMMU's C2 and C3, respectively. The data characterization report was submitted to the DMMP agencies for review and data quality assurance/control review on October 6, 2011. The DMMP agencies concluded, after reviewing the data validation report, that the data was acceptable for decision-making using best professional judgment.

**Table 2. Summary of DMMU Sampling Stations at Harbour Village Marina**

DMMU ID	Approximate Design Elevation of base of dredge prism, feet OHW <sup>(1)</sup>	Exploration ID#	Latitude	Longitude	Approximate Mudline Elevation, feet OHW <sup>(2)</sup>	Approximate depth of design depth to end of core (including Z-samples), feet OHW	DMMU design dredge volume, cubic yards
C1	-9.0	EB-1A	47.75624	122.26048	-7.0	2.5 (-7 to -9.5) Z = 0.5 (-9 to -9.5)	2,461
		EB-1B	47.75629	122.26111	-8.0	2.5 (-8.0 to -10.5) Z = 1.5 (-9 to -10.5)	
		EB-1C	47.75619	122.26167	-6.5	3.5 (-6.5 to -10.0) Z = 1.0 (-9 to -10.0)	
C2	-9.0	EB-2A	47.75640	122.26220	-6.0	4.5 (-6.0 to -10.5) Z = 1.5 (-9 to -10.5)	2,023
		EB-2B	47.75616	122.26225	-6.5	4.0 (-6.5 to -10.5) Z = 1.5 (-9 to -10.5)	
C3	-10.0	EB-3A	47.75646	122.26262	-5.5	5.0 (-5.5 to -10.5) Z = 0.5 (-10 to -10.5)	2,943
		EB-3B	47.75615	122.26270	-7.5	4.0 (-7.5 to -11.5) Z = 1.5 (-10 to -11.5)	

Notes: <sup>(1)</sup> Based on Harbour Village Marina dredge plans dated March 2010; <sup>(2)</sup> Elevations based on records available at [www.nwd-wc.usace.army.mil](http://www.nwd-wc.usace.army.mil) for station at Kenmore, WA on June 7, 2011

5. **Standard Chemicals of Concern Testing Summary.** The Agencies' approved sampling and analysis plan was followed and quality assurance/quality control guidelines specified by PSEP and DMMP were generally complied with. A summary of standard list of CoCs analysis results is provided in Table 3, and demonstrates that PCBs which exceeded the SL in all three DMMUs, with concentrations of total PCBs ranging from 196 ppb (C2), 237 ppb (C3), and 277 ppb (C1). For all three DMMUs, no other detected or undetected chemicals were found to exceed DMMP Marine guidelines.
6. **Dioxin Testing Results Summary.** Table 4 provides the results of dioxin/furan testing results for the three DMMUs, as follows: DMMU-C1 = 92.1 pptr-TEQ, and DMMU-C2 = 77.3 pptr-TEQ, and DMMU-C3 = 43.2 pptr-TEQ (U = ½ detection limit).
7. **Dioxin Interim Interpretative Framework.** The DMMP implemented new interim guidelines for interpreting dioxin data implemented on December 6, 2010, and are summarized below for non-dispersive disposal sites (<http://www.nws.usace.army.mil/Missions/CivilWorks/Dredging/Dioxin.aspx>):
  - a. Nondispersive Screening Levels. DMMUs with dioxin concentrations below 10 pptr TEQ will be allowed for open-water disposal as long as the volume-weighted average concentration of dioxins in material from the entire dredging project does not exceed the Disposal Site Management Objective of 4 pptr TEQ.
8. **Dioxin Interpretation on Suitability for Unconfined-Open-Water Disposal.** As summarized in paragraph 6 above, DMMU's C1, C2, and C3 were all quantitated above the 10 pptr-TEQ upper dioxin guideline limit.

Moreover, the volume-weighted average for the three DMMUs (C1, C2, and C3) totaling 7,427 cy of characterized material is **68.7 pptr-TEQ**, which is well above the 4-pptr-TEQ site management objective (Table 5). Therefore, these dioxin testing results demonstrate that all three DMMUs are **unsuitable** for open-water disposal at the Elliott Bay disposal site.

9. **Antidegradation Evaluation of DMMU's C1, C2, C3:** Based on the PCB and dioxin guideline exceedances, the DMMP required the analysis of all three z-samples underlying the three DMMUs. The results of these z-sample analyses are summarized in Tables 3 and 4. Because the project is located in a freshwater system, the antidegradation evaluation is based on the SEF 2007 Freshwater guidelines, not the DMMP Marine guidelines. For PCBs, the z-samples were all quantitated above the SEF 2007 Freshwater guidelines for PCBs, where DMMU-C1Z (126 ppb) and DMMU-C3Z (237 ppb) both exceed the PCB SL2 criteria (120 ppb) and DMMU-2Z (104 ppb) exceeds the SL1 criteria (60 ppb).

The results of the z-sample analyses for dioxin are summarized in Table 3, and congener specific summaries are found in Table 4. The z-sample results for dioxin in C1 are 64.3 pptr TEQ which is lower than that seen in the dredge prism but still significantly elevated relative to the 4/10 pptr TEQ guidelines. Likewise, dioxin in the exposed surface at DMMU C3 (11.1 pptr-TEQ) was lower than that seen in the dredge prisms and higher than the threshold set by the dioxin guidelines. Only for z-sample,C2 (0.9 pptr-TEQ) were dioxin concentrations below the guidelines.

**Based on the PCBs for all three DMMUs and the Dioxin results for C1Z and C3Z, the DMMP has concluded that the z-sample results for all three DMMUs are not in compliance with the antidegradation standard.** The following actions will be required to remedy the exposed surface after maintenance dredging is completed:

- a. Dredge an additional one-foot of material beyond the required maintenance depth (-12.8 ft to -11.8 ft OHW @ DMMU's C1 and C2; and -11.8 ft to -10.8 ft OHW @ DMMU-C3).
  - b. Place a one-foot clean sand cover over the exposed surface.
10. **Suitability for Unconfined-Open Water Disposal.** Based on the testing results for the three DMMUs summarized in Table 3, all 7,427 cy of proposed dredged material is unsuitable for unconfined open-water disposal, and will have to be dredged and placed at an Ecology approved upland confined disposal site.
11. This memorandum documents the suitability determination for the characterized dredged material at the Harbour Village Marina maintenance dredging area for unconfined-open-water disposal at the Elliott Bay non-dispersive disposal site. It also documents the requirements to evaluate the exposed post-dredge surface to assess antidegradation compliance, and proposed remedy to address this concern. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this project must be completed as part of the final project approval process. 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.
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**Signed SDM is on file in the Dredged Material Management Office**

Concur:

\_\_\_\_\_  
Date

\_\_\_\_\_  
David R. Kendall, Ph.D., Seattle District Corps of Engineers

\_\_\_\_\_  
Date

\_\_\_\_\_  
Erika Hoffman, Environmental Protection Agency

\_\_\_\_\_  
Date

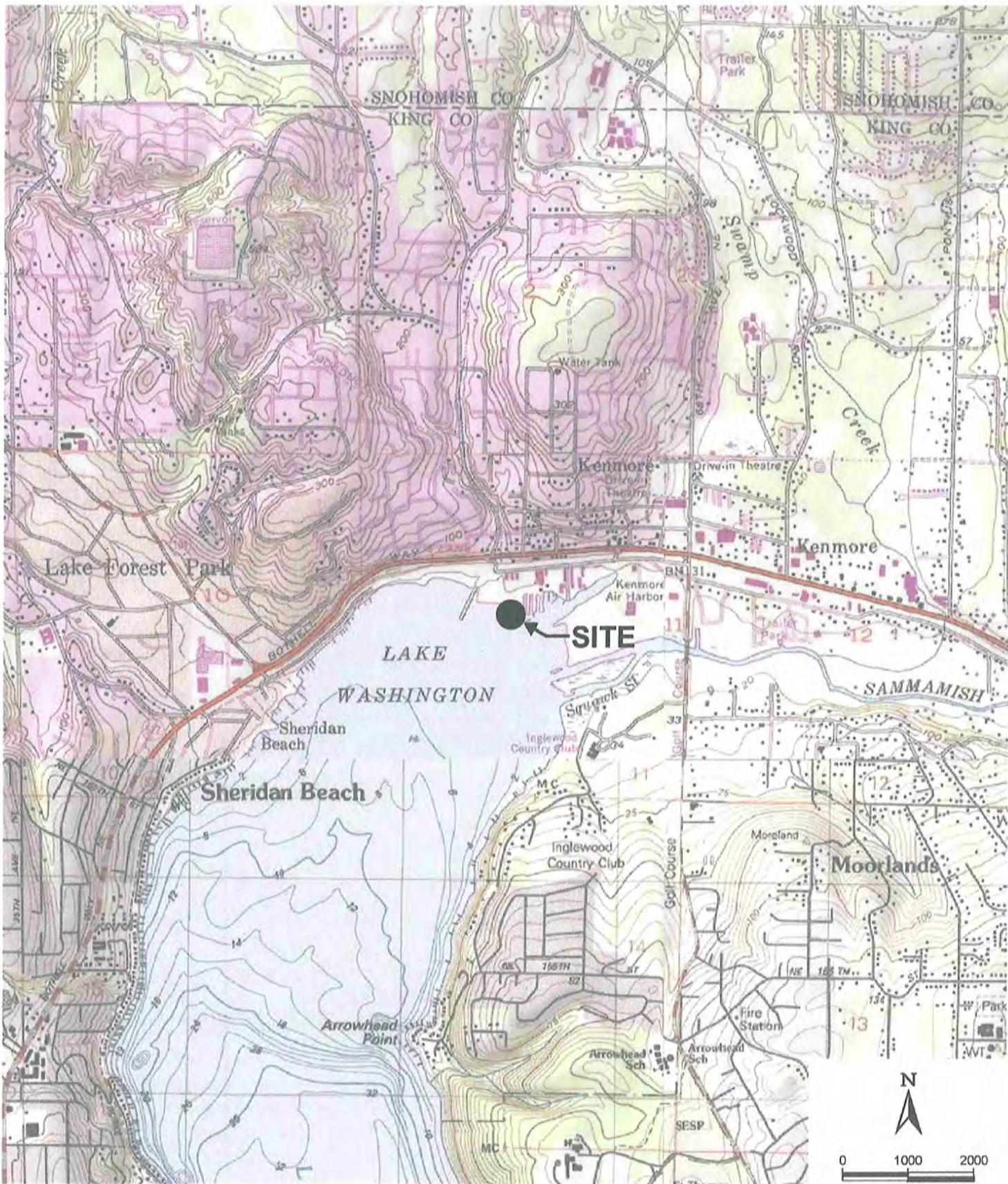
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DMMO file



REFERENCE: USGS TOPOI

Associated Earth Sciences, Inc.

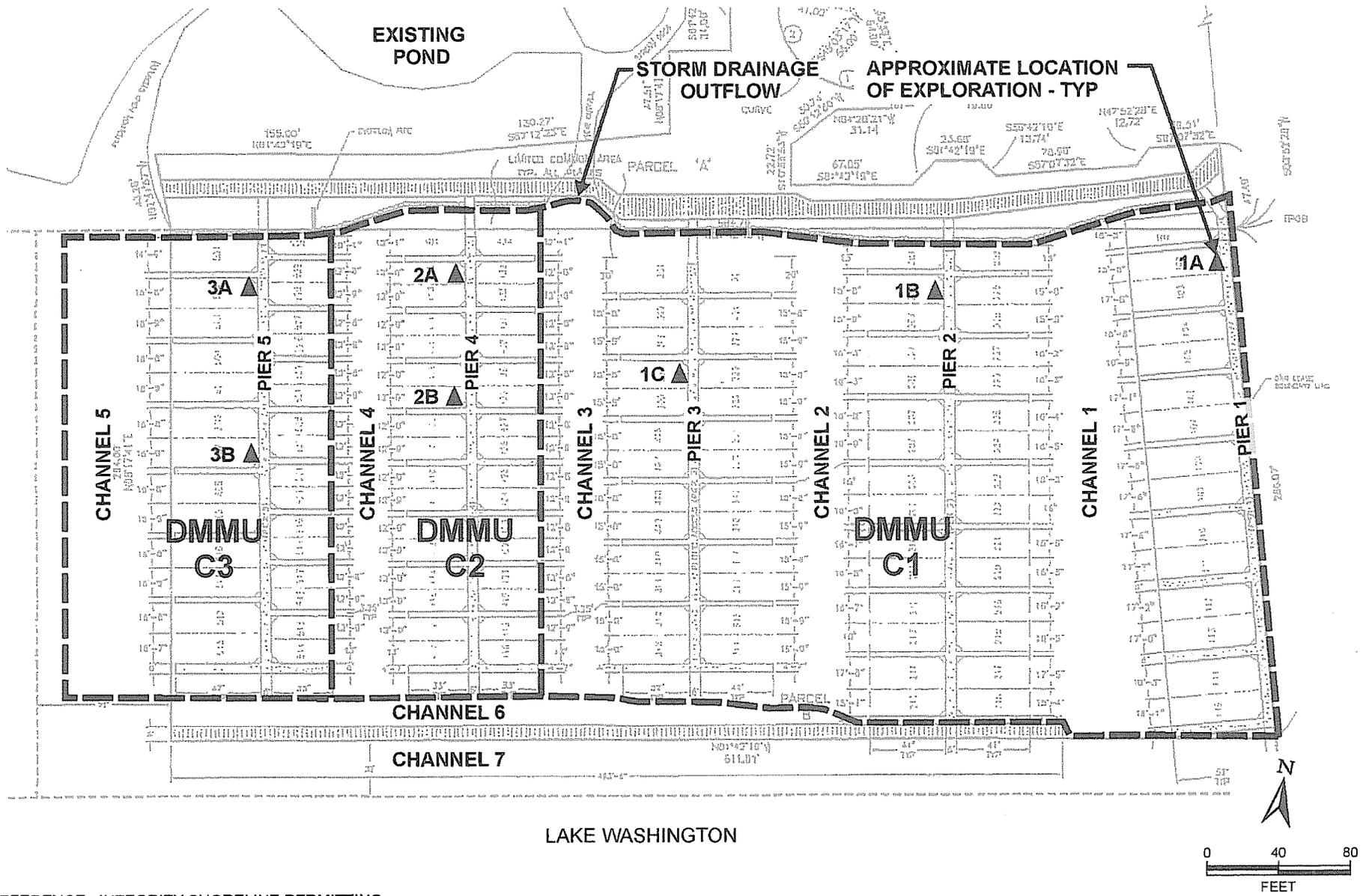


VICINITY MAP  
 HARBOUR VILLAGE MARINA DREDGING  
 SEATTLE, WASHINGTON

FIGURE 1

DATE 6/11

PROJ. NO. KV090373A



REFERENCE: INTEGRITY SHORELINE PERMITTING

Associated Earth Sciences, Inc.



**SITE AND EXPLORATION PLAN**  
**HARBOUR VILLAGE MARINA DREDGING**  
**KENMORE, WASHINGTON**

FIGURE 2

DATE 9/11

PROJ. NO. KE090373A



Table 3. Harbor Village Marina DMMP Characterization Summary

CHEMICAL NAME	Units	DMMP (Marine-DW)						SEF (Freshwater - DW)		Sample ID:		DMMU-1			DMMU-2			DMMU-3									
		SL			BT			ML			SL1		SL2		Units		DMMU ID:		C1			C2			C3		
		SMS	QSQ	CSL	mg/kg-DW	mg/kg-OC	VQ	mg/kg-DW	mg/kg-OC	VQ	mg/kg-DW	mg/kg-OC	VQ	mg/kg-DW	mg/kg-OC	VQ	mg/kg-DW	mg/kg-OC	VQ								
		DMMP	SMS	DMMP	SMS	DMMP	SMS	DMMP	SMS	DMMP	SMS	DMMP	SMS	DMMP	SMS	DMMP	SMS	DMMP	SMS								
N-Nitrosodiphenylamine	µg/kg	28		130	--	--			mg/kg-OC	11	11	3.3	0.05	U	3.6	0.05	U	3.1	0.05	U							
p,p-DDE	µg/kg	9										0.76		U	0.8		U	0.69		U							
p,p-DDD	µg/kg	16										0.76		U	0.8		U	0.69		U							
p,p-DDT	µg/kg	12										0.76		U	0.8		U	0.69		U							
<b>Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)</b>	µg/kg		50	69	--	--				--	--	0.76		U	0.8		U	0.69		U							
Aldrin	µg/kg	9.5			--	--				--	--	0.76		U	0.8		U	0.69		U							
Chlordane	µg/kg	2.8			--	--				--	--	0.76		U	0.8		U	0.69		U							
Dieldrin	µg/kg	1.9	37		--	--				--	--	0.76		U	0.8		U	0.69		U							
Heptachlor	µg/kg	1.5			--	--				--	--	0.76		U	0.8		U	0.69		U							
Alpha-BHC	µg/kg	10			--	--				--	--																
Gamma-BHC (Lindane)	µg/kg	10	10		--	--				--	--	0.76		U	0.8		U	0.69		U							
<b>Total PCBs</b>	µg/kg	130		3,100	60	120	mg/kg/OC	12.0	65.0	277	4.3	196	2.7	237	4.0												
<b>Total PCBs (TOC-normalized)</b>	mg/kg-OC		38***							4.3		2.7		4.0													
<b>Total PCBs (Z-samples)</b>	µg/kg									126		104		237.0													
<b>Dioxin (TEQ: see Table 4 for detailed results)</b>	ng/kg									92.1		77.3		43.2													
<b>Dioxin (Z-samples)</b>	ng/kg									64.3		0.9		11.1													
Total Solids	%									26.1		24.2		28.3													
Total Volatile Solids	%									16.0		18.1		16.7													
Total Organic Carbon	%									6.5		7.2		6.0													
Total Ammonia	mg/kg									30.0		150.0		110.0													
Total Sulfides	mg/kg									44.8		<36.4		<35.7													
Gravel	%									10.6		0.4		3.5													
Sand	%									28.7		26.9		37.2													
Silt	%									49.6		66.5		57.5													
Clay	%									10.8		6.9		1.7													
Fines (percent silt + clay)	%									60.4		73.4		59.2													
Bioassay Determination: (P/F)										NA		NA		NA													
BTs exceeded:										No		No		No													
Bioaccumulation conducted:										No		No		No													
Bioaccumulation Determination: (P/F)										NA		NA		NA													
ML Rule exceeded:										No		No		No													
<b>PSDDA Determination:</b>										Fail UCOWD/AD		Fail UCOWD/AD		Fail UCOWD/AD													
<b>DMMU Volume:</b>										2,461		2,023		2,943													
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)										H		H		H													
Mean core sampling depth (ft)	ft									1.8		2.8		3.5													
Maximum sampling depth (mudline) (with Z-sample)	ft									2.5		3.0		4.5													
<b>DMMU ID:</b>										DMMU-C1			DMMU-C2			DMMU-C3											

**P = Pass (BPJ: Suitable for Beneficial Use)**  
**Fail = exceeds DMMP suitability guidelines/antidegradation**  
**SL = exceeds DMMP SL guidelines**  
**SL1 = exceeds Freshwater SL1 Guidelines (antidegradation)**  
**SL2 = exceeds Freshwater SL2 Guidelines (antidegradation)**

**VQ = Validation Qualifier**  
**UCOWD = Unconfined open-water disposal**  
**AD = antidegradation**  
**NA = Not applicable**  
**U = undetected at the reporting limit (method detection limit)**

Table 4. Dioxin/furan Testing Summary for Harbor Village Marina Project

Analyte	WHO (05) TEF	C1 (HVM)			C2 (HVM)			C3 (HVM)		
		ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ
2,3,7,8-TCDD	1	1.8		1.8	1.9		1.9	1.2		1.2
1,2,3,7,8-PeCDD	1	17		17	14		14	7.8		7.8
1,2,3,4,7,8-HxCDD	0.1	36		3.6	25		2.5	10		1
1,2,3,6,7,8-HxCDD	0.1	150		15	120		12	66		6.6
1,2,3,7,8,9-HxCDD	0.1	66		6.6	46		4.6	25		2.5
1,2,3,4,6,7,8-HpCDD	0.01	2700		27	2500		25	1300		13
OCDD	0.0003	22000		6.6	22000		6.6	12000		3.6
2,3,7,8-TCDF	0.1	6.8		0.68	5.9		0.59	4.4		0.44
1,2,3,7,8-PeCDF	0.03	0.36	u	0.0054	6.4		0.192	3.7		0.111
2,3,4,7,8-PeCDF	0.3	13		3.9	0.32	u	0.048	8.2		2.46
1,2,3,4,7,8-HxCDF	0.1	19		1.9	17		1.7	16		1.6
1,2,3,6,7,8-HxCDF	0.1	16		1.6	16		1.6	0.34	u	0.017
2,3,4,6,7,8-HxCDF	0.1	17		1.7	24		2.4	7.1		0.71
1,2,3,7,8,9-HxCDF	0.1	10		1	10		1	5.4		0.54
1,2,3,4,6,7,8-HpCDF	0.01	320		3.2	280		2.8	140		1.4
1,2,3,4,7,8,9-HpCDF	0.01	14		0.14	15		0.15	7.9		0.079
OCDF	0.0003	1200		0.36	880		0.264	570		0.171
<b>Total TEQ (u = 1/2):</b>				<b>92.1</b>			<b>77.3</b>			<b>43.2</b>
<b>Total TEQ (u=0):</b>				<b>92.1</b>			<b>77.3</b>			<b>43.2</b>
<b>TOC (%)</b>				<b>6.5</b>			<b>7.2</b>			<b>6.0</b>

Analyte	WHO (05) TEF	C1-Z (HVM)			C2-Z (HVM)			C3-Z (HVM)		
		ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ
2,3,7,8-TCDD	1	0.34	u	0.17	0.35	u	0.175	0.57		0.57
1,2,3,7,8-PeCDD	1	7.4		7.4	0.55	u	0.275	0.73	u	0.365
1,2,3,4,7,8-HxCDD	0.1	20		2	0.5	u	0.025	3.7		0.37
1,2,3,6,7,8-HxCDD	0.1	120		12	0.92		0.092	15		1.5
1,2,3,7,8,9-HxCDD	0.1	36		3.6	0.62	u	0.031	6.7		0.67
1,2,3,4,6,7,8-HpCDD	0.01	2100		21	0.56		0.0056	320		3.2
OCDD	0.0003	20000		6	100		0.03	3400		1.02
2,3,7,8-TCDF	0.1	0.22	u	0.011	0.72		0.072	2.9		0.29
1,2,3,7,8-PeCDF	0.03	0.85	u	0.01275	0.43	u	0.00645	0.98	u	0.0147
2,3,4,7,8-PeCDF	0.3	14		4.2	0.42	u	0.063	5		1.5
1,2,3,4,7,8-HxCDF	0.1	16		1.6	0.63	u	0.0315	3.7		0.37
1,2,3,6,7,8-HxCDF	0.1	9.4		0.94	0.66	u	0.033	2.8		0.28
2,3,4,6,7,8-HxCDF	0.1	11		1.1	0.56	u	0.028	3.9		0.39
1,2,3,7,8,9-HxCDF	0.1	8.1		0.81	0.57	u	0.0285	1.8		0.18
1,2,3,4,6,7,8-HpCDF	0.01	280		2.8	2		0.02	33		0.33
1,2,3,4,7,8,9-HpCDF	0.01	13		0.13	0.47	u	0.00235	2.2		0.022
OCDF	0.0003	1600		0.48	0.75	u	0.000113	130		0.039
<b>Total TEQ (u = 1/2):</b>				<b>64.3</b>			<b>0.9</b>			<b>11.1</b>
<b>Total TEQ (u=0):</b>				<b>64.1</b>			<b>0.2</b>			<b>10.7</b>
<b>TOC (%)</b>				<b>6.5</b>			<b>7.2</b>			<b>6.0</b>

**Table 5. Volume Weighted Average (VWA) Dioxin Concentrations for Harbor Village Marina Dredging Project**

DMMU ID:	Volume (CY)	TCDD/F TEQ	ng/kg-dw	Product (Vol x TEQ)	ng x cy/kg x DMMU	Prod./total	Proportional contribution/Suitable DMMU
C1	2,461	92.1	ng/kg-dw	226,658	ng x cy/kg	44.4%	% of Total DMMU
C2	2,023	77.3	ng/kg-dw	156,378	ng x cy/kg	30.7%	% of Total DMMU
C3	2,943	43.2	ng/kg-dw	127,138	ng x cy/kg	24.9%	% of Total DMMU
Totals (Volume):	7,427	70.87	ng/kg-dw	510,174	ng x cy/kg	68.69	ng/kg-dw/Project (VWA)
Totals (Suitable):	0						