CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD

April 29, 2009
(April 1, 2010 Errata)

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED MAINTENANCE DREDGED MATERIAL FROM THE MJB PROPERTIES SOUTH DOCK BOAT RAMP, AND SUPPLEMENTAL DIOXIN TESTING AT SOUTH DOCK BARGE CHANNEL MAINTENANCE DREDGING PROJECT (NWS-2008-604-NO) IN ANACORTES, WASHINGTON EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR UNCONFINED-OPEN-WATER DISPOSAL AT A DMMP DISPERSIVE OR NON-DISPERSIVE OPEN-WATER DISPOSAL SITE.

1. The following summary 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) on the suitability of an estimated 2,000 cy of maintenance material from the South Dock Boat Ramp, and 17,100 cy of material from the South Dock Barge Channel. The authorized project depth is -5.6 to -11 ft MLLW, which includes + 1 ft of allowable overdredge depth for the South Dock Boat Ramp, and -15 ft MLLW, which includes + 1 ft of allowable overdredge depth for the South Dock Barge Channel. The proposed dredged material was evaluated by the DMMP for open-water unconfined disposal at the non-dispersive open-water disposal site in either Bellingham Bay or Elliott Bay, Washington.

Table 1. Project Tracking Details

SAP received		September 15, 2008
SAP approved		October 17, 2008
Sampling date:	MudMole™ Pneumatic Corer: South Dock Barge Channel (Initial Charact.) MudMole™ Pneumatic Corer: South Dock Boat Ramp MudMole™ Pneumatic Corer: South Dock Barge Channel (Dioxin only)	April 11, 2006 November 6,2008 November 6, 2008
Final data characterization reports for both characterization efforts submitted		February 26, 2009
Initial Suitability Determination for South Dock Barge Channel (all COC except Dioxin)		September 12, 2006
Recency Determination:	Moderate (5 years)	November 2013
DAIS reference number:	South Dock Boat Ramp South Dock (COC except Dioxin) South Dock (Dioxin only)	SDBRA-1-A-F-267 MJBNS-1A-F-225 MJBSD-1-A-F-268

Table 2. South Dock Boat Ramp (SDR) and South Dock Barge Channel (SDBC) Dredging and DMMU Characteristics

DMMU ID	Core Station ID (Sample ID)	Characterized depth, feet MLLW (total core depth, ft)	Design Dredge Depth Elevation (feet MLLW + 1 ft OD)	Volume (cy)
South Dock Boat Ramp: C1	SDR-1 (BRC-1) SDR-2 (BRC-1) SDR-2 (Z-sample)	-0.2 to -3.3 (3.1) -2.4 to -11 (8.6) -11 to -12.7 (1.7)	-5.6 -11 -11	2,000
South Dock: C1	SD-S1 (BCC-1) SD-S2 (BCC-1) SD-S4 (BCC-1)	-8.1 to -12 (3.9) -11.4 to -14.2 (2.8) -9 to -13.1 (4.1)	-15 -15 -15	8,791
South Dock: C2	SD-S3 (BCC-2) SD-S5 (BCC-2)	-11.7 to -13.1 (1.4) -11.8 to -14 (2.2)	-15 -15	8,309
Total Project: Non-Native Total: Native Total:				19,100 17,000 5,100

Table 3. Native Sediment Elevations for the South Dock Barge Channel

DMMU	Core ID.	Estimated mudline elevation (ft MLLW)	Depth to Native Contact (ft)	Estimate Native Contact Elevation (ft MLLW)*	Estimate Native Sediment Volume (cy)	
					Native Contact to Design dredge depth (+1 ft)**	Assuming 0.5 ft overdredge into Native sediments
C-1	SD-S1	-8.1	3.9	-12.0	2,500	1,700
	SD-S2	-11.4	2.8	-14.2		
	SD-S4	-9	4.1	-13.1		
C-2	SD-S3	-11.7	1.4	-13.1	2,600	1,700
	SD-S5	-11.8	2.2	-14.0		
Total:					5,100	3,400

*Average Native Contact Elevation (ft MLLW) = -13.3
**Design depth = 15 ft (e.g., 14 ft + 1 ft over-dredge depth)

2. Background. The Regulatory Tracking Data for both projects covered in this suitability determination are summarized in Table 1. The South Dock Barge Channel Project was previously characterized for all Chemicals-of-Concern except dioxin in 2006, and those results were covered in suitability determination dated 12 September, 2006 (http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/MJB_Anacortes_SDM_Rev2.pdf). The results of the initial testing concluded that South Dock Barge Channel maintenance material was suitable for open-water disposal. Subsequent to that determination, sampling by Ecology in the vicinity of this project confirmed a potential dioxin reason-to-believe, and the DMMP agencies subsequently determined that supplemental dioxin testing would be required at both the South Dock Barge Channel and South Dock Boat Ramp project. The initial sampling of South Dock Barge Channel encountered native sediments, and this layer was further elucidated during the dioxin resampling/testing as described in Tables 2 and 3 above. The native sediments were not tested for dioxin, and the DMMP agencies agreed that native sediments would be suitable for dispersive site disposal if the dredging included a minimum 0.5-1 ft protective buffer within the native contact layer. Because of the Native sediment layer, no Z-samples were collected from South Dock Barge Channel. A single Z-sample was collected and archived at one of the two core location (SDR-2) at the South Dock Boat Ramp proposed dredging footprint as depicted in Table 2, which represented the bulk of the sediment prism proposed for dredging at this location (see Figure 3).

3. The approved sampling and analysis plan was generally followed, and core sampling (Mud Mole™) was initiated and completed at both locations on November 6, 2008 (See Figure 1 for vicinity map of South Dock Boat Ramp, and Figure 2 for vicinity map of South Dock Barge Channel). Two core samples were collected at the South Dock Boat Ramp and composited for one DMMU-C1 (Table 2, Figure 3). Three core samples were collected at South Dock Barge Channel DMMU-C1 and composited for analysis, whereas two core samples were collected at DMMU-C2 and composited for analysis (Table 2, Figure 4). The sampling and analysis characterization reports for both dredging projects were submitted to the DMMP agencies for review on February 26, 2009. The DMMP agencies concluded that the quality assurance/quality control guidelines specified by the DMMP were generally complied with, and these data were deemed acceptable for decision-making using best-professional-judgment.

4. Chemical Analysis results for all chemicals of concern (COC) including dioxin TEQ's for the one surface DMMU from the South Dock Boat Ramp, and dioxin TEQs for South Dock Barge Channel are summarized in Table 4. The results indicated that there were no exceedances of SLs for all non-dioxin chemicals. No toxicity testing or bioaccumulation testing were performed based on these chemical testing results. Dioxin testing results are summarized below.

Dioxin/furan concentrations within the proposed dredging areas are evaluated below relative to the DMMP interim dioxin framework.

5. Dioxin Testing Results Summary. Table 5 provides the results of dioxin/furan testing results for the three DMMUs analyzed. The dioxin testing results show that dioxin concentrations were elevated at both South Dock Barge Channel locations, with DMMU BCC-1 at 14 pptr-TEQ and DMMU BCC-2 at 9.9 pptr-TEQ respectively, and were quantitated at 4.7 pptr-TEQ within the South Dock Boat Ramp DMMU BRC-1.

6. Dioxin Interim Interpretative Framework for Open-Water-Disposal at DMMP Non-Dispersive Sites. The DMMP agencies are currently using an interim framework for interpreting dioxin data for open-water disposal pending the development of a programmatic regulatory framework, expected sometime in 2010 (http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pagename=Dioxin_Guidelines). For dredged material considered for open-water disposal, the interim framework directs a project specific comparison of dioxin/furan concentrations in project dredged material to the disposal site background outside the disposal site. The guidelines applicable to the Bellingham Bay and Elliott Bay non-dispersive disposal sites specify the following:

   - Comparison of dioxin in test sediments to disposal-site background
   - Background is defined using disposal site specific monitoring data, which defined an offsite maximum concentration of 10.5 pptr-TEQ (Bellingham) and 12.2 pptr-TEQ (Elliott Bay), and an offsite average concentration of 6.9 pptr-TEQ (Bellingham) and 8.7 pptr-TEQ (Elliott Bay)
   - Dioxin concentrations in any given DMMU may not exceed the site maximum (Bellingham Bay: 10.5 pptr-TEQ; Elliott Bay: 12.2 pptr-TEQ)
   - Average dioxin concentrations (weighted to the volume of each DMMU cannot exceed the mean offsite concentration (Bellingham Bay: 6.9 pptr-TEQ; Elliott Bay: 8.7 pptr-TEQ)

7. As summarized in Tables 4 and 5, one of the three DMMUs (DMMU BCC-1) representing non-native sediments from South Dock Barge Channel was quantitated above the Bellingham Bay site maximum of 10.5 pptr-TEQ, and the Elliott Bay site maximum of 12.2 pptr-TEQ, and therefore, would not be suitable for unconfined-open-water disposal at either non-dispersive site. The remaining Barge Channel DMMU (DMMU BCC-2) was quantitated at 9.9 pptr-TEQ, which is below the offsite maximum for both non-dispersive sites. The DMMU evaluated for the South Dock Boat Ramp (DMMU BRC-1) was quantitated at 4.7 pptr-TEQ, which is below the Bellingham Bay offsite maximum (6.9 pptr-TEQ) and Elliott Bay offsite maximum (8.7 pptr-TEQ).

   The volume weighted average of the remaining DMMU from the South Dock Barge Channel (BCC-2) and the South Dock Boat Ramp sample (BRC-1) is 8.67 pptr-TEQ which exceeds the mean offsite concentration for the Bellingham Bay site (6.9 pptr-TEQ) but is below the Elliott Bay offsite concentration (8.7 pptr-TEQ) interim guidelines as depicted in Table 6. Considered by itself, the South Dock Boat Ramp, DMMU-BRC-1 would be suitable for open-water disposal at either disposal site. Based on the dioxin testing results for the South Dock Boat Ramp, no analysis of the archived Z-sample was required.

8. As described above (Section 2) the native sediments underlying the non-native sediments within the South Dock Barge Channel were not analyzed. The applicant is proposing to dredge the non-native sediments and an additional 0.5 ft to 1 ft of the native sediments in the Barge Channel as a protective buffer, and dispose all the unsuitable material at an Ecology approved upland disposal site. The remaining 3,400 cy of native sediments would be suitable for unconfined-open-water disposal at the Rosario Strait dispersive site.

9. Suitability for Unconfined-Open Water Disposal. Therefore, based on the Dioxin and non-dioxin chemistry testing results for the South Dock Barge Channel, the 13,700 cy (e.g. 12,100 cy of non-Native sediment + 1,600 cy of native sediments as protective buffer) would be unsuitable for unconfined-open-water disposal (either Bellingham Bay or Elliott Bay) as a stand alone project, and would have to be disposed at an Ecology approved

upland disposal site. The remaining 3,400 cy of native sediments would be suitable for dispersive site disposal at Rosario Strait. The non-dioxin and dioxin chemistry results for the South Dock Boat Ramp indicate all 2,000 cy of material would be suitable for open-water disposal at either the Bellingham Bay or the Elliott Bay non-dispersive sites. If the 6,609 cy of material from South Dock Barge Channel (DMMU-SD-BCC-2) is bundled with the 2,000 cy of material from South Dock Boat Ramp (DMMU-SDBR-BRC-1), the volume weighted average for these two DMMUs would be **8.67 pptr-TEQ**, which is below the Elliott Bay offsite average of **8.7 pptr-TEQ**, and both DMMUs would be suitable for Elliott Bay disposal. If the South Dock Boat Ramp Elliott Bay suitable material is not dredged and disposed with the South Dock Boat Ramp suitable material, the latter would not be suitable for open-water disposal, and would have to be disposed at an Ecology approved upland disposal site.

10. This memorandum affirms:

    a. 13,700 cy of South Dock Barge Channel material is unsuitable for open-water disposal at the Bellingham Bay non-dispersive site;
    b. 7,091 cy of South Dock Barge Channel material is unsuitable for open-water disposal at the Elliott Bay non-dispersive site. The remaining 6,609 cy of material from South Dock Barge Channel is suitable for disposal in Elliott Bay suitable material only if bundled with the 2,000 cy of suitable material from South Dock Boat Ramp.
    c. 3,400 cy of native sediments underlying the unsuitable material at the South Dock Barge Channel would be suitable for dispersive site disposal at the Rosario Strait site.
    d. All unsuitable material would have to be disposed at an Ecology approved upland disposal site.
    e. 2,000 cy of material from the South Dock Boat Ramp is suitable for open-water disposal at either the Bellingham Bay or the Elliott Bay non-dispersive sites.

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.

Concur:

4/1/2010
Date — David R. Kendall, Ph.D., Seattle District Corps of Engineers

4/1/2010
Date — Erika Hoffman, Environmental Protection Agency

4/1/2010
Date — Laura Inouye, Ph.D., Washington Department of Ecology

4/1/2010
Date — Dave Vagt, Washington Department of Natural Resources

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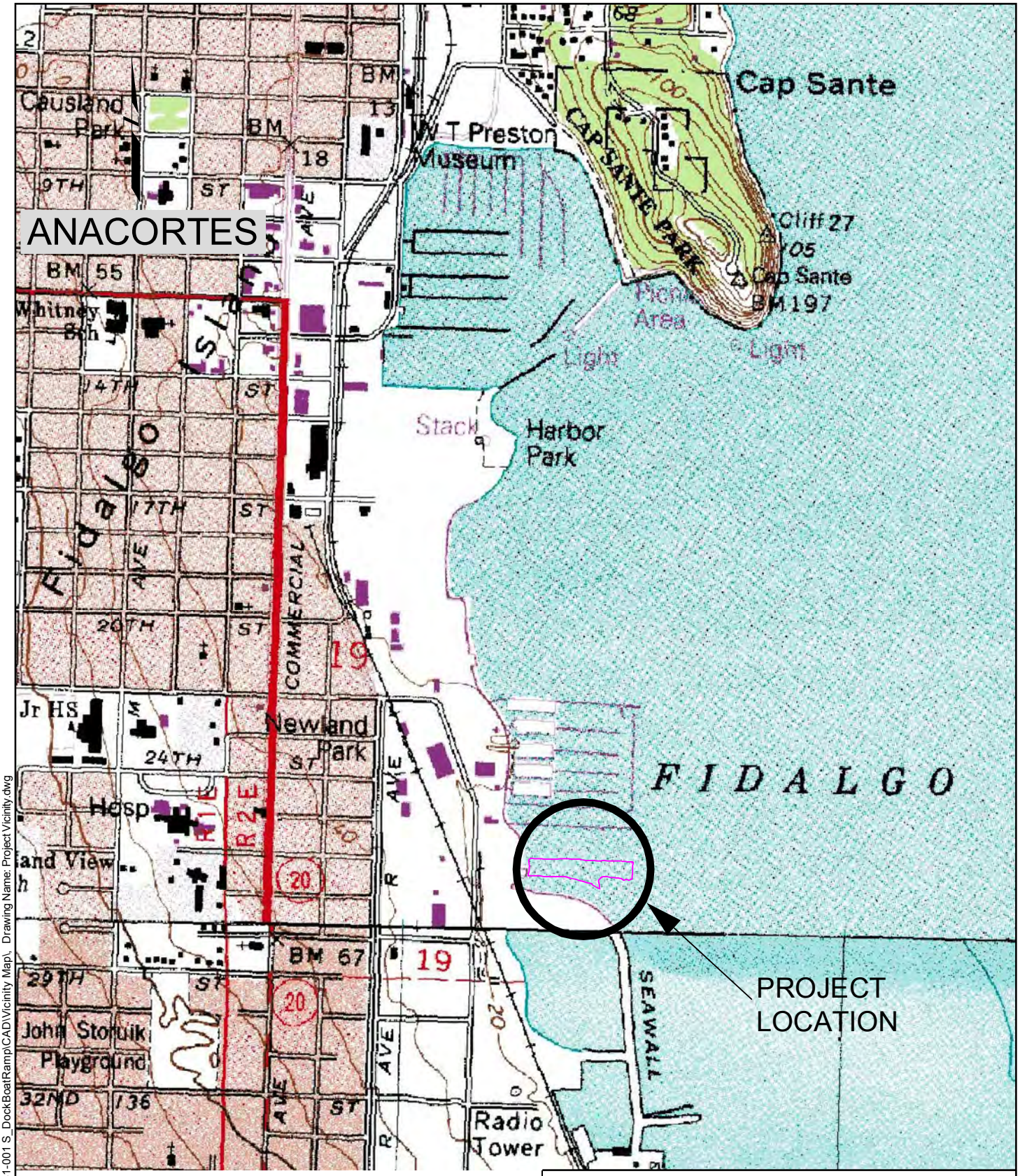

Map courtesy of USGS

APPROXIMATE SCALE IN FEET

0 500 1000 2000

SITE VICINITY

South Dock Barge Channel
Anacortes, Washington

By: GSM	Date: 1/5/09	Project No. 10131.001
AMEC Geomatrix		Figure 1

Plot Date: 01/05/09 - 2:33pm, Plotted by: gary.maxwell
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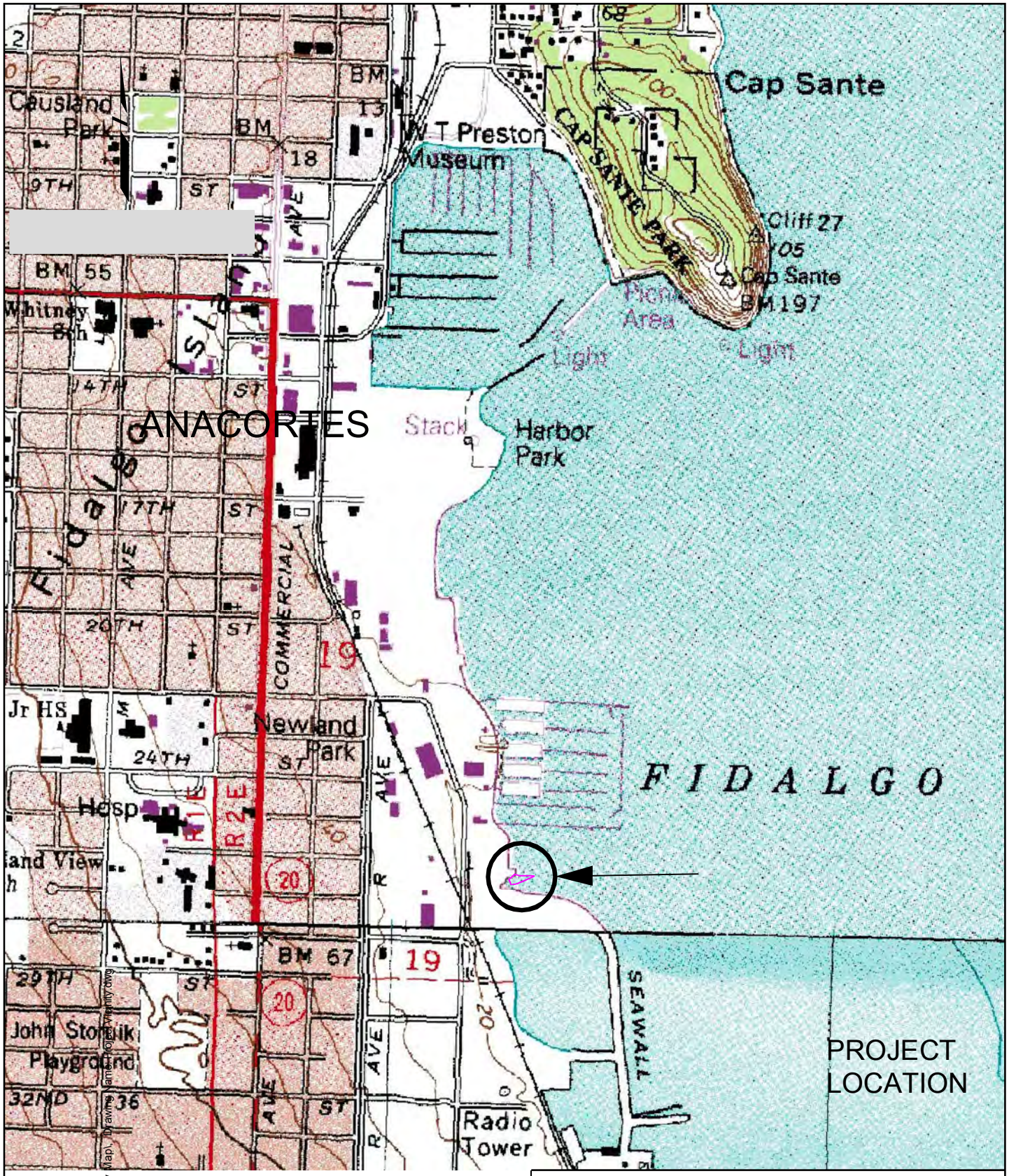

APPROXIMATE SCALE IN FEET

0 500 1000 2000

By: GSM	Date:	Project No. 10131.001
AMEC Geomatrix		Figure 2

Map courtesy of USGS

SITE VICINITY

Plotted by: gary.maxwell
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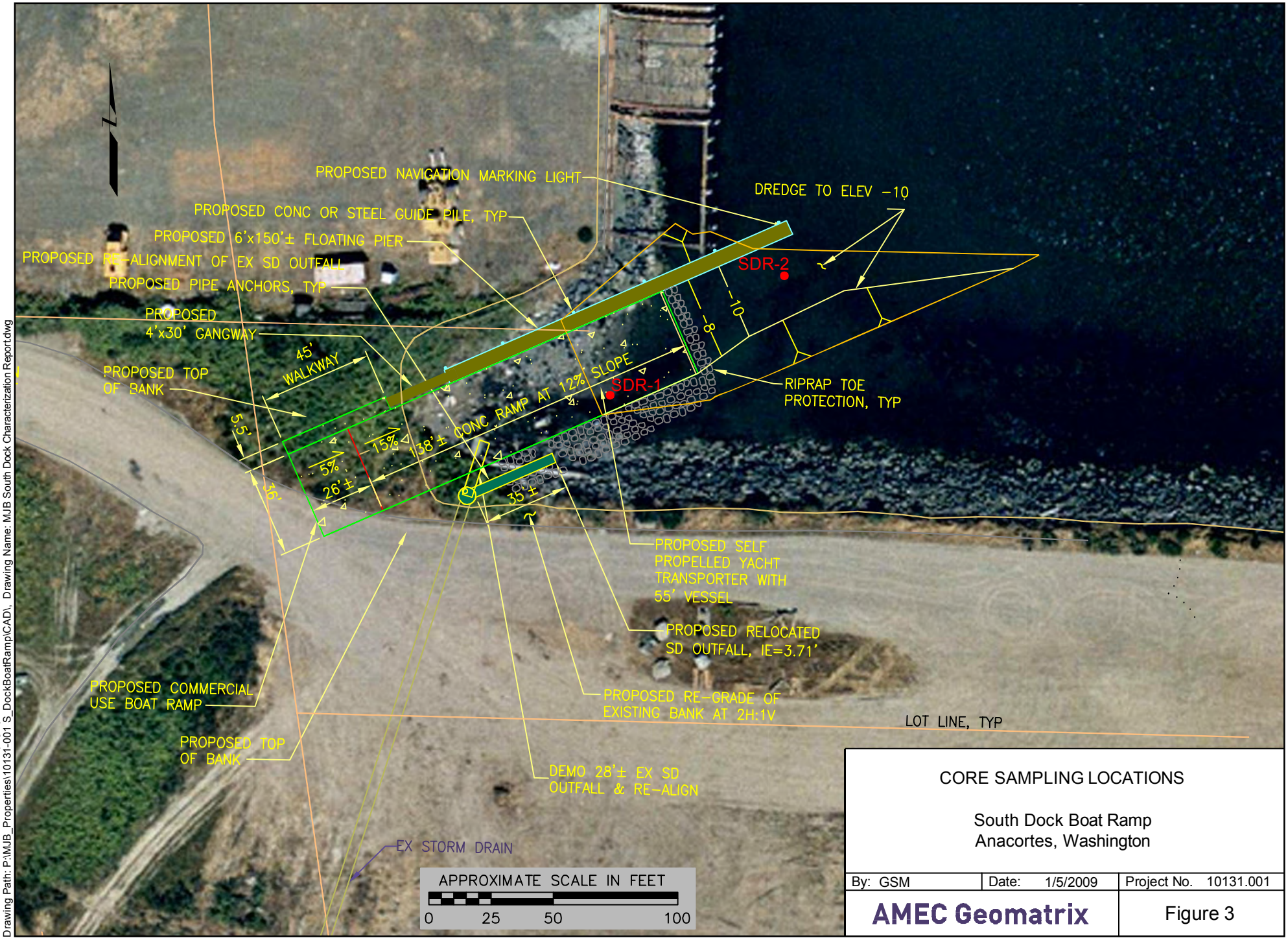

CORE SAMPLING LOCATIONS

South Dock Boat Ramp
Anacortes, Washington

By: GSM	Date: 1/5/2009	Project No. 10131.001
AMEC Geomatrix		Figure 3

Image Courtesy of U.S. Department pf Agriculture
Farm Services Agency Aerial Photography Field Office

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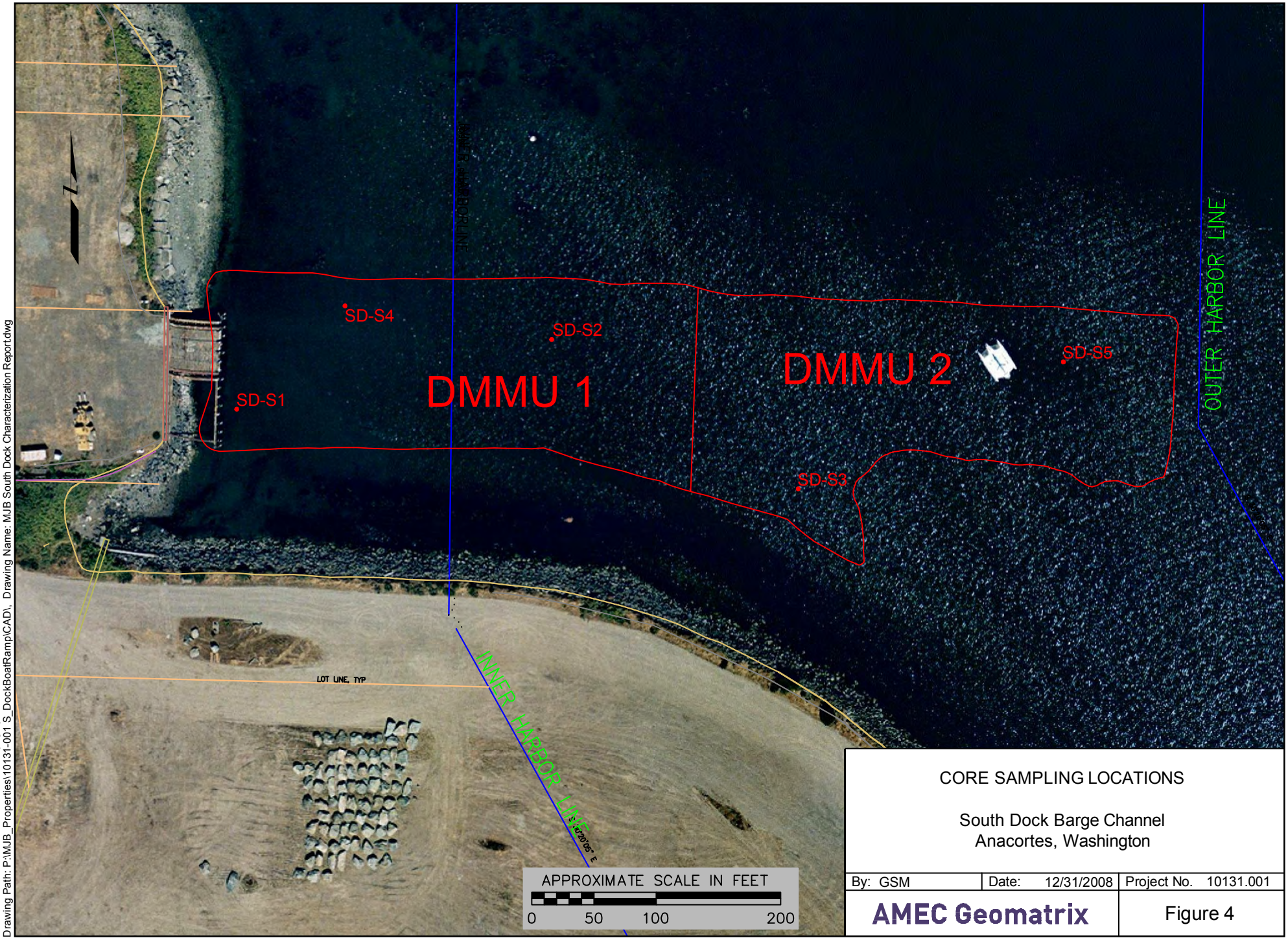

CORE SAMPLING LOCATIONS

South Dock Barge Channel
Anacortes, Washington

By: GSM	Date: 12/31/2008	Project No. 10131.001
AMEC Geomatrix		Figure 4

Image Courtesy of U.S. Department pf Agriculture
Farm Services Agency Aerial Photography Field Office

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Table 4. Summary of Chemcial testing results for the South Dock Boat Ramp, and supplemental Dioxin Testing Results for South Dock (Errata Revision)

								DMMU ID:	SDBR: C-1 (SDR-1, SDR-2)		SD: C-1 (SD-1, SD-2, SD-4)			SD: C-2 (SD-3, SD-5)		
	DMMP				SMS			mg/kg-dry wgt	mg/kg-OC	VQ	mg/kg-dry wgt	mg/kg-OC	VQ	mg/kg-dry wgt	mg/kg-OC	VQ
CHEMICAL NAME	Units	SL	BT	ML	Units	SQS	CSL	DMMP	SMS		DMMP	SMS		DMMP	SMS	
Antimony		150		200				6.0		U						
Arsenic	mg/kg	57	507.1	700	mg/kg	57	93	6.0		U						
Cadmium	mg/kg	5.1	11.3	14	mg/kg	5.1	6.7	0.3		U						
Chromium	mg/kg	(2)	267	(2)	mg/kg	260	270	**51.5**		J						
Copper	mg/kg	390	1,027	1,300	mg/kg	390	390	**28.5**								
Lead	mg/kg	450	975	1,200	mg/kg	450	530	**34.00**								
Mercury	mg/kg	0.41	1.5	2.3	mg/kg	0.41	0.59	0.06		U						
Nickel	mg/kg	140	370	370	mg/kg	--	--	**40.0**		J						
Selenium	mg/kg	(2)	**3**	(2)	mg/kg	--	--	0.2		U						
Silver	mg/kg	6.1	6.1	8.4	mg/kg	6.1	6.1	0.4		U						
Zinc	mg/kg	410	2,783	3,800	mg/kg	410	960	**98.0**		J						
TBT ion (porewater)	ug/L	0.15	0.15		ug/L	0.05	0.35									
Naphthalene	ug/kg	2,100		2,400	mg/kg-OC	99	170	19.0	0.65	U						
Acenaphthylene	ug/kg	560		2,000	mg/kg-OC	66	66	19.0	0.65	U						
Acenaphthene	ug/kg	500		2,000	mg/kg-OC	16	57	**31.0**	**1.1**							
Fluorene	ug/kg	540		3,600	mg/kg-OC	23	79	**29.0**	**0.99**							
Phenanthrene	ug/kg	1,500		2,100	mg/kg-OC	100	480	**500.0**	**17.1**	J						
Anthracene	ug/kg	560		13,000	mg/kg-OC	220	1,200	**68.0**	**2.3**							
2-Methylnapthalene	ug/kg	670		1,900	mg/kg-OC	38	64	19.0	0.65	U						
Total LPAH	ug/kg	5,200		29,000	mg/kg-OC	370	780	**628.0**	**21.5**							
Fluoranthene	ug/kg	1,700	4,600	30,000	mg/kg-OC	160	1,200	**690.0**	**23.6**	J						
Pyrene	ug/kg	2,600	11,980	16,000	mg/kg-OC	1,000	1,400	**650.0**	**22.3**							
Benzo(a)anthracene	ug/kg	1,300		5,100	mg/kg-OC	110	270	**320.0**	**11.0**							
Chrysene	ug/kg	1,400		21,000	mg/kg-OC	110	460	**410.0**	**14.0**							
Total Benzo(b+k)fluoranthenes	ug/kg	3,200		9,900	mg/kg/OC	230	450	**720.0**	**24.7**							
Benzo(a)pyrene	ug/kg	1,600		3,600	mg/kg-OC	99	210	**320.0**	**11.0**							
Indeno(1,2,3-cd)pyrene	ug/kg	600		4,400	mg/kg-OC	34	88	**120.0**	**4.110**							
Dibenzo(a,h)anthracene	ug/kg	230		1,900	mg/kg-OC	12	33	**27.0**	**0.92**							
Benzo(g,h,I)perylene	ug/kg	670		3,200	mg/kg-OC	31	78	**110.0**	**3.8**							
Total HPAH	ug/kg	12,000		69,000	mg/kg-OC	960	5,300	**3,367**	**115.3**							
1,3-Dichlorobenzene	ug/kg	170			mg/kg-OC	2.3	2.3	1.0	**0.034**	U						
1,4-Dichlorobenzene	ug/kg	110		120	mg/kg-OC	3.1	9	1.0	**0.034**	U						
1,2-Dichlorobenzene	ug/kg	35		110	mg/kg-OC	2.3	2.3	1.0	**0.034**	U						
1,2,4-Trichlorobenzene	ug/kg	31		64	mg/kg-OC	0.81	1.8	5.0	**0.17**	U						
Hexachlorobenzne (HCB)	ug/kg	22	168	230	mg/kg-OC	0.38	2.3	0.96	**0.03**	U						
Dimethylphthalate	ug/kg	71		1,400	mg/kg-OC	53	53	**14.0**	**0.48**	J						
Diethylphthalate	ug/kg	200		1,200	mg/kg-OC	61	110	19.0	**0.65**	U						
Di-n-butylphthalate	ug/kg	1,400		5,100	mg/kg-OC	220	1,700	19.0	**0.65**	U						
Butylbenzylphthalate	ug/kg	63		970	mg/kg-OC	4.9	64	19.0	**0.65**	UJ						
Bis(2-ethylhexyl)phthalate	ug/kg	1,300		8,300	mg/kg-OC	47	78	940.0	**32.2**	U						
Di-n-octylphthalate	ug/kg	6,200		6,200	mg/kg-OC	58	4,500	19.0	**0.65**	U						
Phenol	ug/kg	420		1,200	ug/kg	420	1,200	19.0		U						
2-Methylphenol	ug/kg	63		77	ug/kg	63	63	19.0		U						
4-Methylphenol	ug/kg	670		3,600	ug/kg	670	670	22.0		U						
2,4-Dimethylphenol	ug/kg	29		210	ug/kg	29	29	19.0		U						
Pentachlorophenol	ug/kg	400		690	ug/kg	360	690	97.0		U						
Benzyl alcohol	ug/kg	57		87	ug/kg	57	73	19.0		U						
Benzoic acid	ug/kg	650		760	ug/kg	650	650	190.0		U						
Dibenzofuran	ug/kg	540		1,700	mg/kg-OC	15	58	**16.0**	**0.55**	J						
Hexachloroethane	ug/kg	600		1,600	mg/kg-OC			19.0	0.65	U						
Hexachlorobutadiene	ug/kg	29		270	mg/kg-OC	3.9	6.2	0.96	0.03	U						
N-Nitrosodiphenylamine	ug/kg	280		130	mg/kg-OC	11	11	19.0	0.65	U						

Table 4. Summary of Chemcial testing results for the South Dock Boat Ramp, and supplemental Dioxin Testing Results for South Dock (Errata Revision)

CHEMICAL NAME	DMMP				SMS			mg/kg-dry wgt	mg/kg-OC	VQ	mg/kg-dry wgt	mg/kg-OC	VQ	mg/kg-dry wgt	mg/kg-OC	VQ
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	SMS		DMMP	SMS		DMMP	SMS	
Antimony		150		200				6.0		U						
Trichloroethene	ug/kg	160		1,600	ug/kg	--	--	1.0		U						
Tetrachloroethene	ug/kg	57		210	ug/kg	--	--	1.0		U						
Ethylbenzene	ug/kg	10		50	ug/kg	--	--	1.0		U						
Total Zylene (sum of o-,m-,p-)	ug/kg	40		160	ug/kg	--	--	1.0		U						
4,4'-DDE	ug/kg															
4,4'-DDD	ug/kg															
4,4'-DDT	ug/kg															
Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)	ug/kg	6.9	50	69		--	--	1.90		U						
Aldrin	ug/kg	10				--	--	0.96		U						
Chlordane	ug/kg	10	37			--	--	0.96		U						
Dieldrin	ug/kg	10				--	--	1.9		U						
Heptachlor	ug/kg	10				--	--	0.96		U						
Alpha-BHC	ug/kg		10			--	--									
Gamma-BHC (Lindane)	ug/kg	10				--	--	0.96		U						
Aroclor 1016	ug/kg															
Aroclor 1221	ug/kg															
Aroclor 1232	ug/kg															
Aroclor 1242	ug/kg															
Aroclor 1248	ug/kg															
Aroclor 1254	ug/kg															
Aroclor 1260	ug/kg															
Total PCBs	ug/kg	130	38*	3,100	mg/kg-OC	12	65	19.0	0.65	U						
PCDD/F (TEQ: U = 1/2 df)**	ng/kg							**4.7**			**14.0**			**9.87**		
Total Solids	%							**78.2**								
Total Volatile Solids	%							**3.17**								
Total Organic Carbon	%							**2.92**								
Total Ammonia	mg/kg							**20.4**								
Total Sulfides	mg/kg							**1,270**								
Gravel	%							**42.85**								
Sand	%							**48.5**								
Silt	%							**4.0**								
Clay	%							**4.6**								
Fines (percent silt + clay)	%							**8.6**								
Bioassay Determination: (P/F)								**NA**			**NA**			**NA**		
BTs exceeded:								**no**			**no**			**no**		
Bioaccumulation conducted:								**no**			**no**			**no**		
ML Rule exceeded:								**no**			**no**			**no**		
PSDDA Determination (Bellingham Bay):								**PASS (BB)**			**FAIL (BB)**			**FAIL (BB: VWA)**		
PSDDA Determination (Elliott Bay):								**PASS (EB)**			**FAIL (EB)**			**PASS (EB: VWA)**		
DMMU Total Volume:	cy							**2,000**			**8,791**			**8,309**		
Total Native Suitable Volume (Total minus 0.5 ft buffer):	cy							**0**			**2,500 (1,700)**			**2,600 (1,700)**		
Net Volume Unsuitable/Suitable (Non-Native + Buffer)	cy							**0**			**7091 (BB/EB)**			**6609 (BB/EB)**		
Rank								**M**			**M**			**M**		
Mean Core sampling depth	ft							**6.75**			**3.6**			**1.8**		
Maximum sampling depth (mudline) (w-Z-sample)	ft							**10.4**			**4.1**			**2.2**		
DMMU ID:								SDBR: C-1 (SDR-1, SDR-2)			**SD: C-1 (SD-1, SD-2, SD-4)**			**SD: C-2 (SD-3, SD-5)**		

Legend:

PASS = Pass (Suitable for BB & EB disposal-Interim dioxin)

FAIL = Failure (UCOWD Unsuitable (dioxin interim guidelines)

SQS = Sediment Quality Standards exceedance (SMS)

CSL = Cleanup Screening Level exceedance (SMS)

* ppm-organic carbon normalized

** See Table 5 for detail on dioxin analysis results

VQ = Validation Qualifier

VWA = Volume weighted Average (Table 6)

BB = Bellingham Bay; EB = Elliott Bay

UCOWD = Unconfined open-water disposal

U = undetected at the reported concentration

J = Estimated Concentration (< reporting limit)

Table 5. Dioxin/Furan Testing Summary

Analyte	WHO (05) TEF	South Dock Boat Ramp DMMU: C-1 (BRC-1) ng/kg-dw	LQ	TEQ	South Dock DMMU: C-1 (BCC-1) ng/kg-dw	LQ	TEQ	South Dock DMMU: C-2 (BCC-2) ng/kg-dw	LQ	TEQ
2,3,7,8-TCDD	1	0.32		0.32	0.653		0.653	0.386		0.386
1,2,3,7,8-PeCDD	1	1.11		1.11	2.88		2.88	1.84		1.84
1,2,3,4,7,8-HxCDD	0.1	1.63		0.163	3.75		0.375	2.53		0.253
1,2,3,6,7,8-HxCDD	0.1	5.4		0.54	20.2		2.02	14.5		1.45
1,2,3,7,8,9-HxCDD	0.1	4.11		0.411	12		1.2	8.63		0.863
1,2,3,4,6,7,8-HpCDD	0.01	95.3		0.953	358		3.58	260		2.6
OCDD	0.0003	690		0.207	2750		0.825	2010		0.603
2,3,4,7,8-PeCDF	0.3	0.872		0.2616	1.63		0.489	1.06		0.318
2.3.7.8-TCDF	0.1	0.716		0.0716	2.28		0.228	1.67		0.167
1,2,3,4,7,8-HxCDF	0.1	1.64		0.164	3.73		0.373	2.65		0.265
1,2,3,6,7,8-HxCDF	0.1	1.19		0.119	2.24		0.224	1.61		0.161
2,3,4,6,7,8-HxCDF	0.1	1.16		0.116	0.225	u	0.01125	0.174		0.0174
1,2,3,7,8,9-HxCDF	0.1	0.268		0.0268	2.5		0.25	1.59		0.159
1,2,3,7,8-PeCDF	0.03	0.632		0.01896	1.16	u	0.0174	0.694		0.02082
1,2,3,4,6,7,8-HpCDF	0.01	21.1		0.211	73.1		0.731	65.3		0.653
1,2,3,4,7,8,9-HpCDF	0.01	1.51		0.0151	4.02		0.0402	3.62		0.0362
OCDF	0.0003	64.4		0.01932	281		0.0843	269		0.0807
Total TEQ: (U = 1/2)				4.73			14.0			9.87
Total TEQ: (U = 0)				4.73			14.0			9.87
Total TOC, %:				2.92			1.58			1.18

Table 6. Volume Weighted Average (VWA) Dioxin Concentrations for the South Dock Boat Ramp and South Dock Barge Channel (MJB Properties) for Elliott Bay Disposal Site*

DMMU Core ID	Volume (CY)	TCDD/F TEQ	ng/kg-dw	Product (Vol x TEQ)	ng x cy/kg x DMMU	Product/total	Loading contribution/Suitable DMMU
South Dock: SD-BCC-1**	7,091	14	ng/kg-dw				
South Dock: SD-BCC-2	6,609	9.87	ng/kg-dw	65,230.83	ng x cy/kg	87.4%	ng/kg-dw/DMMU
South Dock Boat Ramp: SDBR-BRC-1	2,000	4.7	ng/kg-dw	9,400.00	ng x cy/kg	12.6%	ng/kg-dw/DMMU
Totals (All unsuitable: VWA):	8,609 cy			74,630.83	ng x cy/kg	8.67	ng/kg-dw/Project

* South Dock Barge Channel DMMU volumes adjusted to reflect non-Native + 0.5 ft Native buffer volumes

**exceeds Bellingham offsite maximum of 10.5 pptr-TEQ, and offsite maximum of 12.2 pptr-TEQ at the Elliott Bay disposal site

VWA for 2 DMMUs below offsite maximum of Bellingham bay 10.5 pptr-TEQ & Elliott Bay 12.2 pptr-TEQ, but above the offsite average Bellingham Bay 6.9 pptr-TEQ, but below the Elliott Bay 8.7 pptr-TEQ.

Therefore, both DMMUS (SD-BCC-2 & SDBR-BRC-1) suitable for Elliott Bay disposal, and would not be suitable for Bellingham as VWA is greater than 6.9 pptr-TEQ offsite average.

South Dock Boat Ramp: DMMU (BRC-1 = 2,000 cy) is below the offsite average for both Bellingham Bay and Elliott Bay, and is therefore suitable for disposal at either site