CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD July 30, 2009

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE THATCHER BAY NEARSHORE RESTORATION PROJECT, BLAKELY ISLAND, SAN JUAN COUNTY, FOR UNCONFINED OPEN-WATER DISPOSAL AT THE ROSARIO STRAIT DISPERSIVE 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 12,900 cubic yards (cy) of dredged material from the Thatcher Bay Nearshore Restoration project disposal at the Rosario Strait dispersive open-water site.

2. Background. The Thatcher Bay Nearshore Restoration project on Blakely Island (see Figure 1 for a vicinity map) is being performed by the Skagit Fisheries Enhancement Group (SFEG) to improve habitat at the site of a former sawmill. Historic saw mill activities in Thatcher Bay date back to 1879 and continued for more than 60 years until the mill closed in 1942 (SFEG, 2009). The saw mill activities resulted in accumulation of wood waste in an intertidal area as shown in Figure 2. The distribution and thickness of accumulated wood waste have been previously investigated (UW, 2008). The wood waste is reducing the quality of intertidal habitat. SFEG plans to remove the wood waste-containing sediment and to replace it with a sediment substrate (clean sand and gravel) that will provide more suitable habitat. The plan includes dredging of up to 12,900 cubic yards (cy) of mixed surficial woody debris and sediments, as depicted in Figure 2.

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

Table 1. Project Summary

Project ranking	Low-moderate
Proposed dredging volume	12,900 cubic yards
Proposed dredging depth	varies
Draft SAP received	August 11, 2008
Draft SAP returned for revision	August 24, 2008
Revised SAP received	August 29, 2008
Revised SAP approved	September 4, 2008
Reason-to-believe analysis requested by DMMP agencies for dioxin	September 19, 2008
SAP addendum for dioxin testing submitted	April 24, 2009
Sampling date	April 27, 2009
Draft data report received	June 29, 2009
Draft data report returned for revision	July 13, 2009

Final data report received	July 30, 2009
DAIS Tracking number	THATB-1-A-F-275
USACE Permit Application Number	NWS-2010-18
Recency Determination (low-moderate rank = 5 to 7 years)	April 2014 – April 2016

4. Project Ranking and Sampling Requirements. The project was ranked "low-moderate" by the DMMP agencies based on Table 4-2 in the DMMP Users' Manual (DMMP, 2008a). In a low-moderate-ranked area the number of samples and analyses are calculated using the following guidelines:
   - Maximum volume of sediment represented by each field sample = 8,000 cubic yards
   - Maximum volume of sediment represented by each analysis in the upper 4-feet of the dredging prism (surface sediment) = 32,000 cubic yards

   The total volume of material proposed for dredging was 12,900 cubic yards (including 2 feet of overdepth), with the entire volume considered surface sediment. Therefore, only a single dredged material management unit (DMMU) was required. The minimum number of field samples required under the DMMP guidelines was two. However, due to the heterogeneity of the site and the need to adequately characterize the wood-waste content, five field samples were required for this project.

   A subset of the sampling locations visited in the University of Washington study (UW, 2008) was selected for dredged material characterization (see Figure 2). The sampling plan called for penetration to a depth of three feet beyond the layer of mixed surficial woody debris/sediment at each location. This included two feet of overdepth plus a one-foot z-sample. The overdepth was to be included in the composited sample representing the DMMU, with the z-sample at each station collected and archived separately.

5. Sampling. Sampling took place April 27, 2009 using a vibracore. The vibracore encountered refusal at several sampling locations, primarily due to large woody debris. At these stations the vibracore was repositioned until penetration improved. However, at station 10, penetration beyond the wood waste may not have been achieved and, despite several attempts, full penetration could not be obtained at station 30 due to a layer of coarse sand overlying the wood waste. See Figure 2 for target and actual sampling locations and Table 2 for detailed sampling and compositing information.

   Despite the problems encountered during sampling, the DMMP agencies determined that the collected samples adequately represent the proposed dredged material. The number of samples taken was well above the minimum requirement. While some sampling locations were moved to avoid large woody debris, there were two samples (10 and 30) that likely contained a disproportionate fraction of wood waste due to limited penetration. The samples were also fairly well distributed and were taken largely from areas with thicker layers of wood waste.

6. Chemical Analysis. The wood content of the dredged material was determined using ASTM total volatile solids method 2974C, modified to include a 300-gram sample in place of the standard 50-gram sample size. The resulting volatile solids content was 12.9%. This equates to an approximate wood content of 25.8% by volume. DMMP allows up to 50% wood content by volume without

triggering a requirement for bioassays (see DMMP, 1997). A particle-size analysis was conducted on the ash content remaining at the end of the modified volatile solids test. The results indicated that the proposed dredged material – with the wood waste removed - is predominantly silt. The total organic carbon content was 1.35 percent. These and other sediment conventional results can be found in Table 3.

The results for analysis of chemicals of concern indicated that there were no exceedances of DMMP screening levels (Table 4). Consequently, bioassay testing was not required for this material. The dioxin results are shown in Table 5. The toxicity equivalent (TEQ, with undetects = ½ detection limit) for the DMMU was 0.34 parts per trillion (pptr), well below the 2.44 pptr Samish Bay reference guideline used in recent DMMP projects. Therefore, with no SL exceedances, a dioxin concentration below reference, and wood content of less than 50% by volume, the DMMU met the suitability guidelines for open-water disposal at the Rosario Strait site.

7. Chemical Analysis QA/QC. DMMP QA/QC requirements are shown in Table 6. Precision and accuracy goals were met by the analytical laboratories for this characterization with the following exceptions:
   - Metals: Matrix spike recovery for antimony (10.5%) was outside the action limit range. However, a post-digestion spike was added and recovery (94%) was within control limits. Therefore, the sample result for antimony was considered acceptable, but qualified as "UJ" to indicate a potentially low bias.
   - Volatiles: Recovery was below the warning limit for the surrogate bromofluorobenzene in the sample and matrix spike, but within laboratory control limits. Matrix spike recovery for 1,2,4-trichlorobenzene was below the laboratory control limit and has been qualified as "UJ" to indicate a potentially low bias.
   - Semivolatiles: Recovery was below 50% for the surrogate d5-nitrobenzene in the laboratory control sample, but within laboratory control limits. Matrix spike recoveries for phenol, benzoic acid and benzyl alcohol were below the warning limit. Phenol and benzoic acid were within the laboratory control limits, but the recovery for benzyl alcohol was zero. The dredged material sample was re-extracted and analyzed a second time, with matrix spike recovery falling within the laboratory control limits. No data qualification was necessary.

   Additional quality control assessment was provided by Analytical Resources: "For the semivolatiles analysis, benzoic acid recovery was just below QC limits in the continuing calibration. As all other QC was within compliance and benzoic acid is considered a poor performer, no corrective action was necessary. The method blank (MB) associated with the metals analysis had a low response for zinc. As the sample had greater than ten times the level in the MB, no corrective action was necessary."

   The QA/QC problems encountered during chemical analysis were considered minor in nature and did not significantly impact the overall quality of the data or its use for decision-making.

8. Sediment Exposed by Dredging. Sediment to be exposed by dredging must meet the DMMP antidegradation guidelines (DMMP, 2008b). Comparison of the proposed dredged material to SQS serves as a first-tier indicator for this purpose. Table 7 shows that there were no detected or undetected exceedances of SQS. Therefore, 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.

9. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Thatcher Bay Nearshore Restoration project for open-water disposal. The approved sampling and analysis plan was followed with the exceptions noted above. 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 12,900 cubic yards are suitable for open-water disposal at the Rosario Strait 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 and the Corps of Engineers will be required. A dredging quality control plan must be developed and submitted to the Regulatory Branch project manager 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.

10. References.

DMMP, 1997. *Management of Wood Waste under the Dredged Material Management Program and the Sediment Management Standards Cleanup Program*. Prepared by David Kendall (U.S. Army Corps of Engineers) and Teresa Michelsen (Department of Ecology) for the DMMP agencies. September 2007.

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.

SFEG, 2009. *Dredged Material Management Program Sediment Characterization Report – Thatcher Bay Nearshore Restoration Project.* Prepared by Anchor QEA for the Skagit Fisheries Enhancement Group, July 2009.

UW, 2008. *Thatcher Bay Nearshore Restoration Assessment.* Prepared by the University of Washington for the Skagit Fisheries Enhancement Group. June 2008.

11. Agency Signatures.

Concur:

7/30/09 David F. Fox
Date David Fox, P.E. - Seattle District Corps of Engineers

8/6/09
Date Erika Hoffman - Environmental Protection Agency

08/06/2009 Laura Inouye
Date Laura Inouye, Ph.D. - Washington Department of Ecology

6-Aug-09
Date Courtney Wasson - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Sue Powell, Seattle District Regulatory
Alison Studley, Skagit Fisheries Enhancement Group
Robert Warinner, Washington Department of Fish and Wildlife
James Keithly, Anchor QEA

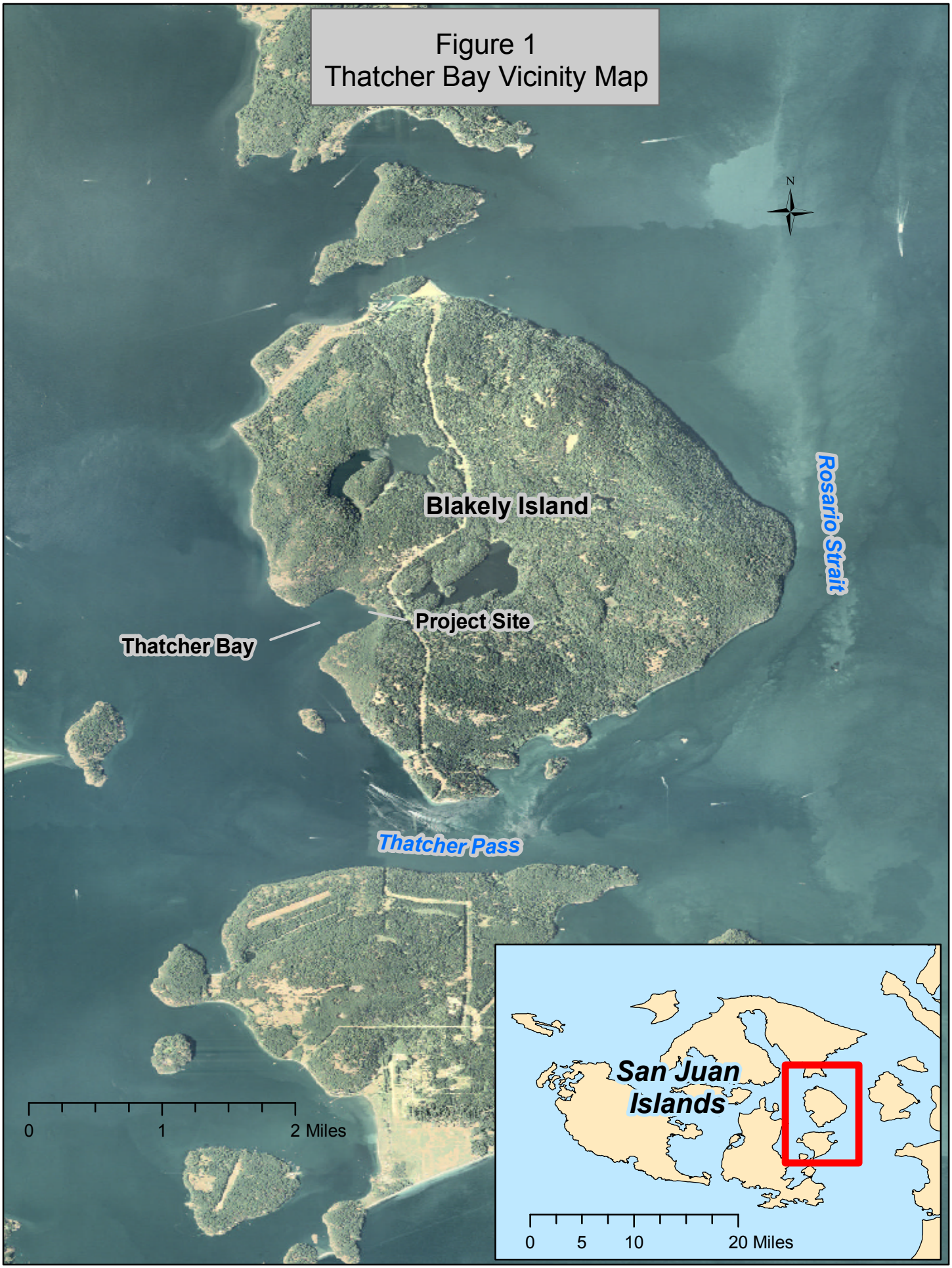
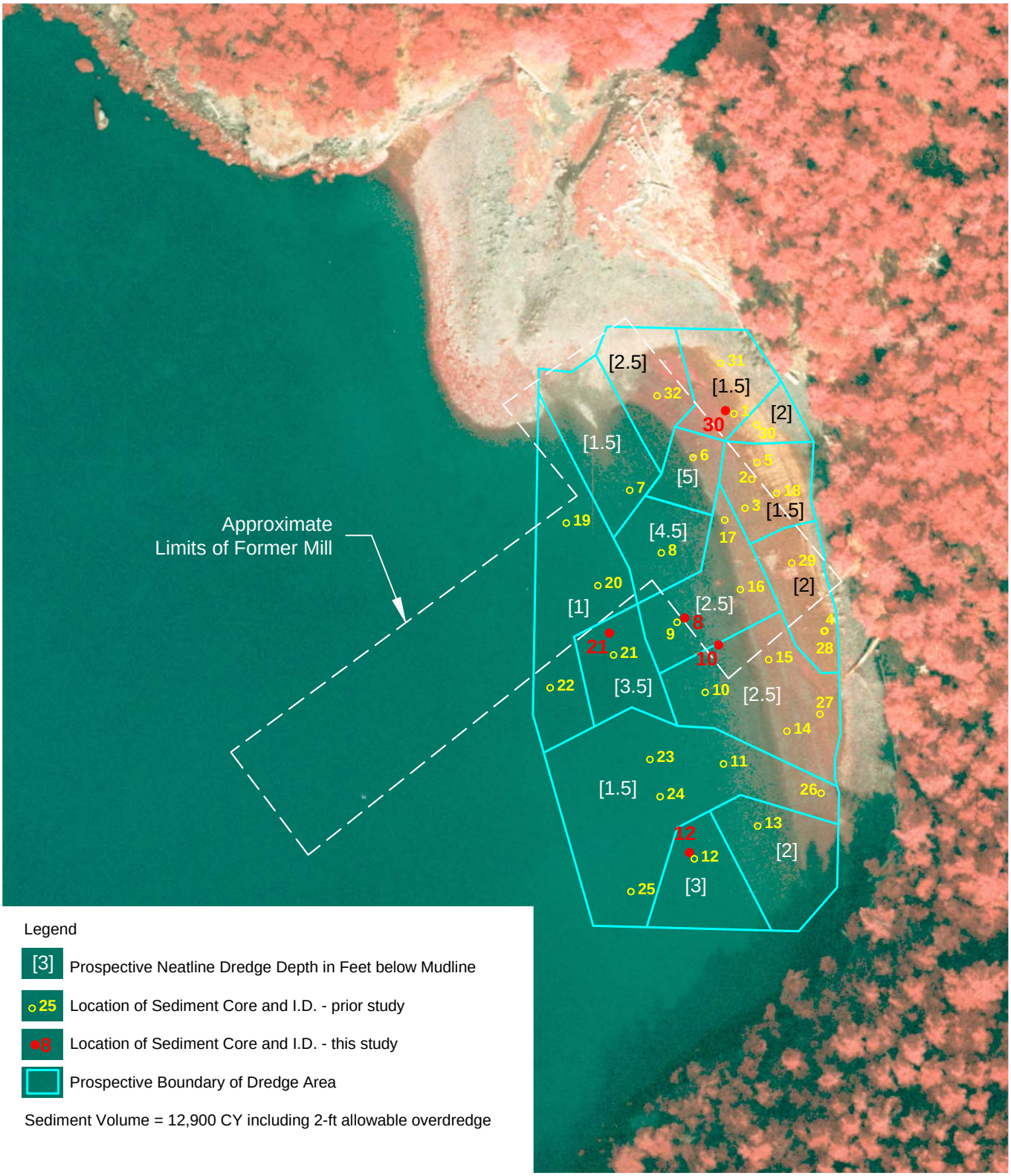


Figure 1
Thatcher Bay Vicinity Map
N
Blakely Island
Rosario Strait
Project Site
Thatcher Bay
Thatcher Pass
0
1
2 Miles
San Juan Islands
0
5
10
20 Miles



Legend

[3] Prospective Neatline Dredge Depth in Feet below Mudline

25 Location of Sediment Core and I.D. - prior study

8 Location of Sediment Core and I.D. - this study

Prospective Boundary of Dredge Area

Sediment Volume = 12,900 CY including 2-ft allowable overdredge

Source: Drawing prepared from GIS files provided by Skagit Fisheries.
Horizontal Datum: Washington State Plane South, NAD83.
Vertical Datum: N/A.

0 100
Scale in Feet

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ANCHOR QEA

Figure 2
Actual Core Locations and Prospective Dredge Areas
Thatcher Bay Site

Table 2. Sampling and Compositing.

sampling station	depth of wood waste from UW study	depth interval collected for dredged material characterization[1]	**latitude[2]**	**longitude[2]**
8	4.5 ft	0 to -6.5 ft	48.55203	-122.81578
10	2.5 ft	0 to -4.5 ft	48.55198	-122.81568
12	3.0 ft	0 to -5.0 ft	48.55158	-122.81575
21	3.5 ft	0 to -5.5 ft	48.55197	-122.81597
30	2.0 ft	0 to -4.0 ft	48.55243	-122.81568

[1]The sampling depths include 2-feet of overdepth; z-samples were taken from the 1-foot interval beyond the depth range shown.

[2]Latitude and longitude referenced to WGS84.

Table 3. Sediment Conventional Data.

		DMMU 1
	DAIS ID:	C1
GRAIN SIZE	% Gravel:	0.8
	% Sand:	5.4
	% Silt:	83.7
	% Clay:	10.1
	% Fines (clay+silt):	93.8
	Total Solids (%):	58.6
	Volatile Solids (%):	12.9
	Total Organic Carbon (%):	1.35
	Total Sulfides (mg/kg):	156
	Total Ammonia (mg N/kg):	60.4

Note 1: Volatile Solids based on ASTM D2974C, modified to determine wood content.

Note 2: Grain-size fractions determined after combusting the sediment sample at 440 degrees Celsius.

Table 4. Chemical results compared to DMMP regulatory guidelines.

CHEMICAL	SL	BT	ML	DMMU 1	
METALS (mg/kg dry)				conc	QL
Antimony	150	---	200	8	UJ
Arsenic	57	507	700	8	U
Cadmium	5.1	11.3	14	1.2	
Chromium	---	267	---	23.4	
Copper	390	1,027	1,300	12.1	
Lead	450	975	1,200	3	U
Mercury	0.41	1.5	2.3	0.03	U
Nickel	140	370	370	17	
Selenium	---	3.0	---	0.8	
Silver	6.1	6.1	8.4	0.5	U
Zinc	410	2,783	3,800	43	
LPAH (ug/kg dry)					
2-Methylnaphthalene	670	---	1,900	19	U
Acenaphthene	500	---	2,000	19	U
Acenaphthylene	560	---	1,300	19	U
Anthracene	960	---	13,000	19	U
Fluorene	540	---	3,600	19	U
Naphthalene	2,100	---	2,400	19	U
Phenanthrene	1,500	---	21,000	19	U
Total LPAH	5,200	---	29,000	19	U
HPAH (ug/kg dry)					
Benzo(a)anthracene	1,300	---	5,100	19	U
Benzo(a)pyrene	1,600	---	3,600	19	U
Benzo(g,h,i)perylene	670	---	3,200	19	U
Benzofluoranthenes	3,200	---	9,900	19	U
Chrysene	1,400	---	21,000	19	U
Dibenzo(a,h)anthracene	230	---	1,900	19	U
Fluoranthene	1,700	4,600	30,000	19	U
Indeno(1,2,3-c,d)pyrene	600	---	4,400	19	U
Pyrene	2,600	11,980	16,000	19	U
Total HPAH	12,000	---	69,000	19	U
CHLORINATED HYDROCARBONS (ug/kg dry)					
1,2,4-Trichlorobenzene	31	---	64	6.6	UJ
1,2-Dichlorobenzene	35	---	110	1.3	U
1,3-Dichlorobenzene	170	---	---	1.3	U
1,4-Dichlorobenzene	110	---	120	1.3	U
Hexachlorobenzene	22	168	230	0.96	U
PHTHALATES (ug/kg dry)					
Bis(2-ethylhexyl)phthalate	1,300	---	8,300	19	U
Butyl benzyl phthalate	63	---	970	19	U
Di-n-butyl phthalate	1,400	---	5,100	19	U
Di-n-octyl phthalate	6,200	---	6,200	19	U
Diethyl phthalate	200	---	1,200	19	U
Dimethyl phthalate	71	---	1,400	19	U

CHEMICAL	SL	BT	ML	DMMU 1	
PHENOLS (ug/kg dry)					
2 Methylphenol	63	---	77	19	U
2,4-Dimethylphenol	29	---	210	19	U
4 Methylphenol	670	---	3,600	19	U
Pentachlorophenol	400	504	690	97	U
Phenol	420	---	1,200	19	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)					
Benzoic acid	650	---	760	190	U
Benzyl alcohol	57	---	870	19	U
Dibenzofuran	540	---	1,700	19	U
Hexachlorobutadiene	29	---	270	0.96	U
Hexachloroethane	1,400	---	14,000	19	U
N-Nitrosodiphenylamine	28	---	130	19	U
VOLATILE ORGANICS (ug/kg dry)					
Ethylbenzene	10	---	50	1.3	U
Tetrachloroethene	57	---	210	1.3	U
Total Xylene	40	---	160	1.3	U
Trichloroethene	160	---	1,600	1.3	U
PESTICIDES AND PCBs (ug/kg dry)					
Aldrin	10	---	---	0.96	U
Chlordane	10	37	---	1.9	U
Dieldrin	10	---	---	1.9	U
Heptachlor	10	---	---	0.96	U
Lindane	10	---	---	0.96	U
Total DDT	6.9	50	69	1.9	U
Total PCBs	130	---	3,100	20	U
Total PCBs (mg/kg OC)	---	38	---	1.5	U

J = estimate
U = undetected
QL = laboratory qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

Table 5. Dioxins/Furans Data and TEQ Calculations

CHEMICAL	TEF	DMMU 1			
DIOXINS (ng/kg dry)		conc	QL	TEQ (U=1/2 DL)	TEQ (U=0)
2,3,7,8-TCDD	1	0.0842	J	0.0842	0.0842
1,2,3,7,8-PeCDD	1	0.138	U	0.0690	0.0000
1,2,3,4,7,8-HxCDD	0.1	0.132	U	0.0066	0.0000
1,2,3,6,7,8-HxCDD	0.1	0.385	J	0.0385	0.0385
1,2,3,7,8,9-HxCDD	0.1	0.407	J	0.0407	0.0407
1,2,3,4,6,7,8-HpCDD	0.01	3.49		0.0349	0.0349
OCDD	0.0003	24.7		0.0074	0.0074
FURANS (ng/kg dry)					
2,3,7,8-TCDF	0.1	0.138	J	0.0138	0.0138
1,2,3,7,8-PeCDF	0.03	0.119	U	0.0018	0.0000
2,3,4,7,8-PeCDF	0.3	0.102	U	0.0153	0.0000
1,2,3,4,7,8-HxCDF	0.1	0.0569	U	0.0028	0.0000
1,2,3,6,7,8-HxCDF	0.1	0.0719	J	0.0072	0.0072
1,2,3,7,8,9-HxCDF	0.1	0.0789	U	0.0039	0.0000
2,3,4,6,7,8-HxCDF	0.1	0.0558	J	0.0056	0.0056
1,2,3,4,6,7,8-HpCDF	0.01	0.369	J	0.0037	0.0037
1,2,3,4,7,8,9-HpCDF	0.01	0.0507	U	0.0003	0.0000
OCDF	0.0003	0.446	J	0.0001	0.0001
Total TEQ				0.3358	0.2361

J = estimated concentration
U = undetected
QL = laboratory qualifier
TEF = toxicity equivalence factor
TEQ = toxicity equivalents
ng/kg = nanogram/kilogram (parts per trillion)

Table 6. QA/QC requirements for chemical analysis in the DMMP program.

QA ELEMENT		WARNING LIMITS	ACTION LIMITS
Precision	Metals	None	20% RPD or COV
	Organics	35% COV	50% COV or a factor of 2 for duplicates
Matrix Spikes	Metals	None	75-125% recovery
	Organics:[1] ▪ Volatiles ▪ Semivolatiles and Pesticides	▪ 70-150% ▪ 50-150%	None (zero percent recovery may be cause for data rejection however)[2]
Reference Materials	Metals	None	95% CI if specified for a particular CRM; 80-120% recovery if not.
	Organics	None	95% CI for CRMs. No action limit for uncertified RMs.
Surrogate Spikes	Organics ▪ Volatiles ▪ Pesticides ▪ Semi-volatiles	▪ 85% minimum recovery ▪ 60% minimum recovery ▪ 50% minimum recovery	EPA CLP chemical-specific recovery limits

[1] Warning limits set at the CLP advisory limits for matrix spike duplicates for those chemicals covered under CLP.
[2] Rigorous control limits are not recommended due to possible matrix effects and interferences.

Table 7. Chemical results compared to SMS regulatory guidelines.

CHEMICAL	SQS	CSL	DMMU 1	
METALS (mg/kg dry)			conc	QL
Arsenic	57	93	8	U
Cadmium	5.1	6.7	1.2	
Chromium	260	270	23.4	
Copper	390	390	12.1	
Lead	450	530	3	U
Mercury	0.41	0.59	0.03	U
Silver	6.1	6.1	0.5	U
Zinc	410	960	43	
LPAH (mg/kg OC)				
2-Methylnaphthalene	38	64	1.4	U
Acenaphthene	16	57	1.4	U
Acenaphthylene	66	66	1.4	U
Anthracene	220	1200	1.4	U
Fluorene	23	79	1.4	U
Naphthalene	99	170	1.4	U
Phenanthrene	100	480	1.4	U
Total LPAH	370	780	1.4	U
HPAH (mg/kg OC)				
Benzo(a)anthracene	110	270	1.4	U
Benzo(a)pyrene	99	210	1.4	U
Benzo(g,h,i)perylene	34	88	1.4	U
Benzofluoranthenes	230	450	1.4	U
Chrysene	110	460	1.4	U
Dibenzo(a,h)anthracene	12	33	1.4	U
Fluoranthene	160	1200	1.4	U
Indeno(1,2,3-c,d)pyrene	34	88	1.4	U
Pyrene	1000	1400	1.4	U
Total HPAH	960	5300	1.4	U
CHLORINATED HYDROCARBONS (mg/kg OC)				
1,2,4-Trichlorobenzene	0.81	1.8	0.49	UJ
1,2-Dichlorobenzene	2.3	2.3	0.10	U
1,4-Dichlorobenzene	3.1	9	0.10	U
Hexachlorobenzene	0.38	2.3	0.07	U
PHTHALATES (mg/kg OC)				
Bis(2-ethylhexyl)phthalate	47	78	1.4	U
Butyl benzyl phthalate	4.9	64	1.4	U
Di-n-butyl phthalate	220	1700	1.4	U
Di-n-octyl phthalate	58	4500	1.4	U
Diethyl phthalate	61	110	1.4	U
Dimethyl phthalate	53	53	1.4	U

CHEMICAL	SQS	CSL	DMMU 1	
PHENOLS (ug/kg dry)				
2 Methylphenol	63	63	19	U
2,4-Dimethylphenol	29	29	19	U
4 Methylphenol	670	670	19	U
Pentachlorophenol	360	690	97	U
Phenol	420	1200	19	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)				
Benzoic acid	650	650	190	U
Benzyl alcohol	57	73	19	U
MISCELLANEOUS EXTRACTABLES (mg/kg OC)				
Dibenzofuran	15	58	1.4	U
Hexachlorobutadiene	3.9	6.2	0.07	U
N-Nitrosodiphenylamine	11	11	1.4	U
PCBs (mg/kg OC)				
Total PCBs (mg/kg carbon)	12	65	1.5	U

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