CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD February 9, 2012

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED FEDERAL OPERATION AND MAINTENANCE DREDGED MATERIAL FROM GRAYS HARBOR, WASHINGTON (PN: CENWS-OD-TS-NS-38) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT, FOR OPEN-WATER DISPOSAL AT THE SOUTH JETTY AND POINT CHEHALIS DISPERSIVE DISPOSAL SITES, AND AT THE SOUTH BEACH AND HALF MOON BAY BENEFICIAL USE SITES.

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 routine operations and maintenance dredged material from Grays Harbor, Washington (Figure 1) for unconfined open-water disposal and beneficial use.

Table 1. Project DMMP Tracking Details

PUBLIC NOTICE:	CENWS-OD-TS-NS-38
SAP submitted:	October 24, 2011
SAP approved	November 2, 2011 (verbal authorization)
Sampling dates: VanVeen Grab	November 4-19, 2011 (28-DMMUs, 223 stations)
Data characterization report submitted:	February 8, 2012
Recency Determination: Low Concern (7 years)	November 2018
DAIS reference number:	GRAYS-1-B-F-319

Table 2. Project Synopsis

Time of Proposed Dredging	Annually, 16 July through 14 February except during fish windows
Proposed Disposal Sites	Point Chehalis and South Jetty open-water dispersive sites; Half Moon Bay (HMB) and South Beach nearshore beneficial use sites, and HMB direct beach nourishment, as needed and approved
Sediment Ranking	Low
Project last dredged	Annually

2. Background. Maintenance dredging of the federal navigation channel is performed annually. However, sediment characterization is only done on a periodic basis. In June 1995, the Grays Harbor Dredged Material Management (Interagency) Study Group prepared a manual entitled *Dredged Material Evaluation Procedures and Disposal Site Management Manual, Grays Harbor and Willapa Bay, Washington* (GHDMEP), which provided guidance for federal maintenance dredging and other dredging projects in Grays Harbor and Willapa Bay. The federal navigation channel was ranked as a “low” concern for sediment contamination. A low-ranked project requires testing every 5 to 7 years under the GHDMEP frequency guidelines. Rather than conduct sediment characterization for the entire maintenance project every 5 to 7 years, the GHDMEP included provisions to allow sampling and testing of a portion of the federal project every other year. In this way federal expenditures for sediment characterization could be spread more evenly over multiple years, resulting in more uniform funding requirements from year to year.

3. From 1996 to 2010, the federal navigation channel was divided into three subareas, with rotating characterization. Every other year, approximately 500,000 to 600,000 cubic yards of sediment from approximately one-third of the navigation channel was fully characterized. The Corps of Engineers prepared a programmatic sampling and analysis plan (PSAP) every six years to cover the rotating sediment characterization within that time span. A PSAP was last prepared in 2006, covering the years 2006 through 2011. A PSAP addendum (PSAPA) was prepared every two years, containing details of the sampling and analysis plan for that particular sediment characterization rotation. The last required testing rotation under the 2006-2011 PSAP occurred in the summer of 2010.

4. While the rotating sediment characterization approach was successful in spreading federal expenditures more evenly over multiple years, the overall cost of characterization was higher due to repeated mobilization and contracting costs. The rotating characterization also forced more frequent updates of environmental documentation with attendant cost implications. Therefore, the Corps of Engineers has decided to alter the previous testing paradigm and characterize the entire federal project from Crossover Reach to the South Aberdeen Reach in the same year. This would also extend the recency from six to seven years, which is the recency period for Low ranked projects.

5. Testing results from previous sediment quality characterizations can be found in suitability determinations for dredging years (DY) 1993, 1994, 1996, 1999, 2001, 2005, 2008, 2009, and 2011. During that period, all material was found suitable for estuarine open-water disposal at the Point Chehalis and South Jetty sites, and for beneficial use at the Half Moon Bay and the South Beach beneficial use sites, and for HMB direct beach placement. These suitability determinations can be found on the Corps' Dredged Material Management Office website at:

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/USACE-GH-O&M-DY93-SDM.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/USACE-Grays-Harbor-DY94-SDM.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/USACE-Grays-Harbor-DY96-SDM.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/USACE-Grays-Harbor-DY99-SDM.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/USACE-Grays-Harbor-DY01-SDM.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/GHO&M-05-sdm.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/GH-DY08-Outer_Harbor_Exclusionary_Determination.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/2008-GH_O&M.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/USACE_Grays_Harbor_SDM_DY09.pdf

http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/2011-GH_SDM_final.pdf

6. Sampling and Analysis Plan. The sampling and analysis plan (SAP) was submitted for DMMP review on October 24, 2011, and was verbally approved on November 2, 2011 with minor revisions.

7. DMMU Allocation. Based on historical dredging records, average annual dredging volumes range between 1.5 to 1.8 million cubic yards (mcy)/year, with an average volume around 1.65 mcy/year. Previously, the federal project was evaluated by characterizing approximately 1/3rd of the federal

project every two years, so that the entire project was characterized every six years. Using this methodology, approximately nine dredged material management units (DMMUs) were characterized every two years from 1996 to 2010. This year, in order to characterize the entire project, 28 DMMUs of approximately equal length (~0.5 miles) were distributed within the federal channel from Crossover Reach to South Aberdeen Reach (See Table 3 and Figure 1). The purpose of using equal-length rather than equal-volume DMMUs is to facilitate the analysis of sediment quality trends (e.g., dioxin) over time throughout the federal channel from Crossover Reach to South Aberdeen Reach. It is envisioned that the same DMMU boundaries will be used in future characterization efforts.

8. Specifically, the 28 DMMUs (all composites) were divided among the reaches along the 13.5 mile inner harbor navigation channel as indicated below. Eight grab samples were collected and composited from each of the 28 DMMUs, for a total of 224 sampling locations. The most recent bathymetric survey data were used to locate representative sampling stations within each DMMU.

   Crossover Reach (Stations: 715+93 to 862+49): 6 DMMUs (C1-C6)
   North Channel Reach (Stations: 862+49 to 1005+71): 5 DMMUs (C7-C11)
   Hoquiam Reach (Stations: 1005+71 to 1156+02): 6 DMMUs (C12-C17)
   Cow Point Reach (Stations: 1156+02 to 1227+99): 3 DMMUs (C18-C20)
   Aberdeen Reach (Stations: 1227+99 to 1315+86): 3 DMMUs (C21-C23)
   South Aberdeen Reach (Stations: 1315+86 to 1448+04): 5 DMMUs (C24-C28)

Table 3. DMMU Allocation for DY 2012 Grays Harbor Maintenance Dredging

Channel Reach	Channel Width (feet)	Channel Depth (ft) (without advanced maintenance or overdepth)	Channel Length (miles)	# of DMMUs
Bar*	1000	46	1.0	NA
Entrance/Point Chehalis*	600 – 1000	28 – 46	4.0	NA
South*	350	36	4.3	NA
Crossover	350	36	2.8	6
North Channel	350	36	2.7	5
Hoquiam	350	36	2.8	6
Cow Point	350	36	1.4	3
Aberdeen	200	30	1.5	3
South Aberdeen	200	30	2.3	5
Totals (non-exclusionary):			13.5	28
Totals (exclusionary + non-exclusionary):			22.8	
Average DMMU channel length in miles:				0.48

*No Test (exclusionary); NA = not applicable

9. Sampling. The sampling commenced on November 4, 2011 and was concluded on November 19, 2011 after encountering several weather days precluding sample collections. Sampling with a VanVeen grab sampler was accomplished at 223 of the 224 stations, and composited into 28 DMMUs (8 samples/DMMU composite, except DMMU-AB-C23, which had 7 samples). Difficulties in finding a suitable replacement station for AB-C23 not already at -40 ft MLLW prevented locating the eighth sample for this DMMU. This deviation from the SAP was coordinated with the DMMO/DMMP and verbally approved, Appendix 1(a-c) and Figures 2-7 provide background information regarding estimated dredging per reach and station keeping sampling and depth data and locations for each station and DMMU. The data characterization report was submitted to the DMMP

quality assurance/control review on February 8, 2012. The DMMP agencies concluded, after reviewing the data validation report, that the data were acceptable for decision-making using best professional judgment.

10. 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 4, and demonstrates that all chemicals were quantitated as either detected or undetected below DMMP SL guidelines.

11. SMS Guidelines Comparison. Data from all twenty-eight DMMUs were carbon-normalized as appropriate and compared with Sediment Management Standards (SMS) Sediment Quality Standards (SQS) guidelines, to assess suitability for beneficial uses Table 4. All the materials evaluated were quantitated (detected and undetected) below SQS guidelines. Therefore, all the material evaluated was found to be suitable for beneficial use relative to SMS guidelines. However, SMS does not include guidelines for dioxins. Thus, the DMMP has modified the beneficial use finding, based on best professional judgment, in the Suitability section below (paragraph 20).

12. Dioxin Testing Results Summary. Table 5 provides the results of the validated dioxin/furan testing results for the twenty-eight DMMUs, which depicted concentrations ranging from 0.68 pptr-TEQ (NC-C7) to a high of 11.8-pptr-TEQ (HO-C16) (U = ½ detection limit) with an average concentration of 3.62 pptr-TEQ. Analysis of dioxin concentrations in the reference sample (GH-S7) depicted a concentration of 4.03 pptr-TEQ (U = ½ detection limit).

13. Dioxin Interim Interpretative Framework. The existing DMMP dioxin guideline in place for Coastal Washington is 15 pptr-TEQ for interpreting dioxin data. The twenty-eight DMMUs evaluated were all quantitated below the existing guideline of 15.0- pptr-TEQ, and all the maintenance dredged material within the Federal channel in Grays Harbor is suitable for open-water disposal at either of the Estuarine Dispersive sites, and for use at an appropriate beneficial use site (see paragraph 20 below) based on these dioxin testing results.

14. Confirmatory Biological Testing. The standard suite of three bioassay tests (amphipod toxicity, bivalve larval mortality/abnormality, and juvenile polychaete growth) was performed on sediments chosen for confirmatory testing. All biological testing was performed by Northwest Aquatic Science (NAS), of Newport, Oregon, in compliance with standard bioassay protocols (PSEP 1995). The DMMP agencies selected two confirmatory biological testing DMMUs, one within North Channel Reach, and the second within Aberdeen Reach after reviewing the previous testing history within each of the reaches (Table 6). No toxicity has been observed during previous confirmatory testing of Grays Harbor O&M material. The DMMP agencies selected two stations from two reaches subjected to the lowest frequency of confirmatory toxicity testing. The two stations selected were North Channel: DMMU-NC-C10 (39.2 % fines) and Aberdeen: DMMU-AB-C21 (60.3 % fines). Subsequently, a reference sample was collected at reference area station GH-S7 (Figure 8) based on wet sieving results from the twenty-eight DMMUs (Appendix 1c). The reference sample was ultimately quantitated at 87.5 % fines, which differs markedly from the two confirmatory testing DMMUs. The disparity was not realized until after testing was completed. The testing results below were compared with both reference sediments and negative controls to evaluate the suitability of these two DMMUs relative to dispersive interpretation guidelines. Comparison with negative control provides a more conservative interpretation, and the higher fines fraction in the reference sediment coupled with the negative control comparison provides a more conservative evaluation.

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			XR-C1			XR-C2			XR-C3			XR-C4			XR-C5			XR-C6			NC-C7		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
								DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS	
Metals								dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm	
Antimony	mg/kg dw	150	200	-		--	--	7.0		U	7.0		U	7.0		U	7.0		U	7.0		U	9.0		U	7.0		U
Arsenic	mg/kg dw	57	700	507.1	mg/kg	57	93	7.0		U	7.0		U	7.0		U	7.0		U	7.0		U	9.0		U	7.0		U
Cadmium	mg/kg dw	5.1	14	11.3	mg/kg	5.1	6.7	0.3		U	**0.3**			0.3		U	0.3		U	0.3		U	0.3		U	0.3		U
Chromium	mg/kg dw	-	-	267	mg/kg	260	270	**21.5**			**21.3**			**20.3**			**19.4**			**20.9**		U	**29.0**			**19.9**		
Copper	mg/kg dw	390	1300	1027	mg/kg	390	390	**13.5**			**13.6**			**15.1**			**13.1**			**14.5**			**29.5**			**9.8**		
Lead	mg/kg dw	450	1200	975	mg/kg	450	530	**3.0**			**3.0**			3.0		U	3.0		U	3.0			**4.0**			3.0		U
Mercury	mg/kg dw	0.41	2.3	1.5	mg/kg	0.41	0.59	0.03		U	**0.03**			0.03		U	0.03		U	0.04			**0.04**			0.03		U
Selenium	mg/kg dw	-	-	3	mg/kg	--	--	0.70		U	**0.70**			0.70		U	0.7		U	0.70		U	0.8		U	0.7		U
Silver	mg/kg dw	6.1	8.4	6.1	mg/kg	6.1	6.1	0.40		U	**0.40**			0.40		U	0.4		U	0.40		U	0.5		U	0.4		U
Zinc	mg/kg dw	410	3800	2783	mg/kg	410	960	**47.0**			**47.0**			**42.0**			**41.0**			**46.0**		U	**60.0**			**41.0**		
PAHs																												
Naphthalene	µg/kg dw	2100	2400	-	mg/kg-OC	99	170	20.0	0.40	U	14.00	0.16	U	19.00	1.33	U	20.00	0.99	U	**9.40**	0.64		**19.0**	**1.58**		19.0	2.38	U
2-Methylnaphthalene	µg/kg dw	670	1900	-	mg/kg-OC	38	64	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	**J**	**13.0**	**1.08**	J	19.0	2.38	U
Acenaphthylene	µg/kg dw	560	1300	-	mg/kg-OC	66	66	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Acenaphthene	µg/kg dw	500	2000	-	mg/kg-OC	16	57	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Fluorene	µg/kg dw	540	3600	-	mg/kg-OC	23	79	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Phenanthrene	µg/kg dw	1500	21000	-	mg/kg-OC	100	480	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	**20.0**	**1.67**		19.0	2.38	U
Anthracene	µg/kg dw	960	13000	-	mg/kg-OC	220	1200	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Total LPAHs	µg/kg dw	5200	29000	-	mg/kg-OC	370	780	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	**9.40**	**0.64**	U	**52.0**	**4.33**	J	19.0	2.38	U
Fluoranthene	µg/kg dw	1700	30000	4600	mg/kg-OC	160	1200	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	J	**18.0**	1.50	J	19.0	2.38	U
Pyrene	µg/kg dw	2600	16000	11980	mg/kg-OC	1000	1400	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	**9.40**	**0.64**	U	**18.0**	1.50	J	19.0	2.38	U
Benzo(a)anthracene	µg/kg dw	1300	5100	-	mg/kg-OC	110	270	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	**J**	19.0	1.58	U	19.0	2.38	U
Chrysene	µg/kg dw	1400	21000	-	mg/kg-OC	110	460	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Benzo(a)pyrene	µg/kg dw	1600	3600	-	mg/kg-OC	99	210	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Indeno(1,2,3-cd)pyrene	µg/kg dw	600	4400	-	mg/kg-OC	34	88	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Dibenzo(a,h)anthracene	µg/kg dw	230	1900	-	mg/kg-OC	12	33	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Benzo(g,h,i)perylene	µg/kg dw	670	3200	-	mg/kg-OC	31	78	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Total Benzofluoranthenes	µg/kg dw	3200	9900	-	mg/kg/OC	230	450	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Total HPAHs	µg/kg dw	12000	69000	-	mg/kg-OC	960	5300	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	**9.40**	**0.64**	U	**36.0**	**3.00**	**J**	19.0	2.38	U
1,4-Dichlorobenzene	µg/kg dw	110	120	-	mg/kg-OC	3.1	9	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	J	19.0	1.58	U	19.0	2.38	U
1,2-Dichlorobenzene	µg/kg dw	35	110	-	mg/kg-OC	2.3	2.3	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
1,2,4-Trichlorobenzene	µg/kg dw	31	64	-	mg/kg-OC	0.81	1.8	20.0	0.40	U	**20.00**	**0.23**	J	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Hexachlorobenzene	µg/kg dw	22	230	168	mg/kg-OC	0.38	2.3	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Dimethyl phthalate	µg/kg dw	71	1400	-	mg/kg-OC	53	53	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Diethyl phthalate	µg/kg dw	200	1200	-	mg/kg-OC	61	110	49.0	0.98	U	50.00	0.57	U	48.00	3.36	U	50.00	2.46	U	47.00	3.18	U	49.0	4.08	U	47.0	5.88	U
Di-n-butyl phthalate	µg/kg dw	-	-	-	mg/kg-OC	220	1700	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Butyl benzyl phthalate	µg/kg dw	63	970	-	mg/kg-OC	4.9	64	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Bis(2-ethylhexyl) phthalate	µg/kg dw	1300	8300	-	mg/kg-OC	47	78	24.0	0.48	U	25.00	0.29	U	24.00	1.68	U	25.00	1.23	U	24.00	1.62	U	**32.0**	**2.67**		**23.0**	**2.88**	J
Di-n-octyl phthalate	µg/kg dw	6200	6200	-	mg/kg-OC	58	4500	20.0	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Phenol	µg/kg dw	420	1200		ug/kg	420	1200	**16.0**		J	36.00		U	19.00		U	20.00		U	**13.00**		U	19.0		U	100.0		
2-Methylphenol	µg/kg dw	63	77	-	ug/kg	63	63	20.0		U	20.00		U	19.00		U	20.00		U	19.00		J	19.0		U	19.0		U
4-Methylphenol	µg/kg dw	670	3600	-	ug/kg	670	670	39.0		U	40.00		UJ	38.00		U	40.00		U	38.00		U	**69.0**			38.0		U
2,4-Dimethylphenol	µg/kg dw	29	210	-	ug/kg	29	29	19.0		UJ	20.00		U	19.00		UJ	19.00		UJ	19.00		U	19.0		UJ	19.0		UJ
Pentachlorophenol	µg/kg dw	400	690	504	ug/kg	360	690	200.0		U	200.00		U	190.00		U	200.00		U	190.00		UJ	190.0		U	190.0		U
Benzyl Alcohol	µg/kg dw	57	870	-	ug/kg	57	73	20.0		U	20.00		U	19.00		U	20.00		U	19.00		U	19.0		U	19.0		U
Benzoic Acid	µg/kg dw	650	760	-	ug/kg	650	650	390.0		U	400.00		U	380.00		U	400.00		U	380.00		U	390.0		U	380.0		U
Dibenzofuran	µg/kg dw	540	1700	-	mg/kg-OC	15	58	20	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
N-Nitrosodiphenylamine	µg/kg dw	28	130	-	mg/kg-OC	11	11	20	0.40	U	20.00	0.23	U	19.00	1.33	U	20.00	0.99	U	19.00	1.28	U	19.0	1.58	U	19.0	2.38	U
Hexachlorobutadiene	µg/kg dw	29	270	-	mg/kg-OC	3.9	6.2	0.49	0.010	U	0.48	0.005	U	0.48	0.03	U	0.49	0.02	U	0.48	0.03	U	0.5	0.04	U	0.5	0.06	U
Heptachlor	µg/kg dw	1.5	-	-		--	--	0.49		U	0.48		U	0.48		U	0.49		U	0.48		U	0.5		U	0.5		U
Aldrin	µg/kg dw	9.5	-	-		--	--	1.2		Y	0.48		U	0.48		U	0.49		U	0.48		U	0.5		U	0.5		U
Dieldrin	µg/kg dw	1.9	-	-		--	--	0.99		U	0.96		U	0.96		U	0.98		U	0.95		U	1.0		U	1.0		U
4,4'-DDE	µg/kg dw	16	-	-		--	--	0.99		U	0.96		U	0.96		U	0.98		U	0.95		U	1.0		U	1.0		U
4,4'-DDD	µg/kg dw	9	-	-		--	--	0.99		U	0.96		U	0.96		U	0.98		U	0.95		U	1.0		U	1.0		U
4,4'-DDT	µg/kg dw	12	-	-		--	--	0.99		U	0.96		U	0.96		U	0.98		U	0.95		U	1.0		U	1.0		U
Total DDT(sum of 4,4'-DDD, 4,4'-DDE & 4,4'-DDT)	µg/kg dw		69	50		--	--	0.99		U	0.96		U	0.96		U	0.98		U	0.95		U	1.0		U	1.0		U
trans-Chlordane	µg/kg dw	-	-	-		--	--	1.3		Y	0.48		U	0.48		U	0.49		U	0.48		U	0.5		U	0.5		U
cis-Chlordane	µg/kg dw	-	-	-		--	--	0.49		U	0.48		U	0.48		U	0.49		U	0.48		U	0.5		U	0.5		U
oxy Chlordane	µg/kg dw							2.0		U	1.90		U	1.90		U	2.00		U	1.90		U	1.9		U	2.0		U
cis-Nonachlor	µg/kg dw							2.0		U	1.90		U	1.90		U	2.00		U	1.90		U	1.9		U	2.0		U
trans-Nonachlor	µg/kg dw							2.0		U	1.90		U	1.90		U	2.00		U	1.90		U	1.9		U	2.0		U
Total chlordane	µg/kg dw	2.8	-	37		--	--	2.0		U	1.90		U	1.90		U	2.00		U	1.90		U	1.9		U	2.0		U

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			XR-C1			XR-C2			XR-C3			XR-C4			XR-C5			XR-C6			NC-C7		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
Aroclor 1016	µg/kg dw	-	-	-		--	--	9.90		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1242	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1248	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1254	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1260	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1221	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1232	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1262	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Aroclor 1268	µg/kg dw	-	-	-		--	--	9.9		U	9.70		U	9.60		U	9.80		U	9.60		U	9.5		U	9.9		U
Total PCBs	µg/kg dw	130	3100	-	mg/kg/OC	**12**	**65**	9.9	0.20	U	9.70	0.11	U	9.60	0.67	U	9.80	0.48	U	9.60	0.65	U	9.5	0.79	U	9.9	1.24	U
Total PCBs	mg/kg OC	-	-	38				0.20			0.11			0.67			0.48			0.65		U	0.79			1.24		
Dioxin (TEQ: see Table 4 for congener specific results)	**ng/kg**							**0.95**			**0.80**			**1.53**			**1.06**			**1.36**			**3.64**			**0.68**		
Total Solids	%							67.3			68.4			69.6			70.9			65.2			55.1			70.5		
Total Volatile Solids	%							61.2			67.6			68.6			49.1			65.6			5.0			2.0		
Total Organic Carbon	%							5.01			8.77			1.43			2.03			1.48			1.2			0.8		
Total Ammonia	mg/kg							2.72			2.63			2.4			2.15			2.79			15.4			4.1		
Total Sulfides	mg/kg							13.7			12.6			7.82			5.78			12.0			2.2			1.4		U
Gravel	%							0.1			0.1			0.1			0.1			0.1			0.1			0.1		
Sand	%							89.1			87.3			84.4			89.1			82.6			62.6			94.8		
Silt	%							6.5			7.6			9.8			6.6			11.0			24.8			2.6		
Clay	%							4.3			5			5.9			4.3			6.5			12.6			2.6		
Fines (percent silt + clay)	%							10.8			12.6			15.7			10.9			17.5			37.4			5.2		
Eohaustorius estuarius hits: (NH, 2H, 1H)																												
Mytilus galloprovincialis hits: (NH, 2H, 1H)																												
Neanthes arenaceodentata hits: (NH, 2H, 1H)																												
Bioassay Determination: (Pass/Fail)								NA			NA			NA			NA			NA			NA			NA		
BTs exceeded: Y/N								N			N			N			N			N			N			N		
Bioaccumulation conducted: Y/N								N			N			N			N			N			N			N		
Bioaccumulation Determination: (P/F)								NA			NA			NA			NA			NA			NA			NA		
ML Rule exceeded: Y/N								N			N			N			N			N			N			N		
PSDDA Determination: (Suitable/Unsuitable)								**Suitable**	**BU**		**Suitable**	**BU**		**Suitable**	**BU**		**Suitable**	**BU**		**Suitable**	**BU**		**Suitable**			**Suitable**		
DMMU Volume:	cy							60,000			60,000			60,000			60,000			60,000			60,000			60,000		
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)								L			L			L			L			L			L			L		
Mean Grab sampling depth (cm)	cm							10			10			10			10			10			10			10		
DMMU ID:								**XR-C1**			**XR-C2**			**XR-C3**			**XR-C4**			**XR-C5**			**XR-C6**			**NC-C7**		

Legend:
VQ = Validation Qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and/or QC parameter out of Control limits
NA = not analyzed
SL = screening level
BT = bioaccumulation trigger
ML = maximum level
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
DMMP = dredged material management program
DMMU = dredged material management unit
dw = dry weight
ww = wet weight
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
OC = organic carbon normalized
PCBs = polychlorinated biphenyls
RL = reporting limit
SVOCs = semi-volatile organic compounds
NH = No Hit; 2H = Two Hit Failure; 1H = One Hit Failure
BU = Suitable for Beneficial Use
Denotes DMMUs subject to Confirmatory Bioassay testing

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			NC-C8			NC-C9			NC-C10			NC-C11			HO-C12			HO-C13			HO-C14		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
								DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS	
Metals								dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm	
Antimony	mg/kg dw	150	200	-		--	--	7.0		U	8.0		U	8.0		U	7.0		U	7.0		U	8.0		U	9.0		U
Arsenic	mg/kg dw	57	700	507.1	mg/kg	57	93	8.0			8.0		U	**8.0**			**7.0**			7.0		U	8.0		U	9.0		U
Cadmium	mg/kg dw	5.1	14	11.3	mg/kg	5.1	6.7	0.3		U	0.3		U	0.3		U	0.3		U	0.3		U	0.3		U	0.3		U
Chromium	mg/kg dw	-	-	267	mg/kg	260	270	**29.0**			**26.4**			**34.6**			**26.6**			**28.4**			**32.5**			**32.9**		
Copper	mg/kg dw	390	1300	1027	mg/kg	390	390	**30.6**			**25.4**			**44.1**			**23.3**			**29.4**			**42.2**			**38.8**		
Lead	mg/kg dw	450	1200	975	mg/kg	450	530	**4.0**			**3.0**			**4.0**			**3.0**		U	**3.0**			**4.0**			**4.0**		
Mercury	mg/kg dw	0.41	2.3	1.5	mg/kg	0.41	0.59	0.03		U	0.03		U	0.04		U	0.03		U	0.03		U	0.04		U	**0.04**		
Selenium	mg/kg dw	-	-	3	mg/kg	--	--	0.7		U	0.8		U	0.8		U	0.7		U	0.7		U	0.8		U	0.9		U
Silver	mg/kg dw	6.1	8.4	6.1	mg/kg	6.1	6.1	0.4		U	0.5		U	0.5		U	0.4		U	0.4		U	0.5		U	0.5		U
Zinc	mg/kg dw	410	3800	2783	mg/kg	410	960	**59.0**			**54.0**			**69.0**			**55.0**			**60.0**			**72.0**			**68.0**		
PAHs																												
Naphthalene	µg/kg dw	2100	2400	-	mg/kg-OC	99	170	19.0	1.06	U	19.0	1.19	U	**25.0**	**1.47**		18.0	1.50	U	**10.0**	**0.77**	J	**11.0**	0.73	J	19.0	1.06	U
2-Methylnaphthalene	µg/kg dw	670	1900	-	mg/kg-OC	38	64	19.0	1.06	U	19.0	1.19	U	**11.0**	**0.65**	J	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Acenaphthylene	µg/kg dw	560	1300	-	mg/kg-OC	66	66	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Acenaphthene	µg/kg dw	500	2000	-	mg/kg-OC	16	57	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Fluorene	µg/kg dw	540	3600	-	mg/kg-OC	23	79	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Phenanthrene	µg/kg dw	1500	21000	-	mg/kg-OC	100	480	19.0	1.06	U	19.0	1.19	U	**17.0**	**1.00**	J	**10.0**	**0.83**	J	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Anthracene	µg/kg dw	960	13000	-	mg/kg-OC	220	1200	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Total LPAHs	µg/kg dw	5200	29000	-	mg/kg-OC	370	780	19.0	1.06	U	19.0	1.19	U	**53.0**	**3.12**	J	**10.0**	**0.83**	J	**10.0**	**0.77**	J	**11.0**	0.73	J	19.0	1.06	U
Fluoranthene	µg/kg dw	1700	30000	4600	mg/kg-OC	160	1200	19.0	1.06	U	**9.6**	**0.60**	J	**17.0**	**1.00**	J	**9.2**	**0.77**	J	19.0	1.46	U	**9.6**	0.64	J	**12.0**	**0.67**	J
Pyrene	µg/kg dw	2600	16000	11980	mg/kg-OC	1000	1400	19.0	1.06	U	19.0	1.19	U	**21.0**	**1.24**		**10.0**	**0.83**	JQ	19.0	1.46	U	**12.0**	0.80	J	**12.0**	**0.67**	J
Benzo(a)anthracene	µg/kg dw	1300	5100	-	mg/kg-OC	110	270	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Chrysene	µg/kg dw	1400	21000	-	mg/kg-OC	110	460	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Benzo(a)pyrene	µg/kg dw	1600	3600	-	mg/kg-OC	99	210	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Indeno(1,2,3-cd)pyrene	µg/kg dw	600	4400	-	mg/kg-OC	34	88	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Dibenzo(a,h)anthracene	µg/kg dw	230	1900	-	mg/kg-OC	12	33	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Benzo(g,h,i)perylene	µg/kg dw	670	3200	-	mg/kg-OC	31	78	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Total Benzofluoranthenes	µg/kg dw	3200	9900	-	mg/kg/OC	230	450	19.0	1.06	U	19.0	1.19	U	**12.0**	**0.71**	J	18.0	1.50	U	19.0	1.46	U	**9.6**	0.64	J	19.0	1.06	U
Total HPAHs	µg/kg dw	12000	69000	-	mg/kg-OC	960	5300	19.0	1.06	U	**9.6**	**0.60**	J	**50.0**	**2.94**	J	18.0	1.50	U	19.0	1.46	U	**31.2**	2.08	J	**24.0**	**1.33**	J
1,4-Dichlorobenzene	µg/kg dw	110	120	-	mg/kg-OC	3.1	9	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
1,2-Dichlorobenzene	µg/kg dw	35	110	-	mg/kg-OC	2.3	2.3	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
1,2,4-Trichlorobenzene	µg/kg dw	31	64	-	mg/kg-OC	0.81	1.8	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Hexachlorobenzene	µg/kg dw	22	230	168	mg/kg-OC	0.38	2.3	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Dimethyl phthalate	µg/kg dw	71	1400	-	mg/kg-OC	53	53	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Diethyl phthalate	µg/kg dw	200	1200	-	mg/kg-OC	61	110	48.0	2.67	U	48.0	3.00	U	48.0	2.82	U	46.0	3.83	U	47.0	3.62	U	48.0	3.20	U	48.0	2.67	U
Di-n-butyl phthalate	µg/kg dw	-	-	-	mg/kg-OC	220	1700	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Butyl benzyl phthalate	µg/kg dw	63	970	-	mg/kg-OC	4.9	64	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Bis(2-ethylhexyl) phthalate	µg/kg dw	1300	8300	-	mg/kg-OC	47	78	**20.0**	**1.11**	J	**22.0**	1.38	J	**29.0**	1.71		23.0	1.92	U	**25.0**	1.92	B	24.0	1.60	U	24.0	1.33	U
Di-n-octyl phthalate	µg/kg dw	6200	6200	-	mg/kg-OC	58	4500	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Phenol	µg/kg dw	420	1200		ug/kg	420	1200	19.0		U	13.0		J	**18.0**		J	**11.0**		J	19.0		U	19.0		U	**9.7**		J
2-Methylphenol	µg/kg dw	63	77	-	ug/kg	63	63	19.0		U	19.0		U	19.0		U	18.0		U	19.0		U	19.0		U	19.0		U
4-Methylphenol	µg/kg dw	670	3600	-	ug/kg	670	670	38.0		U	**12.0**		J	**26.0**		J	37.0		U	**11.0**		J	**20.0**		J	**67.0**		
2,4-Dimethylphenol	µg/kg dw	29	210	-	ug/kg	29	29	19.0		UJ	19.0		UJ	19.0		UJ	18.0		UJ	38.0		U	19.0		U	39.0		U
Pentachlorophenol	µg/kg dw	400	690	504	ug/kg	360	690	190.0		U	190.0		U	190.0		U	180.0		U	190.0		U	190.0		U	190.0		U
Benzyl Alcohol	µg/kg dw	57	870	-	ug/kg	57	73	19.0		U	19.0		U	19.0		U	18.0		U	19.0		U	19.0		U	19.0		U
Benzoic Acid	µg/kg dw	650	760	-	ug/kg	650	650	380.0		U	380.0		U	390.0		U	370.0		U	380.0		U	380.0		U	390.0		U
Dibenzofuran	µg/kg dw	540	1700	-	mg/kg-OC	15	58	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
N-Nitrosodiphenylamine	µg/kg dw	28	130	-	mg/kg-OC	11	11	19.0	1.06	U	19.0	1.19	U	19.0	1.12	U	18.0	1.50	U	19.0	1.46	U	19.0	1.27	U	19.0	1.06	U
Hexachlorobutadiene	µg/kg dw	29	270	-	mg/kg-OC	3.9	6.2	0.5	0.03	U	0.5	0.03	U	0.5	0.03	U	0.5	0.04	U	0.5	0.04	U	0.5	0.03	U	0.5	0.03	U
Heptachlor	µg/kg dw	1.5	-	-		--	--	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U
Aldrin	µg/kg dw	9.5	-	-		--	--	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U
Dieldrin	µg/kg dw	1.9	-	-		--	--	1.0		U	0.9		U	0.9		U	1.0		U	1.0		U	0.9		U	1.0		U
4,4'-DDE	µg/kg dw	16	-	-		--	--	1.0		U	0.9		U	0.9		U	1.0		U	1.0		U	0.9		U	1.0		U
4,4'-DDD	µg/kg dw	9	-	-		--	--	1.0		U	0.9		U	0.9		U	1.0		U	1.0		U	0.9		U	1.0		U
4,4'-DDT	µg/kg dw	12	-	-		--	--	1.0		U	0.9		U	0.9		U	1.0		U	1.0		U	0.9		U	1.0		U
Total DDT(sum of 4,4'-DDD, 4,4'-DDE & 4,4'-DDT)	µg/kg dw		69	50		--	--	1.0		U	0.9		U	0.9		U	1.0		U	1.0		U	0.9		U	1.0		U
trans-Chlordane	µg/kg dw	-	-	-		--	--	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U
cis-Chlordane	µg/kg dw	-	-	-		--	--	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U	0.5		U
oxy Chlordane	µg/kg dw							1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U
cis-Nonachlor	µg/kg dw							1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U
trans-Nonachlor	µg/kg dw							1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U
Total chlordane	µg/kg dw	2.8	-	37		--	--	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U	1.9		U

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			NC-C8			NC-C9			NC-C10			NC-C11			HO-C12			HO-C13			HO-C14		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
Aroclor 1016	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1242	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1248	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1254	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1260	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1221	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1232	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1262	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Aroclor 1268	µg/kg dw	-	-	-		--	--	9.7		U	9.5		U	9.5		U	9.4		U	9.6		U	9.6		U	9.7		U
Total PCBs	µg/kg dw	130	3100	-	mg/kg/OC	**12**	**65**	9.7	0.54	U	9.5	0.59	U	9.5	0.56	U	9.4	0.78	U	9.6	0.74	U	9.6	0.64	U	9.7	0.54	U
Total PCBs	mg/kg OC	-	-	38				0.54			0.59			0.56			0.78			0.74			0.64			0.54		
Dioxin (TEQ: see Table 4 for congener specific results)	**ng/kg**							**3.57**			**2.87**			**4.5**			**2.4**			**1.57**			**3.61**			**4.24**		
Total Solids	%							65.4			58.2			57.4			66.9			65.3			60.4			50.3		
Total Volatile Solids	%							3.5			4.0			5.0			3.0			3.3			4.4			5.2		
Total Organic Carbon	%							1.8			1.6			1.7			1.2			1.3			1.5			1.8		
Total Ammonia	mg/kg							8.5			7.5			11.2			11.4			13.1			13.5			20.4		
Total Sulfides	mg/kg							1.8			1.5		U	325			1.6		U	23.6			1.8		U	9.3		
Gravel	%							0.1			0.1			0.2			0.1			0.1			1.0			0.2		
Sand	%							76.3			74.9			60.4			85.2			82.3			64.4			55.3		
Silt	%							15.6			15.3			25.4			9.0			11.3			23.9			33.5		
Clay	%							8.0			9.8			13.8			5.7			6.1			10.6			11.1		
Fines (percent silt + clay)	%							23.6			25.1			39.2			14.7			17.4			34.5			44.6		
Eohaustorius estuarius hits: (NH, 2H, 1H)														NH														
Mytilus galloprovincialis hits: (NH, 2H, 1H)														NH														
Neanthes arenaceodentata hits: (NH, 2H, 1H)														NH														
Bioassay Determination: (Pass/Fail)								NA			NA			**PASS**			NA			NA			NA			NA		
BTs exceeded: Y/N																												
Bioaccumulation conducted: Y/N								N			N			N			N			N			N			N		
Bioaccumulation Determination: (P/F)								NA			NA			NA			NA			NA			NA			NA		
ML Rule exceeded: Y/N								N			N			N			N			N			N			N		
PSDDA Determination: (Suitable/Unsuitable)								**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**		
DMMU Volume:	cy							60,000			60,000			60,000			60,000			60,000			60,000			60,000		
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)								L			L			L			L			L			L			L		
Mean Grab sampling depth (cm)	cm							10			10			10			10			10			10			10		
DMMU ID:								**NC-C8**			**NC-C9**			**NC-C10**			**NC-C11**			**HO-C12**			**HO-C13**			**HO-C14**		

Legend:
VQ = Validation Qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and/or QC parameter out of Control limits
NA = not analyzed
SL = screening level
BT = bioaccumulation trigger
ML = maximum level
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
DMMP = dredged material management program
DMMU = dredged material management unit
dw = dry weight
ww = wet weight
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
OC = organic carbon normalized
PCBs = polychlorinated biphenyls
RL = reporting limit
SVOCs = semi-volatile organic compounds
NH = No Hit; 2H = Two Hit Failure; 1H = One Hit Failure
BU = Suitable for Beneficial Use
Denotes DMMUs subject to Confirmatory Bioassay testing

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			HO-C15			HO-C16			HO-C17			CP-C18			CP-C19			CP-C20			AB-C21		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
								DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS	
Metals								dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm	
Antimony	mg/kg dw	150	200	-		--	--	8.0		U	10.0		U	10.0		U	10.00		U	10.00		U	10.00		U	10.00		U
Arsenic	mg/kg dw	57	700	507.1	mg/kg	57	93	8.0		U	10.0		U	10.0		U	10.00		U	10.00		U	10.00		U	10.00		U
Cadmium	mg/kg dw	5.1	14	11.3	mg/kg	5.1	6.7	0.3		U	0.4		U	0.5		U	0.40		U	0.50		U	0.60		U	0.40		U
Chromium	mg/kg dw	-	-	267	mg/kg	260	270	**31.9**			**40.0**			**40.0**			**36.00**			**41.00**			**42.00**			**37.00**		
Copper	mg/kg dw	390	1300	1027	mg/kg	390	390	**36.1**			**69.3**			**64.6**			**49.10**			**55.30**			**57.90**			**52.10**		
Lead	mg/kg dw	450	1200	975	mg/kg	450	530	**4.0**			**6.0**			**6.0**			**5.00**			**7.00**			**8.00**			**6.00**		
Mercury	mg/kg dw	0.41	2.3	1.5	mg/kg	0.41	0.59	**0.03**			**0.05**			**0.06**			**0.04**			**0.06**			**0.07**			**0.04**		
Selenium	mg/kg dw	-	-	3	mg/kg	--	--	0.8		U	1.0		U	1.0		U	1.00		U	1.00		U	1.00		U	1.00		U
Silver	mg/kg dw	6.1	8.4	6.1	mg/kg	6.1	6.1	0.5		U	0.7		U	0.7		U	0.60		U	0.80		U	0.80		U	0.60		U
Zinc	mg/kg dw	410	3800	2783	mg/kg	410	960	**66.0**			**83.0**			**82.0**			**76.00**			**85.00**			**87.00**			**79.00**		
PAHs																												
Naphthalene	µg/kg dw	2100	2400	-	mg/kg-OC	99	170	**11.0**	0.79	J	19.0	0.79	U	**20.0**	0.74		**23.00**	**1.25**		**15.00**	**0.60**	J	**20.00**	**0.71**		**24.00**	**1.04**	
2-Methylnaphthalene	µg/kg dw	670	1900	-	mg/kg-OC	38	64	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	**15.00**	**0.82**	J	20.00	0.80	U	20.00	0.71	U	**11.00**	0.48	J
Acenaphthylene	µg/kg dw	560	1300	-	mg/kg-OC	66	66	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Acenaphthene	µg/kg dw	500	2000	-	mg/kg-OC	16	57	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Fluorene	µg/kg dw	540	3600	-	mg/kg-OC	23	79	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Phenanthrene	µg/kg dw	1500	21000	-	mg/kg-OC	100	480	**9.5**	0.68	J	19.0	0.79	U	**29.0**	1.07		**22.00**	**1.20**		**27.00**	**1.08**		**22.00**	**0.79**		**41.00**	**1.78**	
Anthracene	µg/kg dw	960	13000	-	mg/kg-OC	220	1200	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Total LPAHs	µg/kg dw	5200	29000	-	mg/kg-OC	370	780	**20.5**	1.46	J	19.0	0.79	U	**49.0**	1.81		**60.00**	**3.26**	J	**42.00**	**1.69**	J	**42.00**	**1.50**	J	**76.00**	**3.30**	J
Fluoranthene	µg/kg dw	1700	30000	4600	mg/kg-OC	160	1200	19.0	1.36	U	19.0	0.79	U	**26.0**	0.96		**16.00**	**0.87**	J	**23.00**	**0.92**		**21.00**	**0.75**		**41.00**	**1.78**	
Pyrene	µg/kg dw	2600	16000	11980	mg/kg-OC	1000	1400	19.0	1.36	U	19.0	0.79	U	24.0	0.89	Q	**18.00**	**0.98**	JQ	31.00	1.24	Q	22.00	0.79	Q	38.00	1.65	Q
Benzo(a)anthracene	µg/kg dw	1300	5100	-	mg/kg-OC	110	270	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	**11.00**	**0.44**	J	20.00	0.71	U	**14.00**	**0.61**	J
Chrysene	µg/kg dw	1400	21000	-	mg/kg-OC	110	460	19.0	1.36	U	19.0	0.79	U	**9.6**	0.36	J	**11.00**	**0.60**	J	**16.00**	**0.64**	J	**11.00**	0.39	J	**18.00**	**0.78**	J
Benzo(a)pyrene	µg/kg dw	1600	3600	-	mg/kg-OC	99	210	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	**15.00**	**0.60**	J	20.00	0.71	U	20.00	0.87	U
Indeno(1,2,3-cd)pyrene	µg/kg dw	600	4400	-	mg/kg-OC	34	88	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Dibenzo(a,h)anthracene	µg/kg dw	230	1900	-	mg/kg-OC	12	33	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Benzo(g,h,i)perylene	µg/kg dw	670	3200	-	mg/kg-OC	31	78	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Total Benzofluoranthenes	µg/kg dw	3200	9900	-	mg/kg/OC	230	450	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	**24.00**	**0.96**		20.00	0.71	U	**24.00**	**1.04**	
Total HPAHs	µg/kg dw	12000	69000	-	mg/kg-OC	960	5300	19.0	1.36	U	19.0	0.79	U	**35.6**	1.32	J	**45.0**	**2.45**	J	**66.0**	**2.65**	J	**32.0**	**1.14**	J	**214.0**	**9.30**	J
1,4-Dichlorobenzene	µg/kg dw	110	120	-	mg/kg-OC	3.1	9	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
1,2-Dichlorobenzene	µg/kg dw	35	110	-	mg/kg-OC	2.3	2.3	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
1,2,4-Trichlorobenzene	µg/kg dw	31	64	-	mg/kg-OC	0.81	1.8	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Hexachlorobenzene	µg/kg dw	22	230	168	mg/kg-OC	0.38	2.3	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Dimethyl phthalate	µg/kg dw	71	1400	-	mg/kg-OC	53	53	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Diethyl phthalate	µg/kg dw	200	1200	-	mg/kg-OC	61	110	47.0	3.36	U	48.0	2.00	U	48.0	1.78	U	49.00	2.66	U	50.00	2.01	U	50.00	1.79	U	49.00	2.13	U
Di-n-butyl phthalate	µg/kg dw	-	-	-	mg/kg-OC	220	1700	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Butyl benzyl phthalate	µg/kg dw	63	970	-	mg/kg-OC	4.9	64	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Bis(2-ethylhexyl) phthalate	µg/kg dw	1300	8300	-	mg/kg-OC	47	78	24.0	1.71	U	24.0	1.00	U	24.0	0.89	U	**35.00**	**1.90**	B	**31.00**	**1.24**	B	**31.00**	**1.11**	B	**60.00**	**2.61**	B
Di-n-octyl phthalate	µg/kg dw	6200	6200	-	mg/kg-OC	58	4500	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Phenol	µg/kg dw	420	1200		ug/kg	420	1200	19.0		U	**13.0**		J	**13.0**		J	**20.00**			**23.00**			**32.00**			**22.00**		
2-Methylphenol	µg/kg dw	63	77	-	ug/kg	63	63	19.0		U	19.0		U	19.0		U	20.00		U	20.00		U	20.00		U	20.00		U
4-Methylphenol	µg/kg dw	670	3600	-	ug/kg	670	670	**22.0**		J	**15.0**		J	**24.0**		J	**35.00**		J	**42.00**			**37.00**		J	**29.00**		J
2,4-Dimethylphenol	µg/kg dw	29	210	-	ug/kg	29	29	38.0		U	38.0		U	19.0		UJ	19.00		UJ	20.00		UJ	20.00		UJ	20.00		UJ
Pentachlorophenol	µg/kg dw	400	690	504	ug/kg	360	690	190.0		U	190.0		U	190.0		U	200.00		U	200.00		U	200.00		U	200.00		U
Benzyl Alcohol	µg/kg dw	57	870	-	ug/kg	57	73	19.0		U	**21.0**			**12.0**		J	20.00		U	**15.00**		J	**27.00**			**11.00**		J
Benzoic Acid	µg/kg dw	650	760	-	ug/kg	650	650	380.0		U	380.0		U	380.0		U	390.00		U	400.00		U	400.00		U	390.00		U
Dibenzofuran	µg/kg dw	540	1700	-	mg/kg-OC	15	58	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
N-Nitrosodiphenylamine	µg/kg dw	28	130	-	mg/kg-OC	11	11	19.0	1.36	U	19.0	0.79	U	19.0	0.70	U	20.00	1.09	U	20.00	0.80	U	20.00	0.71	U	20.00	0.87	U
Hexachlorobutadiene	µg/kg dw	29	270	-	mg/kg-OC	3.9	6.2	0.5	0.03	U	0.5	0.02	U	0.5	0.02	U	0.48	0.03	U	0.49	0.02	U	0.50	0.02	U	0.48	0.02	U
Heptachlor	µg/kg dw	1.5	-	-		--	--	0.5		U	0.5		U	0.5		U	0.48		U	0.49		U	0.50		U	0.48		U
Aldrin	µg/kg dw	9.5	-	-		--	--	0.5		U	0.5		U	0.5		U	0.48		U	0.49		U	0.50		U	0.48		U
Dieldrin	µg/kg dw	1.9	-	-		--	--	0.9		U	1.0		U	1.0		U	0.97		U	0.98		U	0.99		U	0.97		U
4,4'-DDE	µg/kg dw	16	-	-		--	--	0.9		U	1.0		U	1.0		U	0.97		U	0.98		U	0.99		U	0.97		U
4,4'-DDD	µg/kg dw	9	-	-		--	--	0.9		U	1.0		U	1.0		U	0.97		U	0.98		U	0.99		U	0.97		U
4,4'-DDT	µg/kg dw	12	-	-		--	--	0.9		U	1.0		U	1.0		U	0.97		U	0.98		U	0.99		U	0.97		U
Total DDT(sum of 4,4'-DDD, 4,4'-DDE & 4,4'-DDT)	µg/kg dw		69	50		--	--	0.9		U	1.0		U	1.0		U	0.97		U	0.98		U	0.99		U	0.97		U
trans-Chlordane	µg/kg dw	-	-	-		--	--	0.5		U	0.5		U	1.2		Y	0.48		U	0.49		U	0.50		U	0.51		
cis-Chlordane	µg/kg dw	-	-	-		--	--	0.5		U	0.5		U	0.5		U	0.48		U	0.49		U	0.50		U	0.48		U
oxy Chlordane	µg/kg dw							1.9		U	2.0		U	1.9		U	1.90		U	2.00		U	2.00		U	1.90		U
cis-Nonachlor	µg/kg dw							1.9		U	2.0		U	1.9		U	1.90		U	2.00		U	2.00		U	1.90		U
trans-Nonachlor	µg/kg dw							1.9		U	2.0		U	1.9		U	1.90		U	2.00		U	2.00		U	1.90		U
Total chlordane	µg/kg dw	2.8	-	37		--	--	1.9		U	2.0		U	1.9		U	1.90		U	2.00		U	2.00		U	1.90		U

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			HO-C15			HO-C16			HO-C17			CP-C18			CP-C19			CP-C20			AB-C21		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
Aroclor 1016	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	9.70		U	9.80		U	9.70		U	9.60		U
Aroclor 1242	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	9.70		U	9.80		U	9.70		U	9.60		U
Aroclor 1248	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	19.00		Y	9.80		U	9.70		U	9.60		U
Aroclor 1254	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	19.00		Y	9.80		U	9.70		U	9.60		U
Aroclor 1260	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	9.70		U	9.80		U	9.70		U	9.60		U
Aroclor 1221	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	9.70		U	9.80		U	9.70		U	9.60		U
Aroclor 1232	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	9.70		U	9.80		U	9.70		U	9.60		U
Aroclor 1262	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	**35.00**			9.80		U	9.70		U	9.60		U
Aroclor 1268	µg/kg dw	-	-	-		--	--	9.6		U	9.6		U	9.8		U	9.70		U	9.80		U	9.70		U	9.60		U
Total PCBs	µg/kg dw	130	3100	-	mg/kg/OC	**12**	**65**	9.6	0.69	U	9.6	0.40	U	9.8	0.36	U	**35.00**	**1.90**		9.80	0.39	U	9.70	0.35	U	9.60	0.42	U
Total PCBs	mg/kg OC	-	-	38				0.69			0.40			0.36			**1.90**			0.39			0.35			0.42		
Dioxin (TEQ: see Table 4 for congener specific results)	**ng/kg**							**3.22**			**11.83**			**3.86**			**6.34**			**10.48**			**10.6**			**7.23**		
Total Solids	%							63.4			45.6			40.4			45.2			34.8			32.8			43.5		
Total Volatile Solids	%							4.4			7			7.7			6.62			8.61			9.2			6.84		
Total Organic Carbon	%							1.4			2.4			2.7			1.84			2.49			2.8			2.23		
Total Ammonia	mg/kg							12.8			56.8			57.7			17.4			25			11.3			18.9		
Total Sulfides	mg/kg							2.2			22.6			571			368			5.32			3.46			8.33		
Gravel	%							0.1			0.1			0.1			0.2			0.1			0.1			0.4		
Sand	%							67.1			22.8			16.8			42.4			14.2			8.7			39.6		
Silt	%							22.8			53.5			57.5			40.5			59.3			63.9			42.7		
Clay	%							10.2			23.5			25.7			16.9			26.2			27.4			17.6		
Fines (percent silt + clay)	%							33.0			77.0			83.2			57.4			85.5			91.3			60.3		
Eohaustorius estuarius hits: (NH, 2H, 1H)																										NH		
Mytilus galloprovincialis hits: (NH, 2H, 1H)																										NH		
Neanthes arenaceodentata hits: (NH, 2H, 1H)																										NH		
Bioassay Determination: (Pass/Fail)								NA			NA			NA			NA			NA			NA			**PASS**		
BTs exceeded: Y/N											N			N			N			N			N			N		
Bioaccumulation conducted: Y/N								N			N			N			N			N			N			N		
Bioaccumulation Determination: (P/F)								NA			NA			NA			NA			NA			NA			NA		
ML Rule exceeded: Y/N								N			N			N			N			N			N			N		
PSDDA Determination: (Suitable/Unsuitable)								**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**		
DMMU Volume:	cy							60,000			60,000			60,000			60,000			60,000			60,000			60,000		
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)								L			L			L			L			L			L			L		
Mean Grab sampling depth (cm)	cm							10			10			10			10			10			10			10		
DMMU ID:								**HO-C15**			**HO-C16**			**HO-C17**			**CP-C18**			**CP-C19**			**CP-C20**			**AB-C21**		

Legend:
VQ = Validation Qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and/or QC parameter out of Control limits
NA = not analyzed
SL = screening level
BT = bioaccumulation trigger
ML = maximum level
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
DMMP = dredged material management program
DMMU = dredged material management unit
dw = dry weight
ww = wet weight
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
OC = organic carbon normalized
PCBs = polychlorinated biphenyls
RL = reporting limit
SVOCs = semi-volatile organic compounds
NH = No Hit; 2H = Two Hit Failure; 1H = One Hit Failure
BU = Suitable for Beneficial Use
Denotes DMMUs subject to Confirmatory Bioassay testing

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			AB-C22			AB-C23			SA-C24			SA-C25			SA-C26			SA-C27			SA-C28			Reference: GH-S7		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
								DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS	
Metals								dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm	
Antimony	mg/kg dw	150	200	-		--	--	20.00		U	**20.00**			10.00		U	20.00		U	10.0		U	20.0		U	20.0		U			
Arsenic	mg/kg dw	57	700	507.1	mg/kg	57	93	20.00		U	20.00		U	10.00		U	20.00		U	10.0		U	20.0		U	20.0		U			
Cadmium	mg/kg dw	5.1	14	11.3	mg/kg	5.1	6.7	0.60		U	0.60		U	0.60		U	**0.60**			0.4		U	0.7		U	0.7		U			
Chromium	mg/kg dw	-	-	267	mg/kg	260	270	**36.00**			29.00		U	**35.00**			**35.00**			**38.0**			**33.0**			**35.0**					
Copper	mg/kg dw	390	1300	1027	mg/kg	390	390	**51.40**			**42.30**			**47.00**			54.60		U	**57.9**			**48.7**			**48.8**					
Lead	mg/kg dw	450	1200	975	mg/kg	450	530	6.00		U	**6.00**			6.00		U	6.00		U	**6.0**			7.0		U	7.0		U			
Mercury	mg/kg dw	0.41	2.3	1.5	mg/kg	0.41	0.59	0.03		U	0.03		U	0.03		U	**0.02**			**0.06**			0.03		U	0.03		U			
Selenium	mg/kg dw	-	-	3	mg/kg	--	--	0.60		U	**0.60**			0.60		U	0.70		U	1.0		U	0.7		U	0.7		U			
Silver	mg/kg dw	6.1	8.4	6.1	mg/kg	6.1	6.1	1.00		U	1.00		U	0.90		U	**1.00**			0.7		U	1.0		U	1.0		U			
Zinc	mg/kg dw	410	3800	2783	mg/kg	410	960	**77.00**			64.00		U	**71.00**			**73.00**			**82.0**			**73.0**			**75.0**					
PAHs																															
Naphthalene	µg/kg dw	2100	2400	-	mg/kg-OC	99	170	19.00	1.30	U	**20.00**	**2.02**		19.00	1.79	U	19.00	0.67	UJ	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
2-Methylnaphthalene	µg/kg dw	670	1900	-	mg/kg-OC	38	64	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Acenaphthylene	µg/kg dw	560	1300	-	mg/kg-OC	66	66	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Acenaphthene	µg/kg dw	500	2000	-	mg/kg-OC	16	57	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Fluorene	µg/kg dw	540	3600	-	mg/kg-OC	23	79	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Phenanthrene	µg/kg dw	1500	21000	-	mg/kg-OC	100	480	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	**11.0**	**0.39**	J	**9.3**	**0.55**	J	19.0	1.27	U			
Anthracene	µg/kg dw	960	13000	-	mg/kg-OC	220	1200	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Total LPAHs	µg/kg dw	5200	29000	-	mg/kg-OC	370	780	19.00	1.30	U	**20.00**	**2.02**	J	19.00	1.79	U	19.00	0.67	U	**11.0**	**0.39**	J	**9.3**	**0.55**	J	19.0	1.27	U			
Fluoranthene	µg/kg dw	1700	30000	4600	mg/kg-OC	160	1200	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	**12.0**	**0.43**	J	**9.3**	**0.55**	J	19.0	1.27	U			
Pyrene	µg/kg dw	2600	16000	11980	mg/kg-OC	1000	1400	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	**12.0**	**0.43**	J	19.0	1.12	U	19.0	1.27	U			
Benzo(a)anthracene	µg/kg dw	1300	5100	-	mg/kg-OC	110	270	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	**19.00**	**0.67**	B	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Chrysene	µg/kg dw	1400	21000	-	mg/kg-OC	110	460	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Benzo(a)pyrene	µg/kg dw	1600	3600	-	mg/kg-OC	99	210	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Indeno(1,2,3-cd)pyrene	µg/kg dw	600	4400	-	mg/kg-OC	34	88	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Dibenzo(a,h)anthracene	µg/kg dw	230	1900	-	mg/kg-OC	12	33	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Benzo(g,h,i)perylene	µg/kg dw	670	3200	-	mg/kg-OC	31	78	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Total Benzofluoranthenes	µg/kg dw	3200	9900	-	mg/kg/OC	230	450	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	**19.00**	**0.67**	BJ	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Total HPAHs	µg/kg dw	12000	69000	-	mg/kg-OC	960	5300	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	**38.0**	**1.34**	BJ	**24.0**	**0.86**	J	19.0	1.12	U	19.0	1.27	U			
1,4-Dichlorobenzene	µg/kg dw	110	120	-	mg/kg-OC	3.1	9	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
1,2-Dichlorobenzene	µg/kg dw	35	110	-	mg/kg-OC	2.3	2.3	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
1,2,4-Trichlorobenzene	µg/kg dw	31	64	-	mg/kg-OC	0.81	1.8	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Hexachlorobenzene	µg/kg dw	22	230	168	mg/kg-OC	0.38	2.3	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Dimethyl phthalate	µg/kg dw	71	1400	-	mg/kg-OC	53	53	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Diethyl phthalate	µg/kg dw	200	1200	-	mg/kg-OC	61	110	48.00	3.29	U	49.00	4.95	U	46.00	4.34	U	46.00	1.62	U	48.0	1.71	U	47.0	2.76	U	48.0	3.20	U			
Di-n-butyl phthalate	µg/kg dw	-	-	-	mg/kg-OC	220	1700	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Butyl benzyl phthalate	µg/kg dw	63	970	-	mg/kg-OC	4.9	64	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Bis(2-ethylhexyl) phthalate	µg/kg dw	1300	8300	-	mg/kg-OC	47	78	24.00	1.64	U	26.00	2.63	U	23.00	2.17	U	27.00	0.95	U	**36.0**	**1.29**	B	23.0	1.35	U	**24.0**	**1.60**	B			
Di-n-octyl phthalate	µg/kg dw	6200	6200	-	mg/kg-OC	58	4500	19.00	1.30	U	**20.00**	**2.02**	B	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Phenol	µg/kg dw	420	1200		ug/kg	420	1200	19.00		U	20.00		U	19.00		U	19.00		U	**14.0**		J	19.0		U	19.0		U			
2-Methylphenol	µg/kg dw	63	77	-	ug/kg	63	63	19.00		U	20.00		U	19.00		U	19.00		U	19.0		U	19.0		U	19.0		U			
4-Methylphenol	µg/kg dw	670	3600	-	ug/kg	670	670	38.00		U	39.00		U	37.00		U	37.00		U	**14.0**		J	37.0		U	38.0		U			
2,4-Dimethylphenol	µg/kg dw	29	210	-	ug/kg	29	29	19.00		UJ	20.00		U	19.00		UJ				38.0		U	37.0		U	38.0		U			
Pentachlorophenol	µg/kg dw	400	690	504	ug/kg	360	690	190.00		U	200.00		UJ	190.00		U	190.00		U	190.0		U	190.0		U	190.0		U			
Benzyl Alcohol	µg/kg dw	57	870	-	ug/kg	57	73	19.00		U	20.00		U	19.00		U	19.00		U	**9.6**		J	19.0		U	19.0		U			
Benzoic Acid	µg/kg dw	650	760	-	ug/kg	650	650	380.00		U	390.00		U	370.00		U	370.00		U	380.0		U	370.0		U	380.0		U			
Dibenzofuran	µg/kg dw	540	1700	-	mg/kg-OC	15	58	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
N-Nitrosodiphenylamine	µg/kg dw	28	130	-	mg/kg-OC	11	11	19.00	1.30	U	20.00	2.02	U	19.00	1.79	U	19.00	0.67	U	19.0	0.68	U	19.0	1.12	U	19.0	1.27	U			
Hexachlorobutadiene	µg/kg dw	29	270	-	mg/kg-OC	3.9	6.2	0.47	0.03	U	0.48	0.05	U	0.48	0.05	U	0.48	0.02	U	0.5	0.02	U	0.5	0.03	U	0.5	0.03	U			
Heptachlor	µg/kg dw	1.5	-	-		--	--	0.47		U	0.48		U	0.48		U	0.48		U	0.5		U	0.5		U	0.5		U			
Aldrin	µg/kg dw	9.5	-	-		--	--	0.47		U	0.48		U	0.48		U	0.48		U	0.5		U	0.5		U	0.5		U			
Dieldrin	µg/kg dw	1.9	-	-		--	--	0.94		U	0.95		U	0.96		U	0.97		U	1.0		U	0.9		U	1.0		U			
4,4'-DDE	µg/kg dw	16	-	-		--	--	0.94		U	0.95		U	0.96		U	0.97		U	1.0		U	0.9		U	1.0		U			
4,4'-DDD	µg/kg dw	9	-	-		--	--	0.94		U	0.95		U	0.96		U	0.97		U	1.0		U	0.9		U	1.0		U			
4,4'-DDT	µg/kg dw	12	-	-		--	--	0.94		U	0.95		U	0.96		U	0.97		U	1.0		U	0.9		U	1.0		U			
Total DDT(sum of 4,4'-DDD, 4,4'-DDE & 4,4'-DDT)	µg/kg dw		69	50		--	--	0.94		U	0.95		U	0.96		U	0.97		U	1.0		U	0.9		U	1.0		U			
trans-Chlordane	µg/kg dw	-	-	-		--	--	0.47		U	0.48		U	0.48		U	0.48		U	0.5		U	0.5		U	0.5		U			
cis-Chlordane	µg/kg dw	-	-	-		--	--	0.47		U	0.48		U	0.48		U	0.48		U	0.5		U	0.5		U	0.5		U			
oxy Chlordane	µg/kg dw							1.90		U	1.90		U	1.90		U	1.90		U	1.9		U	1.8		U	1.9		U			
cis-Nonachlor	µg/kg dw							1.90		U	1.90		U	1.90		U	1.90		U	1.9		U	1.8		U	1.9		U			
trans-Nonachlor	µg/kg dw							1.90		U	1.90		U	1.90		U	1.90		U	1.9		U	1.8		U	1.9		U			
Total chlordane	µg/kg dw	2.8	-	37		--	--	1.90		U	1.90		U	1.90		U	1.90		U	1.9		U	1.8		U	1.9		U			

Table 4. DMMP Characterization Results Summary for USACE Grays Harbor Navigation Project - DY2012 Characterization

Chemical Name	DMMP Guidelines				SMS Guidelines			AB-C22			AB-C23			SA-C24			SA-C25			SA-C26			SA-C27			SA-C28			Reference: GH-S7		
	Unit	SL	ML	BT	Unit	SQS	CSL	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ	Result	Result	VQ
Aroclor 1016	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1242	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1248	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1254	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1260	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1221	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1232	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1262	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Aroclor 1268	µg/kg dw	-	-	-		--	--	9.50		U	9.50		U	9.60		U	9.60		U	9.9		U	9.8		U	9.6		U			
Total PCBs	µg/kg dw	130	3100	-	mg/kg/OC	**12**	**65**	9.50	0.65	U	9.50	0.96	U	9.60	0.91	U	9.60	0.34	U	9.9	0.35	U	9.8	0.58	U	9.6	0.64	U			
Total PCBs	mg/kg OC	-	-	38				0.65			0.96			0.91			0.34			0.35			0.58			0.64					
Dioxin (TEQ: see Table 4 for congener specific results)	**ng/kg**							**1.58**			**0.84**			**1.37**			**1.35**			**7.76**			**1.21**			**1.26**			**4.03**		
Total Solids	%							76			71.3			77.9			71.7			42.5			67.6			71.1			38.8		
Total Volatile Solids	%							2.99			2.41			3.51			3.05			6.5			3			2.7			8.12		
Total Organic Carbon	%							1.46			0.99			1.06			2.84			2.8			1.7			1.5			2.26		
Total Ammonia	mg/kg							2.47			1.05			1.58			2.67			18.6			5.9			2.5			65.2		
Total Sulfides	mg/kg							55.3			1.27			1.32			2.92			3.6			1.5			1.6			2270		
Gravel	%							3.5			9.6			25.3			38.3			0.1			0.6			4.8			0.2		
Sand	%							88.2			86.5			70.0			49.2			40.2			87.1			89.2			12.3		
Silt	%							4.9			15.2			2.5			8.0			40.5			7.3			3.4			60.2		
Clay	%							3.5			11.4			2.2			4.5			19.0			4.9			2.6			27.4		
Fines (percent silt + clay)	%							8.4			26.6			4.7			12.5			59.5			12.2			6.0			87.5		
Eohaustorius estuarius hits: (NH, 2H, 1H)																															
Mytilus galloprovincialis hits: (NH, 2H, 1H)																															
Neanthes arenaceodentata hits: (NH, 2H, 1H)																															
Bioassay Determination: (Pass/Fail)								NA			NA			NA			NA			NA			NA			NA					
BTs exceeded: Y/N											N			N			N			N			N			N					
Bioaccumulation conducted: Y/N								N			N			N			N			N			N			N					
Bioaccumulation Determination: (P/F)								NA			NA			NA			NA			NA			NA			NA					
ML Rule exceeded: Y/N								N			N			N			N			N			N			N					
PSDDA Determination: (Suitable/Unsuitable)								**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**			**Suitable**					
DMMU Volume:	cy							60,000			60,000			60,000			60,000			60,000			60,000			60,000					
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)								L			L			L			L			L			L			L			L		
Mean Grab sampling depth (cm)	cm							10			10			10			10			10			10			10			10		
DMMU ID:								**AB-C22**			**AB-C23**			**SA-C24**			**SA-C25**			**SA-C26**			**SA-C27**			**SA-C28**			**Reference: GH-S7**		

Legend:
VQ = Validation Qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and/or QC parameter out of Control limits
NA = not analyzed
SL = screening level
BT = bioaccumulation trigger
ML = maximum level
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
DMMP = dredged material management program
DMMU = dredged material management unit
dw = dry weight
ww = wet weight
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
OC = organic carbon normalized
PCBs = polychlorinated biphenyls
RL = reporting limit
SVOCs = semi-volatile organic compounds
NH = No Hit; 2H = Two Hit Failure; 1H = One Hit Failure
BU = Suitable for Beneficial Use
Denotes DMMUs subject to Confirmatory Bioassay testing

Table 5. Dioxin/furan Summary for USACE Grays Harbor Navigation DY2012 DMMP Characterization

Analyte	WHO (05) TEF	XR-C1			XR-C2			XR-C3			XR-C4			XR-C5			XR-C6			NC-C7			NC-C8		
		ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ
2,3,7,8-TCDD	1	0.33	U	0.165	0.43	U	0.215	0.618	U	0.309	0.443	U	0.2215	0.487	U	0.2435	1.23	J	1.23	0.301	U	0.1505	1.29		1.29
1,2,3,7,8-PeCDD	1	0.44	J	0.44	0.51	U	0.255	0.814	J	0.814	0.536	J	0.536	0.691	J	0.691	1.5	J	1.5	0.354	J	0.354	1.57		1.57
1,2,3,4,7,8-HxCDD	0.1	0.15	U	0.0075	0.18	U	0.009	0.149	U	0.00745	0.116	U	0.0058	0.125	U	0.00625	0.313	U	0.01565	0.0899	U	0.0007035	0.334	J	0.0334
1,2,3,6,7,8-HxCDD	0.1	0.55	J	0.055	0.56	J	0.056	0.562	U	0.0281	0.444	J	0.0444	0.651	J	0.0651	1.37	J	0.137	0.342	J	0.0342	1.14	J	0.114
1,2,3,7,8,9-HxCDD	0.1	1.15	J	0.115	1.22	J	0.122	1.84	J	0.184	1.19	J	0.119	1.29	J	0.129	3.11	J	0.311	0.688	J	0.0688	3.45		0.345
1,2,3,4,6,7,8-HpCDD	0.01	6.4		0.064	6.34		0.0634	7.72		0.0772	5.24		0.0524	8.1		0.081	15.3	J	0.153	3.24		0.0324	11		0.11
OCDD	0.0003	33.3		0.00999	37.6		0.01128	52		0.0156	30.6		0.00918	46.8		0.01404	94.6	J	0.02838	19.9		0.00597	59.6		0.01788
2,3,7,8-TCDF	0.1	0.25	U	0.0125	0.26	U	0.013	0.194	J	0.0194	0.251	J	0.0251	0.293	J	0.0293	0.513	J	0.0513	0.176	U	0.0045144	0.187	U	0.00935
1,2,3,7,8-PeCDF	0.03	0.06	U	0.0009	0.04	U	0.0006	0.0514	U	0.000771	0.0252	U	0.000378	0.067	J	0.00201	0.0978	U	0.001467	0.0156	U	1.144E-05	0.0398	U	0.000597
2,3,4,7,8-PeCDF	0.3	0.11	U	0.0165	0.09	U	0.0135	0.0968	U	0.01452	0.0839	U	0.012585	0.131	U	0.01965	0.222	U	0.0333	0.0762	U	0.0012687	0.0815	U	0.012225
1,2,3,4,7,8-HxCDF	0.1	0.15	J	0.015	0.08	U	0.004	0.124	U	0.0062	0.0964	U	0.00482	0.158	J	0.0158	0.337	J	0.0337	0.0411	U	0.0006925	0.133	J	0.0133
1,2,3,6,7,8-HxCDF	0.1	0.12	J	0.012	0.08	U	0.004	0.112	J	0.0112	0.0813	U	0.004065	0.12	U	0.006	0.25	J	0.025	0.043	U	0.0005375	0.0915	U	0.004575
2,3,4,6,7,8-HxCDF	0.1	0.13	J	0.013	0.07	U	0.0035	0.0964	J	0.00964	0.0829	U	0.004145	0.161	J	0.0161	0.405	J	0.0405	0.0841	J	0.00841	0.177	J	0.0177
1,2,3,7,8,9-HxCDF	0.1	0.04	U	0.002	0.04	U	0.002	0.0397	U	0.001985	0.0477	U	0.002385	0.0463	U	0.002315	0.0898	U	0.00449	0.0395	U	8.868E-05	0.0517	J	0.00517
1,2,3,4,6,7,8-HpCDF	0.01	2.17		0.0217	2.55		0.0255	2.58		0.0258	1.89	J	0.0189	3.69		0.0369	7.01	J	0.0701	1.54	J	0.0154	2.97		0.0297
1,2,3,4,7,8,9-HpCDF	0.01	0.06	U	0.0003	0.09	J	0.0009	0.0865	U	0.0004325	0.0678	U	0.000339	0.0759	U	0.0003795	0.18	U	0.0009	0.0332	U	1.494E-05	0.109	U	0.000545
OCDF	0.0003	2.24	J	0.000672	2.59	J	0.000777	4.36	J	0.001308	2.49	J	0.000747	4.02	J	0.001206	7.73	J	0.002319	1.42	J	0.000426	4.83	J	0.001449
Total TEQ (u = 1/2):				0.95			0.80			1.53			1.06			1.36			3.64			0.68			3.57
Total TEQ (u=0):				0.75			0.28			1.16			0.81			1.08			3.58			0.52			3.55
TOC (%)				5.0			8.8			1.4			2.0			1.5			1.2			0.8			1.8

Legend:
LQ = laboratory qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and/or QC parameter out of Control limits
XR = Crossover Reach
NC = North Channel
HO = Hoquium Channel
CP = Cow Point Reach
AB = Aberdeen Reach
SA = South Aberdeen

Table 5. Dioxin/furan Summary for USACE Grays Harbor Navigation DY2012 DMMP Characterization

Analyte	WHO (05) TEF	NC-C9			NC-C10			NC-C11			HO-C12			HO-C13			HO-C14			HO-C15			HO-C16		
		ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ
2,3,7,8-TCDD	1	1.06		1.06	1.63		1.63	0.97	J	0.97	0.96	U	0.48	1.35	U	0.675	1.48	U	0.74	1.07		1.07	4.14		4.14
1,2,3,7,8-PeCDD	1	1.2		1.2	1.89		1.89	0.928	J	0.928	1.05	U	0.525	1.81		1.81	1.98		1.98	1.21		1.21	5.34		5.34
1,2,3,4,7,8-HxCDD	0.1	0.302	J	0.0302	0.555	J	0.0555	0.173	U	0.00865	0.3	U	0.015	0.48	J	0.048	0.71	J	0.071	0.405	U	0.02025	1.01	J	0.101
1,2,3,6,7,8-HxCDD	0.1	0.899	J	0.0899	1.47	U	0.0735	0.807	J	0.0807	0.91	U	0.0455	1.82	J	0.182	2.29		0.229	1.47	J	0.147	3.37		0.337
1,2,3,7,8,9-HxCDD	0.1	2.4		0.24	4.93		0.493	2.02		0.202	2.54		0.254	4.03		0.403	5.51		0.551	3.35		0.335	12.8		1.28
1,2,3,4,6,7,8-HpCDD	0.01	10.8		0.108	17		0.17	8.19		0.0819	10.4		0.104	18.7		0.187	26.7		0.267	15.7		0.157	34.9		0.349
OCDD	0.0003	66.8		0.02004	96.8		0.02904	49.7		0.01491	61.7		0.01851	114		0.0342	196		0.0588	96.9		0.02907	214		0.0642
2,3,7,8-TCDF	0.1	0.29	J	0.029	0.335	J	0.0335	0.227	U	0.01135	0.34	J	0.034	0.33	U	0.0165	0.68	J	0.068	0.464	J	0.0464	0.388	J	0.0388
1,2,3,7,8-PeCDF	0.03	0.112	J	0.00336	0.0912	U	0.001368	0.112	U	0.00168	0.07	U	0.00105	0.11	U	0.00165	0.15	U	0.00225	0.103	J	0.00309	0.134	U	0.00201
2,3,4,7,8-PeCDF	0.3	0.0519	U	0.007785	0.168	U	0.0252	0.129	U	0.01935	0.13	J	0.039	0.21	U	0.0315	0.25	J	0.075	0.178	J	0.0534	0.226	J	0.0678
1,2,3,4,7,8-HxCDF	0.1	0.144	U	0.0072	0.234	U	0.0117	0.189	U	0.00945	0.13	U	0.0065	0.3	U	0.015	0.42	U	0.021	0.318	J	0.0318	0.284	U	0.0142
1,2,3,6,7,8-HxCDF	0.1	0.152	U	0.0076	0.174	U	0.0087	0.151	J	0.0151	0.12	U	0.006	0.28	J	0.028	0.33	U	0.0165	0.259	J	0.0259	0.202	U	0.0101
2,3,4,6,7,8-HxCDF	0.1	0.226	J	0.0226	0.299	U	0.01495	0.175	J	0.0175	0.05	U	0.0025	0.33	J	0.033	0.49	J	0.049	0.338	U	0.0169	0.0795	U	0.003975
1,2,3,7,8,9-HxCDF	0.1	0.0751	U	0.003755	0.0278	U	0.00139	0.0526	U	0.00263	0.05	U	0.0025	0.09	U	0.0045	0.06	U	0.003	0.053	U	0.00265	0.0574	U	0.00287
1,2,3,4,6,7,8-HpCDF	0.01	4.14		0.0414	5.54		0.0554	3.54		0.0354	3.9		0.039	13.3		0.133	9.83		0.0983	6.93		0.0693	7.11		0.0711
1,2,3,4,7,8,9-HpCDF	0.01	0.182	U	0.00091	0.208	J	0.00208	0.0996	U	0.000498	0.07	U	0.00035	0.33	U	0.00165	0.35	U	0.00175	0.259	J	0.00259	0.412	J	0.00412
OCDF	0.0003	5.51		0.001653	7.45		0.002235	3.83	J	0.001149	4.95	U	0.0007425	12.2		0.00366	14.2		0.00426	8.7		0.00261	22.3		0.00669
Total TEQ (u = 1/2):				2.87			4.50			2.40			1.57			3.61			4.24			3.22			11.83
Total TEQ (u=0):				2.85			4.36			2.35			0.49			2.86			3.45			3.18			11.80
TOC (%)				1.6			1.7			1.2			1.3			1.5			1.8			1.4			2.4

Legend:
LQ = laboratory qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and
XR = Crossover Reach
NC = North Channel
HO = Hoquium Channel
CP = Cow Point Reach
AB = Aberdeen Reach
SA = South Aberdeen

Table 5. Dioxin/furan Summary for USACE Grays Harbor Navigation DY2012 DMMP Characterization

Analyte	WHO (05) TEF	HO-C17			CP-C18			CP-C19			CP-C20			AB-C21			AB-C22			AB-C23		
		ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ
2,3,7,8-TCDD	1	1.23		1.23	1.89		1.89	3.13		3.13	3.03		3.03	2.22		2.22	0.63	U	0.315	0.33	U	0.165
1,2,3,7,8-PeCDD	1	1.58		1.58	2.59		2.59	4.07		4.07	4.15		4.15	2.82		2.82	0.8		0.8	0.42	J	0.42
1,2,3,4,7,8-HxCDD	0.1	0.442	J	0.0442	0.64	U	0.032	1.33	J	0.133	1.25	J	0.125	0.94	J	0.094	0.27	U	0.0135	0.14	U	0.007
1,2,3,6,7,8-HxCDD	0.1	1.62	J	0.162	2.74		0.274	4.56		0.456	4.74		0.474	2.95		0.295	0.66	J	0.066	0.48	U	0.024
1,2,3,7,8,9-HxCDD	0.1	3.73		0.373	6.31		0.631	10.1		1.01	10.5		1.05	7.36		0.736	1.68	J	0.168	0.95	J	0.095
1,2,3,4,6,7,8-HpCDD	0.01	17.8		0.178	34.5		0.345	63.3		0.633	64.9		0.649	38.2		0.382	6.34		0.0634	6.64		0.0664
OCDD	0.0003	117		0.0351	224		0.0672	469		0.1407	428		0.1284	245		0.0735	36.7		0.01101	36.2		0.01086
2,3,7,8-TCDF	0.1	0.577	J	0.0577	0.8	J	0.08	1.49		0.149	1.54		0.154	0.92	J	0.092	0.18	J	0.018	0.08	J	0.008
1,2,3,7,8-PeCDF	0.03	0.12	J	0.0036	0.23	J	0.0069	0.36	J	0.0108	0.4	U	0.006	0.26	U	0.0039	0.17	J	0.0051	0.05	U	0.00075
2,3,4,7,8-PeCDF	0.3	0.198	U	0.0297	0.31	J	0.093	0.52	J	0.156	0.61	J	0.183	0.349	J	0.1047	0.16	U	0.024	0.05	U	0.0075
1,2,3,4,7,8-HxCDF	0.1	0.374	J	0.0374	0.6	J	0.06	0.99	J	0.099	1.31	J	0.131	0.72	J	0.072	0.21	J	0.021	0.13	J	0.013
1,2,3,6,7,8-HxCDF	0.1	0.29	J	0.029	0.45	J	0.045	0.88	J	0.088	0.89	J	0.089	0.58	J	0.058	0.22	J	0.022	0.04	U	0.002
2,3,4,6,7,8-HxCDF	0.1	0.37	U	0.0185	0.67	J	0.067	1.15	J	0.115	1.27	J	0.127	0.79	J	0.079	0.22	U	0.011	0.05	U	0.0025
1,2,3,7,8,9-HxCDF	0.1	0.102	U	0.0051	0.14	U	0.007	0.26	U	0.013	0.36	U	0.018	0.341	J	0.0341	0.18	J	0.018	0.03	J	0.003
1,2,3,4,6,7,8-HpCDF	0.01	7.65		0.0765	13.7		0.137	25.7		0.257	26.2		0.262	14.8		0.148	2.02		0.0202	1.15	J	0.0115
1,2,3,4,7,8,9-HpCDF	0.01	0.3	U	0.0015	0.56	J	0.0056	0.96	J	0.0096	1.02	J	0.0102	0.73	J	0.0073	0.3	J	0.003	0.07	J	0.007
OCDF	0.0003	8.39		0.002517	21		0.0063	42.2		0.01266	37.8		0.01134	20.8		0.00624	3.96	J	0.001188	1.01	U	0.0001515
Total TEQ (u = 1/2):				3.86			6.34			10.48			10.60			7.23			1.58			0.84
Total TEQ (u=0):				3.81			6.30			10.47			10.57			7.22			1.22			0.63
TOC (%)				2.7			1.8			2.5			2.8			2.2			1.5			1.0

Legend:
LQ = laboratory qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and
XR = Crossover Reach
NC = North Channel
HO = Hoquium Channel
CP = Cow Point Reach
AB = Aberdeen Reach
SA = South Aberdeen

Table 5. Dioxin/furan Summary for USACE Grays Harbor Navigation DY2012 DMMP Characterization

Analyte	WHO (05) TEF	SA-C24			SA-C25			SA-C26			SA-C27			SA-C28			Reference: GH-S7			Puget Sound SRM-111511			SRM Acceptance Limits		
		ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw	LQ	TEQ	ng/kg-dw (AVG)	TEQ	In/Out (Low/High)
2,3,7,8-TCDD	1	0.489	J	0.489	0.478	U	0.239	2.67		2.67	0.657	U	0.3285	0.509	U	0.2545	1.01		1.01	1.12		1.12000	1.05	1.05	In (.525/1.57)
1,2,3,7,8-PeCDD	1	0.58	J	0.58	0.71	J	0.71	3.04		3.04	0.77	U	0.385	0.747	J	0.747	1.72		1.72	1.23		1.23000	1.08	1.08	In (.542/1.63)
1,2,3,4,7,8-HxCDD	0.1	0.12	J	0.012	0.18	J	0.018	0.804	J	0.0804	0.247	J	0.0247	0.092	U	0.0046	0.634	U	0.0317	1.64	J	0.16400	1.59	0.159	In (0.797/2.39)
1,2,3,6,7,8-HxCDD	0.1	0.48	J	0.048	0.6	J	0.06	2.8		0.28	0.788	J	0.0788	0.461	U	0.02305	1.81	J	0.181	4.21		0.42100	3.88	0.388	In (1.94/5.82)
1,2,3,7,8,9-HxCDD	0.1	1.27	J	0.127	1.56	J	0.156	7.18		0.718	2.1		0.21	1.24	J	0.124	3.62		0.362	3.07		0.30700	3.04	0.304	In (1.52/4.55)
1,2,3,4,6,7,8-HpCDD	0.01	4.47		0.0447	6.75		0.0675	35.3		0.353	7.79		0.0779	4.97		0.0497	21		0.21	117		1.17000	90.6	0.906	In (45.3/136)
OCDD	0.0003	26.2		0.00786	39.1		0.01173	240		0.072	44		0.0132	28.2	J	0.00846	115		0.0345	1150		0.34500	811	0.2433	In (406/1217)
2,3,7,8-TCDF	0.1	0.139	U	0.00695	0.162	J	0.0162	0.774	J	0.0774	0.189	U	0.00945	0.119	U	0.00595	0.836	J	0.0836	0.94	J	0.09400	1.11	0.111	In (0.557/1.67)
1,2,3,7,8-PeCDF	0.03	0.0451	U	0.0006765	0.0526	U	0.000789	0.242	J	0.00726	0.0498	U	0.000747	0.0614	U	0.000921	0.442	U	0.0001989	1.14	J	0.03420	1.23	0.0369	In (0.613/1.84)
2,3,4,7,8-PeCDF	0.3	0.0824	J	0.02472	0.09	U	0.0135	0.354	J	0.1062	0.119	U	0.01785	0.0475	U	0.007125	0.466	J	0.1398	0.81	J	0.24300	1.07	0.321	In (0.533/1.60)
1,2,3,4,7,8-HxCDF	0.1	0.0726	J	0.00726	0.121	J	0.0121	0.672	J	0.0672	0.111	J	0.0111	0.103	U	0.00515	0.588	J	0.0588	2.93		0.29300	3.02	0.302	In (1.51/4.53)
1,2,3,6,7,8-HxCDF	0.1	0.0608	J	0.00608	0.0877	U	0.004385	0.488	J	0.0488	0.0915	J	0.00915	0.098	U	0.0049	0.499	J	0.0499	1.03	J	0.10300	1.09	0.109	In (.545/1.64)
2,3,4,6,7,8-HxCDF	0.1	0.0707	U	0.003535	0.17	J	0.017	0.706	J	0.0706	0.135	J	0.0135	0.104	U	0.0052	0.607	J	0.0607	2.1		0.21000	1.83	0.183	In (.917/2.75)
1,2,3,7,8,9-HxCDF	0.1	0.03	U	0.0015	0.0448	U	0.00224	0.226	J	0.0226	0.0378	U	0.00189	0.138	U	0.0069	0.266	J	0.0266	0.583	J	0.05830	0.511	0.0511	In (.255/0.77)
1,2,3,4,6,7,8-HpCDF	0.01	1.3	J	0.013	2.08	J	0.0208	13.3		0.133	2.47		0.0247	1.37	J	0.0137	7.27		0.0727	19.8		0.19800	18.7	0.187	In (9.36/28.1)
1,2,3,4,7,8,9-HpCDF	0.01	0.06	U	0.0003	0.0955	J	0.000955	0.49	J	0.0049	0.14	U	0.0007	0.0934	U	0.000467	0.374	J	0.00374	1.62	J	0.01620	1.63	0.0163	In (.815/2.44)
OCDF	0.0003	1.68	J	0.000504	2.65		0.000795	19.7		0.00591	3.05	J	0.000915	1.9	U	0.000285	8.76		0.002628	73		0.02190	58.4	0.01752	In (29.2/87.6)
Total TEQ (u = 1/2):				1.37			1.35			7.76			1.21			1.26			4.05			6.029		5.465	
Total TEQ (u=0):				1.36			1.09			7.76			0.46			0.94			4.02			6.029		5.465	
TOC (%)				1.1			2.8			2.8			1.7			1.5			2.26						

Mean (U = 1/2): 3.63
Mean (U = 0): 3.39

Legend:
LQ = laboratory qualifier
U = undetected at reporting limit
J = Estimated value, less than reporting limit, and
XR = Crossover Reach
NC = North Channel
HO = Hoquium Channel
CP = Cow Point Reach
AB = Aberdeen Reach
SA = South Aberdeen

Table 6. Biological (confirmatory testing) History – Grays Harbor O&M.

Date	Crossover	North Channel	Hoquiam	Cow Point	Aberdeen	S. Aberdeen
1992				2		
1994			2			
1996				2		
1998	1					1
2001				1		1
2005				1	1	
2008		1	1			
2009					1	1
2011			1	1		
2012*		1			1	
Totals:	**1**	**2**	**4**	**7**	**3**	**3**

*Current characterization

15. Grays Harbor disposal sites are dispersive sites, which under DMMP guidelines require more conservative bioassay data interpretation than non-dispersive sites, due to the inability to monitor disposed dredged material over time.

16. Protocol Adjustments. The Corps chose to evaluate protocol adjustments to the sediment larval bioassay and the *Neanthes* growth bioassay by running side-by-side tests with project sediments. The DMMP recommended this step to evaluate methods to reduce false positive responses. Protocol adjustments (SMARM 2010) were:

    Bivalve Larval Development test: The sediment larval bioassay was terminated by two different methods, with data from both methods being reported. The first method was the usual PSEP termination procedure of decanting and subsampling the overlying test water with no agitation. The second termination procedure ("resuspension") specifies agitation of overlying water and sediment, with subsequent settling for approximately 24 hours prior to decanting and subsampling the overlying test water.

    Neanthes Growth test: The *Neanthes* growth bioassay breakdown procedure was modified as follows: after recording dry weight of worms at the end of the test period, the dried material was subjected to oxidation in a muffle oven to determine the ash free dry weight (AFDW). Both dry weight and AFDW were reported in the final report.

17. Bioassay Test Performance. Negative control and reference sediments met DMMP performance criteria for both the larval and amphipod tests (Table 7). For the *Neanthes* growth test, the mortality performance standard was met for both the control and reference sediments, as was the mean individual growth (MIG) rate performance standard for the negative control. The reference sample failed to meet the mean individual growth rate standard relative to control with the standard protocol, but met the standard with the AFDW protocol adjustment. The DMMP agencies accepted the AFDW protocol adjustment as valid for evaluating the *Neanthes* reference sediment performance using best professional judgment (BPJ).

Table 7. Bioassay Test Performance Summary

Bioassay		Negative Control Performance	Reference Sediment Performance
Amphipod Mortality: (*Eohaustorius estuarius*)	Standard	$M_C \leq 10\%$	$M_R - M_C \leq 20\%$
	Actual	$M_C = 0\%$	$M_R - M_C = 1.8\%$
Bivalve Larval: (*Mytilus galloprovincialis*)	Standard	$M_R - M_C \geq 70\%$	$N_R/N_C \geq 0.65\%$
	Actual	$M_R - M_C = 91.7\%$	$N_R/N_C = 0.926\%$
Juvenile Neanthes Growth: (*Neanthes arenaceodenta*)	Standard	$M_C \leq 10\%$; $MIG_C \geq 0.38$	$M_R < 20\%$ & $MIG_R/MIG_C > 0.80\%$
	Actual	$M_C = 0\%$; $MIG_C = 0.66$	$M_R = 0\%$; $MIG_R/MIG_C = 0.72\%$ AFDW = 0.91%

M = mortality, N = normal larvae, MIG = mean individual growth rate mg/individual/day), AFDW = ash free dry weight
Subscripts: R = reference sediment, C = negative control

Table 8. Amphipod 10-day Mortality Bioassay*.

Station	% Fines	% Clay	Amphipod (*E. estuarius*) Mortality (%)		DMMP Pass/Fail (dispersive guidelines)
			Mean	sd	
Control	--	--	**0.0**	**0**	**n/a**
Reference: GH-S7	**87.5**	**27.4**	**1.8**	**0.8**	**n/a**
NC10	**39.2**	**13.8**	**1.0**	**1.2**	**Pass**
AB21	**60.3**	**17.6**	**0.0**	**0**	**Pass**

***$M_T - M_C > 20\%$;** and **M_T vs N_RSS ($p = 0.05$)**, and **$M_T - M_R > 10\%$**
n/a = not applicable, R = reference sediment, C = negative control sediment, T = test sediment;
SS = statistically significant

Reference toxicant: Ammonium Chloride, 96 hr survival (EC/LC50): 183 mg NH_3-N/L;
Lab Historical Control Range (Mean ± 2SD): 44.9 – 297 mg NH_3-N/L

Table 9. Bivalve Larval Bioassay Results Summary*

Station	% Fines	% Clay	Sediment Larval (*M. galloprovincialis*) NCMA (%)		Re-suspension (*M. galloprovincialis*) NCMA (%)		DMMP Pass/Fail*
			Mean	sd	Mean	sd	
Control	--	--	**0.0**	**8.9**	**0.0**	**4.5**	**n/a**
Reference: GHS7	**87.5**	**27.4**	**7.4**	**5.4**	**8.2**	**4.6**	**n/a**
NC10	**39.2**	**13.8**	**1.2**	**8.8**	**2.6**	**4.6**	**Pass**
AB21	**60.3**	**17.6**	**0.6**	**6.2**	**8.3**	**5.7**	**Pass**

* **$N_T \div N_C < 0.80$**, and **N_T/N_C vs. N_R/N_C SS ($p = 0.10$)**, and **$N_R/N_C - N_T/N_C > 0.15$**
Dispersive Guidelines; NCMA =normalized combined percent mortality; n/a = not applicable,
R = reference sediment, C = negative control, T = test sediment, N = normal larvae,
SS = statistically significant

Reference toxicant: Copper Sulfate Normality (EC/LC50): 10.8 µg/L;
Lab Historical Control Range (mean ± 2SD): 9.42 – 12.3 µg/L

Table 10. *Neanthes* Juvenile Growth Bioassay Summary*.

Station	% Fines	% Clay	% Mortality	Conventional Protocol (Dry weight)				Test Protocol (Ash-Free-Dry Wgt.)				DMMP Pass/Fail*
				MIG (mg/ind/day)		MIG % of Cont.	MIG % of Ref.	MIG (mg/ind/day)		MIG % of Cont.	MIG % of Ref.	
				Mean	Sd			Mean	Sd			
Control	--	--	0	0.99	0.11	--	--	0.66	0.08	--	--	n/a
Reference: GHS7	87.5	27.4	0	0.71	0.11	0.72	--	0.60	0.09	0.91	--	n/a
NC10	39.2	13.8	0	0.68	0.12	0.69	0.96	0.56	0.11	0.85	0.93	Pass
AB21	60.3	17.6	0	0.62	0.09	0.63	0.87	0.53	0.07	0.80	0.88	Pass

* $MIG_T \div MIG_C < 0.80$, and MIG_T vs. MIG_R SS ($p = 0.05$), and $MIG_T/MIG_R < 0.70$
Dispersive Guidelines; n/a = not applicable, MIG = mean individual growth rate (mg/ind/day), R = reference sediment, C = negative control, T = test sediment, SS = statistically significant

Reference toxicant: Ammonium Chloride, 96 hr survival (EC/LC_{50}): 242 mg NH_3-N/L; Lab Historical Control Range (mean ± 2SD): 137-273 mg NH_3-N/L

18. Bioassay Testing Results. The amphipod (Table 8) and bivalve larval (Table 9) bioassays both passed dispersive guidelines with no hits in comparison to reference sediment and negative control. The resuspension protocol for the bivalve larval test did not appreciably alter the test results, and both sets of results passed DMMP dispersive guidelines. The *Neanthes* results are displayed in Table 10. Comparison of test results with reference sediment using the AFDW protocol adjustment indicate the *Neanthes* results pass the DMMP dispersive guidelines compared to both reference sediments and control sediments.

19. Past problems with the *Neanthes* reference sediment not meeting performance standards using the standard protocol has been an issue over multiple years of testing of material for the federal project in Grays Harbor. Application of the AFDW protocol adjustment appears to remedy the reference performance problem, which is the result of differential retention of control and reference sediments in the guts of exposed worms. In this case, the control sediment generally contained much coarser grain sizes compared to the reference sediment.

20. Suitability for Unconfined Open-Water Disposal and Beneficial Use. In summary, the testing results for the 28 DMMUs (including all DMMP COCs and dioxins/furans), and after comparison to DMMP and SMS guidelines, and confirmatory toxicity testing of two DMMUs, indicate that all 1.65 million cubic yards of material characterized is suitable for open-water disposal at the South Jetty and Point Chehalis dispersive sites. Based on agency best professional judgment regarding acceptable dioxin concentrations in beneficial use material, only exclusionary material from the Outer Reaches (including Bar, Entrance, Point Chehalis, and South Reaches), and material from the first five DMMU's from Crossover Reach (XR-C1 through XR-C5) may be used at approved beneficial use (nearshore and onshore) sites.

21. This memorandum documents the suitability determination for the characterized dredged material at the Grays Harbor O&M project for unconfined open-water disposal at Grays Harbor dispersive disposal sites and at appropriate beneficial use locations. 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.

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED FEDERAL OPERATION AND MAINTENANCE DREDGED MATERIAL FROM GRAYS HARBOR, WASHINGTON (PN: CENWS-OD-TS-NS-38) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT, FOR OPEN-WATER DISPOSAL AT THE SOUTH JETTY AND POINT CHEHALIS DISPERSIVE DISPOSAL SITES, AND AT THE SOUTH BEACH AND HALF MOON BAY BENEFICIAL USE SITES.

Concur:

2/9/12
Date

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

2/9/12
Date

Justine Barton, Environmental Protection Agency

02/09/2012
Date

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

2/9/12
Date

Celia Barton, Washington Department of Natural Resources

Copied furnished:
John Hicks, Chief of Navigation
Elizabeth Chien, Navigation Project Manager
Justine Barton, EPA
Laura Inouye, Ph.D. Department of Ecology
Celia Barton, DNR
DMMO file

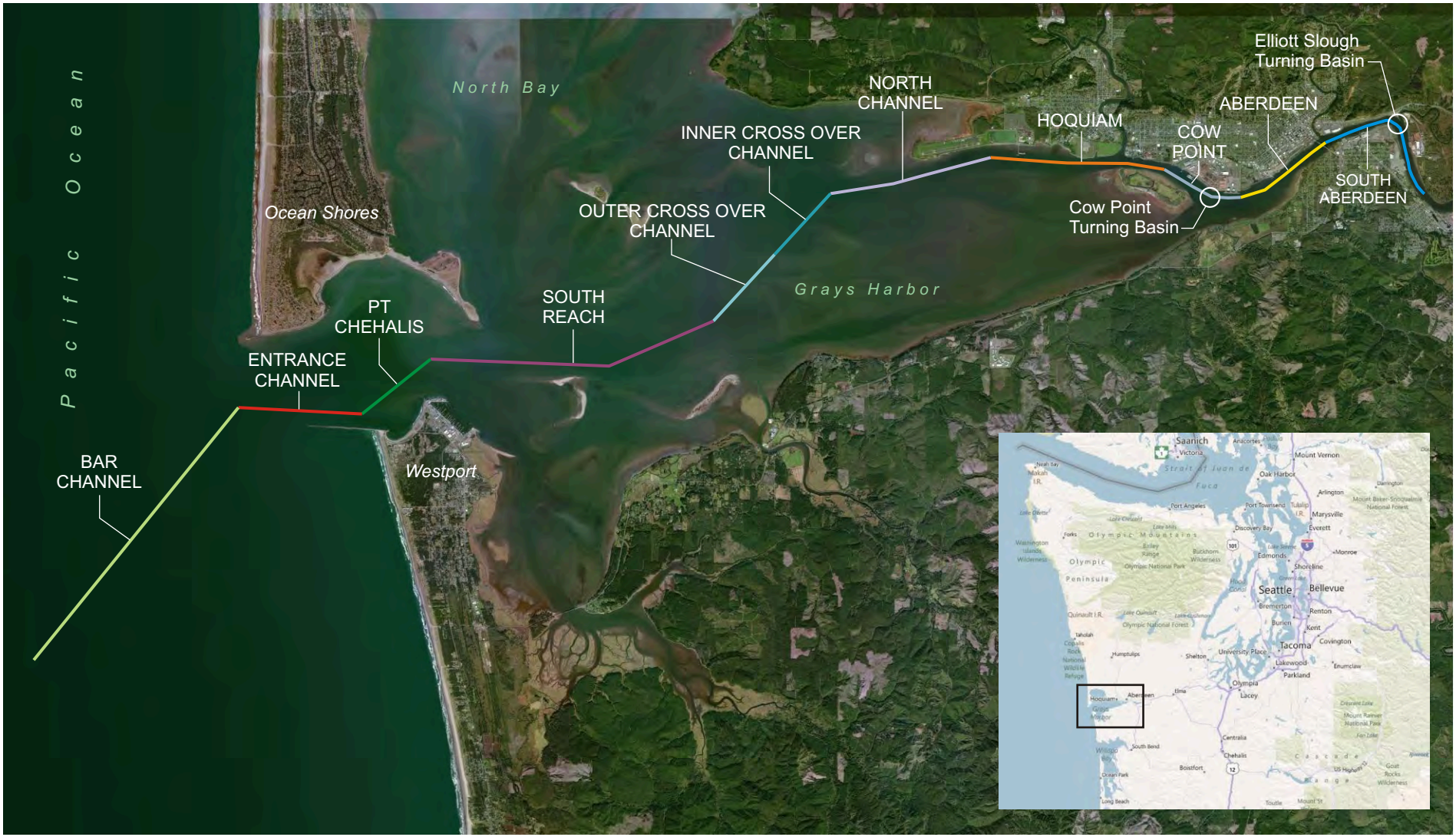

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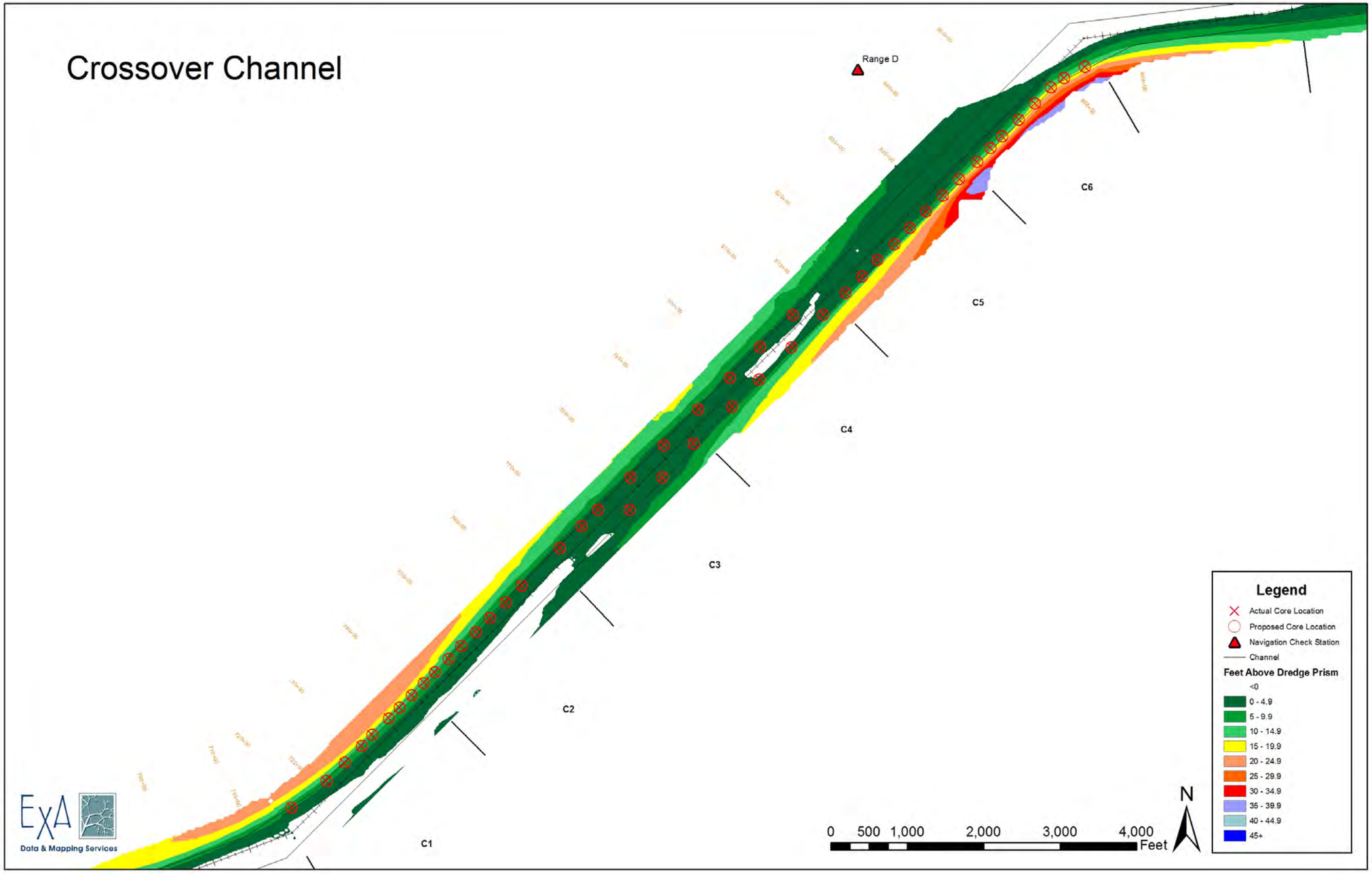
Figure 1. Grays Harbor Federal Navigation Channel Reaches



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Grays Harbor, WA

Figure 2. . Crossover Reach Dredged Material Management Units. Planned and Actual Sampling Locations

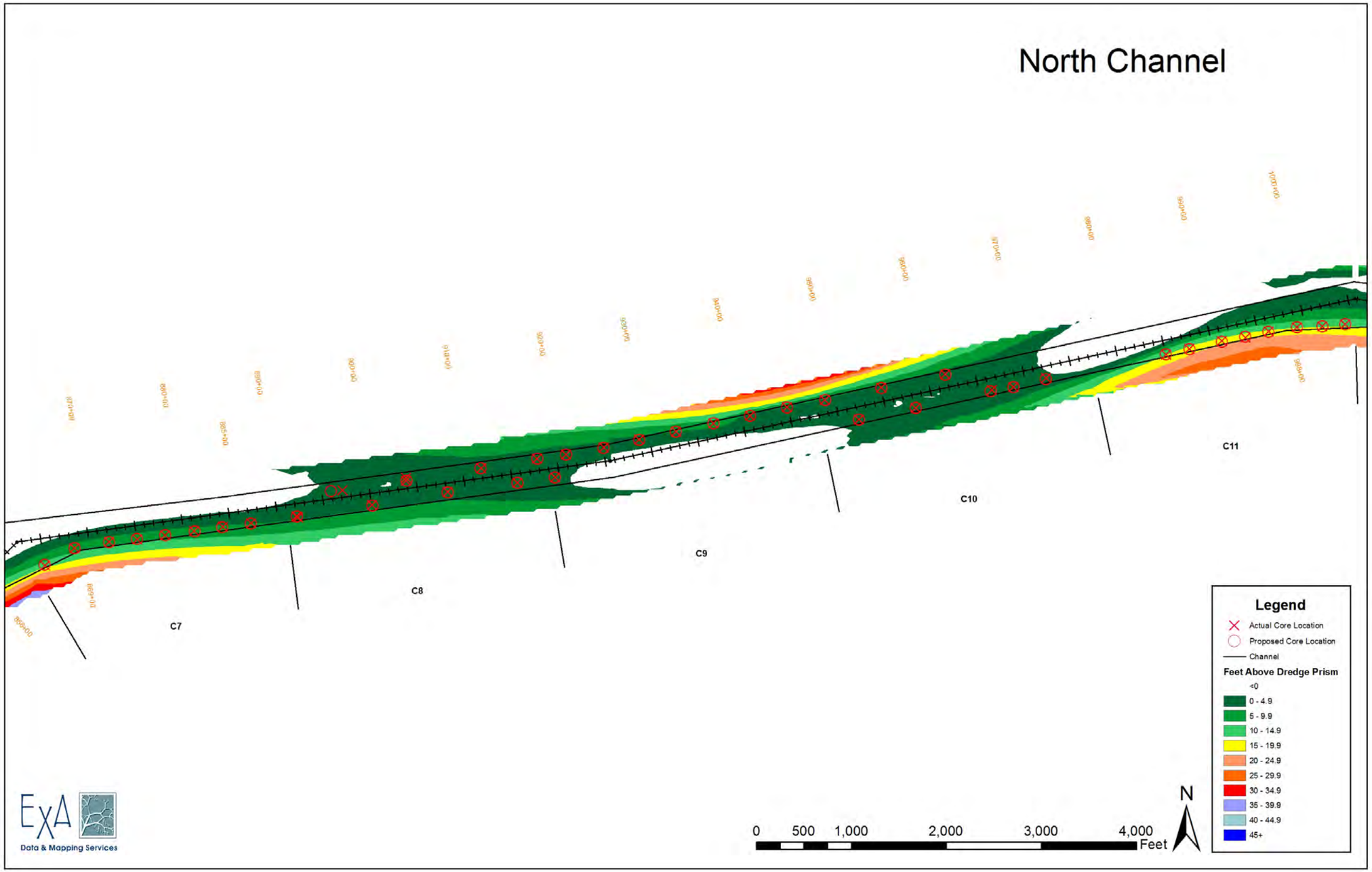

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Figure 3. North Channel ReachDredged Material Management Units. Planned and Actual Sampling Locations

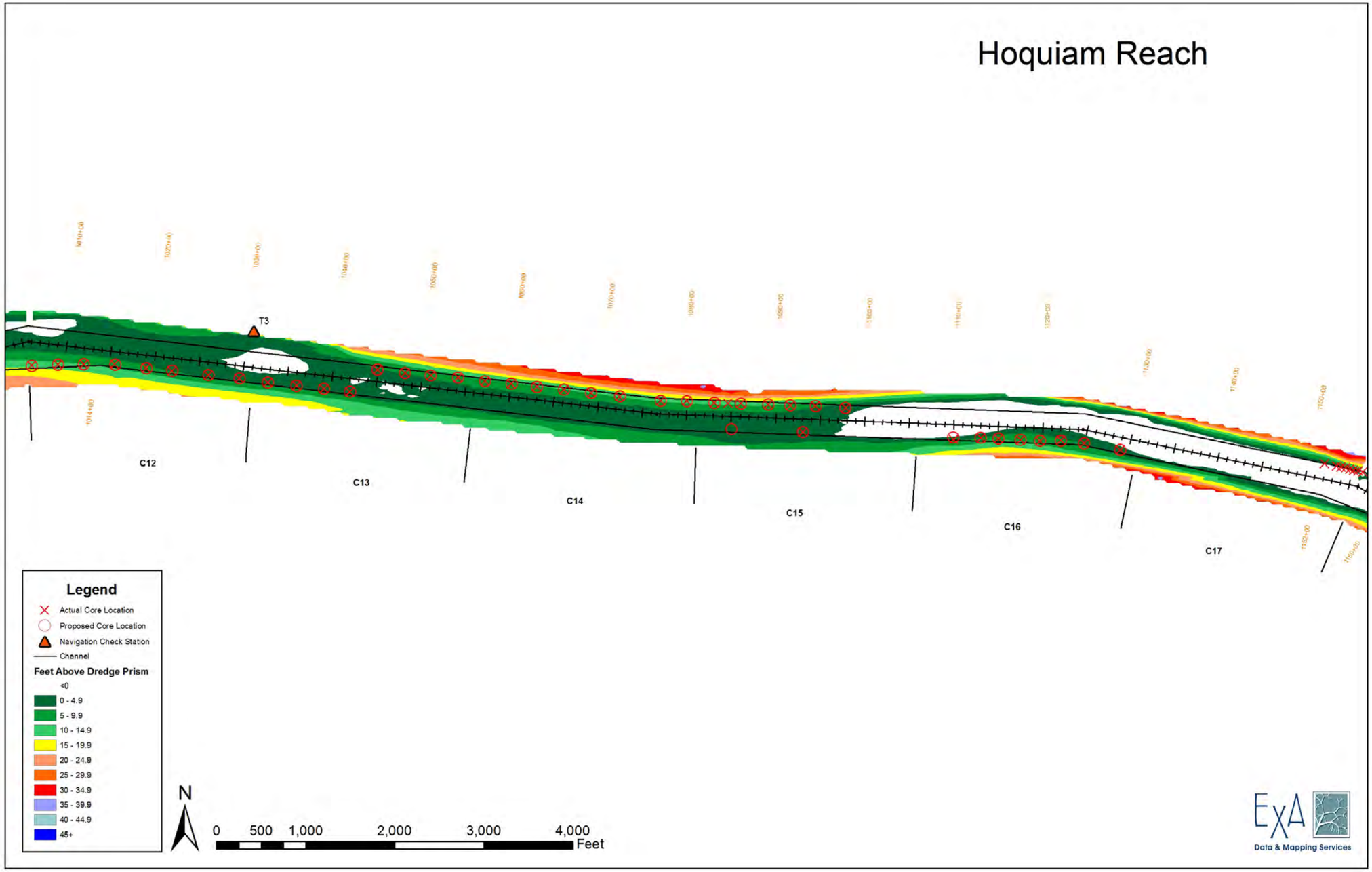

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Figure 4. . Hoquiam Reach Dredged Material Management Units. Planned and Actual Sampling Locations

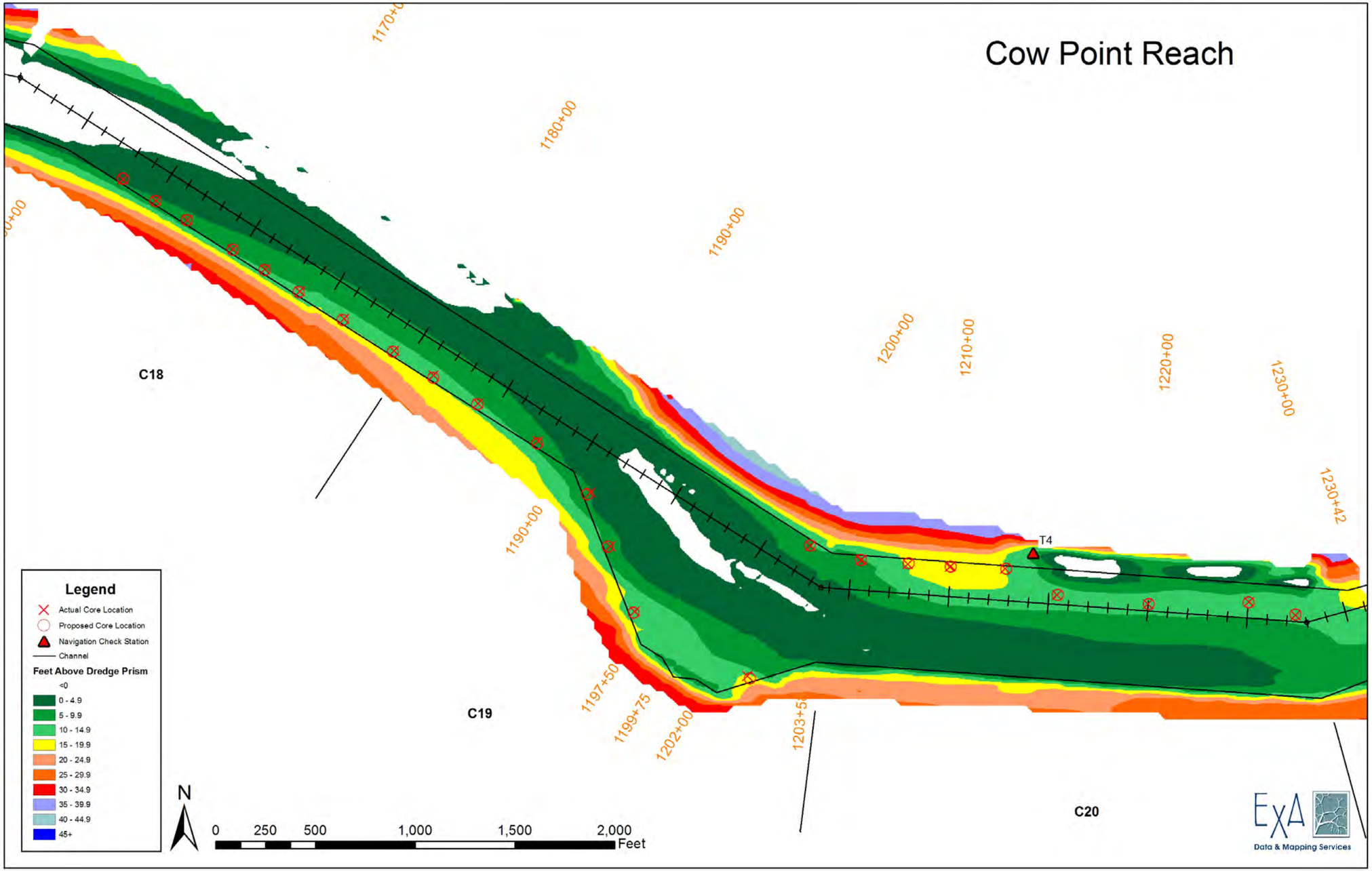

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Figure 5. . Cow Point Reach Dredged Material Management Units. Planned and Actual Sampling Locations

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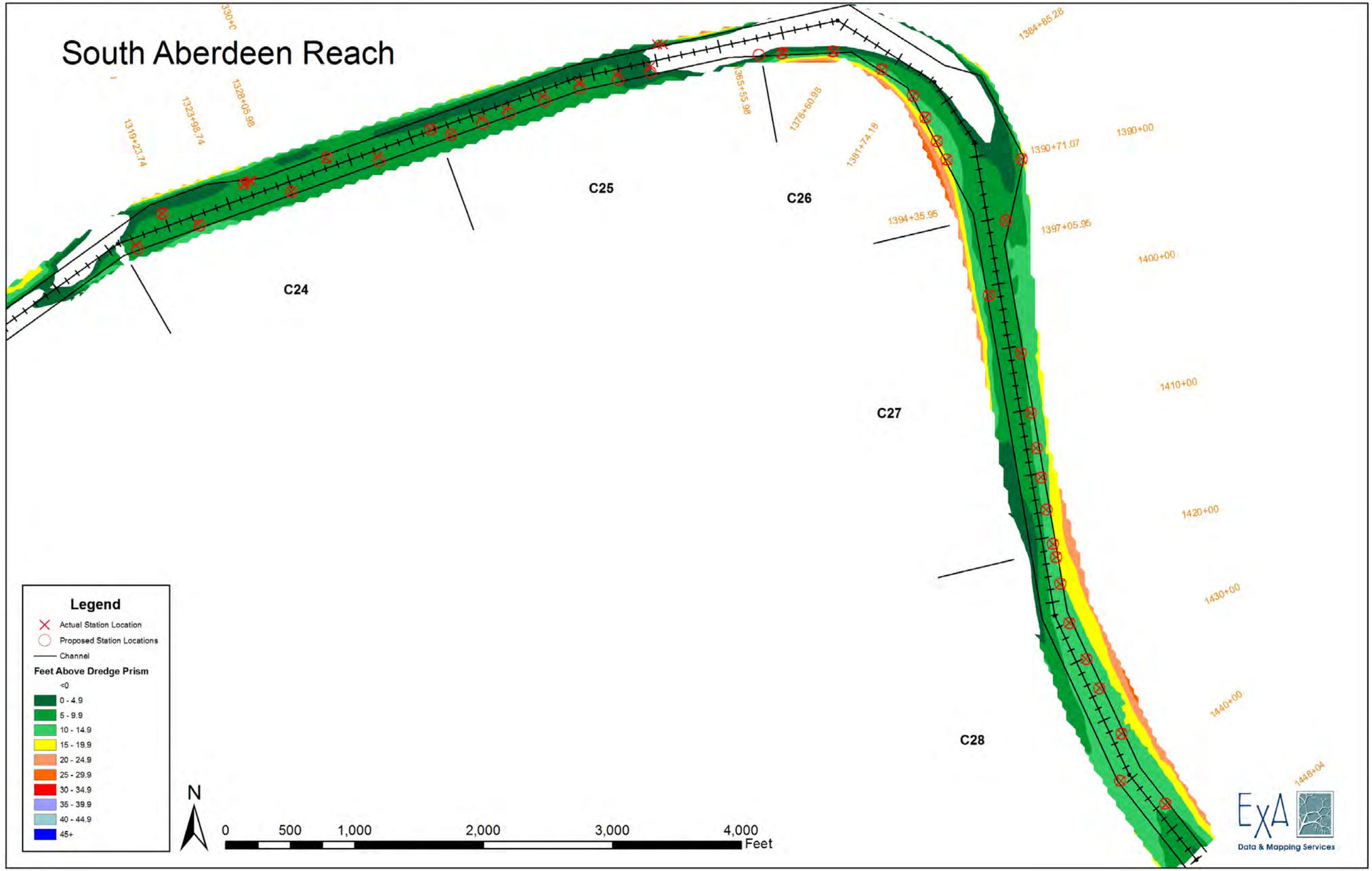
Sediment Characterization
Grays Harbor, WA

Figure 6. Aberdeen Reach Dredged Material Management Units. Planned and Actual Sampling Locations



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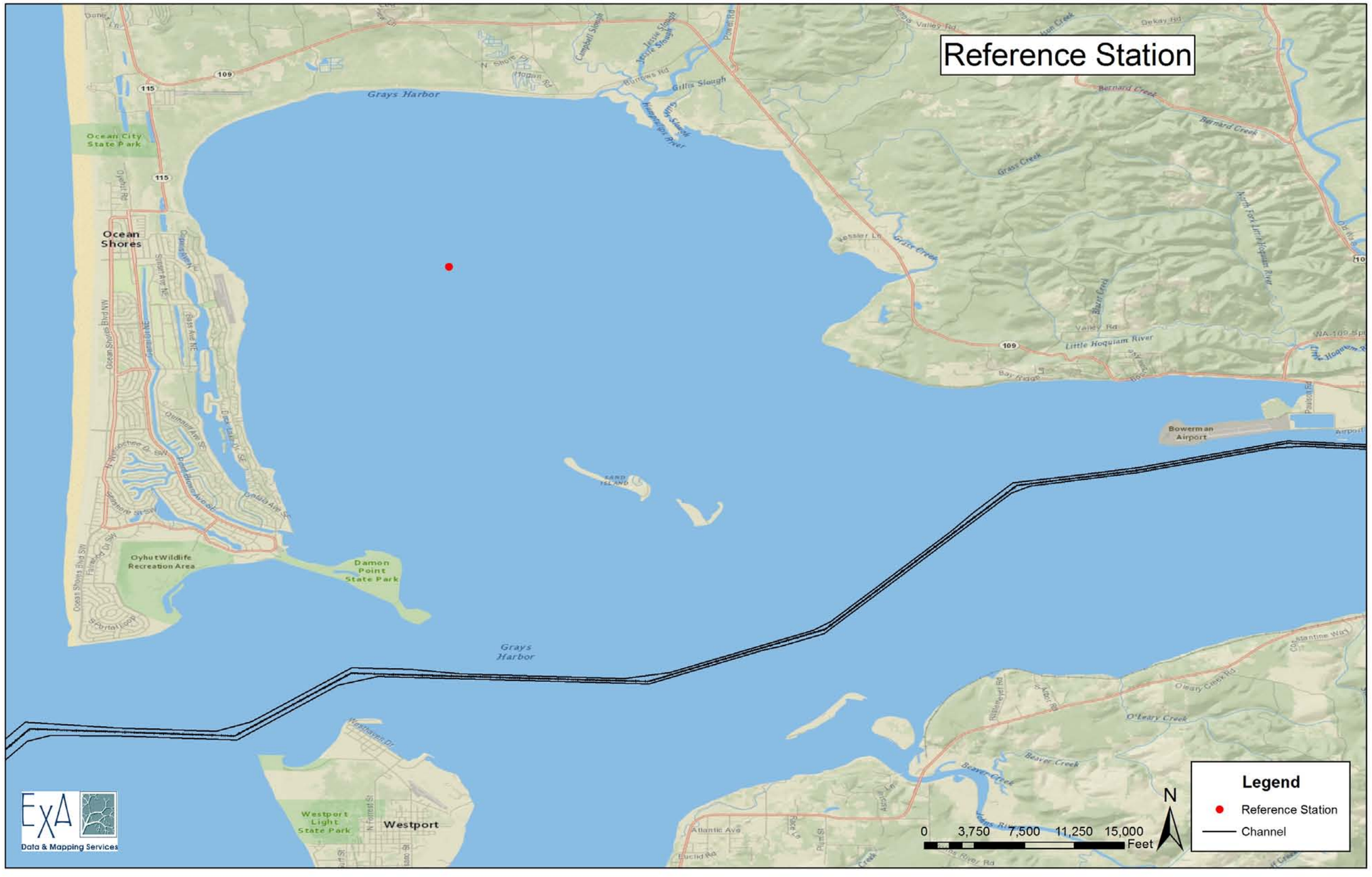
Grays Harbor, WA

Figure 7. . South Aberdeen Reach Dredged Material Management Units. Planned and Actual Sampling Locations



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Seattle, WA 98105

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Figure 8. Grays Harbor Reference Station GHS7 Sampling Location in North Bay

Table 1-3 Estimated FY11 and into Future Years Maintenance Dredging Program by Reach

Reach	Volume (cubic yards)[1]	Sediment Type	Dredge Type	Channel Dimensions[2]	Disposal Area(s)	Work Closures	Work Scheduled
S. Aberdeen	~55,000 Semi-decadal	silt / sand	Clamshell	-32 ft MLLW 200-300 ft wide	South Jetty or Point Chehalis[3]	15 Feb to 15 July	16 July to 14 Feb
Elliott Slough Turning Basin/S. Aberdeen	~60,000 biennially	silt / sand	Clamshell	-32 ft MLLW 350-550 ft wide	South Jetty or Point Chehalis[3]	15 Feb to 15 July	16 July to 14 Feb
Cow Point/Aberdeen	~750,000 annually	sandy silt	Clamshell	-36 ft MLLW 350-550 ft wide	South Jetty or Point Chehalis[3]	15 Feb to 15 July	16 July to 14 Feb
Cow Point Turning Basin	~215,000 annually	sandy silt	Clamshell	-36 ft MLLW 350-950 ft wide	South Jetty or Point Chehalis[3]	15 Feb to 15 July	16 July to 14 Feb
Hoquiam	~150,000 annually	sandy silt	Clamshell	-36 ft MLLW 350 ft wide	South Jetty or Point Chehalis[3]	15 Feb to 15 July	16 July to 14 Feb
North Channel	~175,000 annually	silty sand	Clamshell	-36 ft MLLW 350 ft wide	Point Chehalis	None	August to 14 Feb
Inner Crossover	~375,000 annually	silty sand	Clamshell	-36 ft MLLW 350-450 ft wide	Point Chehalis	None	August to 14 Feb
Outer Crossover	~235,000 annually	silty sand	Hopper[4]	-36 ft MLLW 350 ft wide	Point Chehalis	No hopper after 31 May	April and May
South Reach	~190,000 annually	sand	Hopper[4]	-36 ft MLLW 350-450 ft wide	Point Chehalis or Half Moon Bay	No hopper after 30 June	April to June
Entrance/ Point Chehalis	~685,000 annually	sand	Hopper	-40 ft to -46 ft MLLW 600-900 ft wide	South Jetty or Half Moon Bay or Point Chehalis	No hopper after 31 May	April and May
Bar Channel	~260,000 as needed	sand	Hopper	-46 ft MLLW 900 ft wide	South Beach or South Jetty or 3.9-mile ocean site	No hopper after 31 May	April and May

Notes:

[1] Volumes are averages, plus one standard deviation, computed on the last 10 years' dredging records, thus the actual volumes dredged may differ from those in the table.

[2] Depths shown are authorized depths and do not include 2-ft advanced maintenance or 2-ft overdepth tolerance. Exceptions: South Aberdeen Reach has 0-ft advance maintenance and 1-ft over-depth tolerance. Elliott Slough Turning Basin has 3-ft advance maintenance for half of the channel (inside bend). Widths shown are those of the channel bottom, and do not include extra width at channel bends.

[3] Adverse weather/wave relief site.

[4] Clamshell required after May 31 (Outer Crossover) and June 30 (South Reach).

ft = feet; MMLW = Mean Lower Low Water

Table 2-2 Actual Sampling Locations

Crossover Reach																
	Station Location															
	1		2		3		4		5		6		7		8	
DMMU	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.
XR-C1	46 55.92084 N	124 01.13178 W	46 55.98146 N	124 01.02887 W	46 56.02189 N	124 00.97304 W	46 56.05980 N	124 00.92395 W	46 56.08484 N	124 00.89120 W	46 56.12217 N	124 00.84198 W	46 56.14596 N	124 00.80933 W	46 56.17305 N	124 00.77245 W
XR-C2	46 56.20119 N	124 00.73509 W	46 56.22518 N	124 00.70271 W	46 56.25460 N	124 00.66078 W	46 56.28405 N	124 00.62423 W	46 56.31510 N	124 00.57982 W	46 56.34572 N	124 00.53777 W	46 56.38097 N	124 00.49109 W	46 56.41887 N	124 00.44257 W
XR-C3	46 56.50423 N	124 00.32801 W	46 56.55197 N	124 00.26227 W	46 56.58999 N	124 00.21401 W	46 56.59144 N	124 00.11472 W	46 56.66284 N	124 00.11501 W	46 56.66448 N	124 00.01640 W	46 56.73451 N	124 00.01657 W	46 56.74060 N	123 59.92343 W
XR-C4	46 56.81442 N	123 59.91201 W	46 56.82354 N	123 59.80748 W	46 56.88500 N	123 59.81789 W	46 56.88377 N	123 59.72590 W	46 56.95359 N	123 59.72698 W	46 56.95625 N	123 59.62762 W	46 57.02597 N	123 59.63003 W	46 57.02881 N	123 59.53312 W
XR-C5	46 57.07778 N	123 59.46680 W	46 57.11421 N	123 59.41801 W	46 57.15125 N	123 59.37208 W	46 57.18704 N	123 59.31836 W	46 57.22310 N	123 59.27368 W	46 57.26010 N	123 59.22335 W	46 57.29634 N	123 59.17249 W	46 57.33277 N	123 59.12383 W
XR-C6	46 57.37195 N	123 59.07182 W	46 57.40325 N	123 59.03285 W	46 57.42849 N	123 58.99557 W	46 57.46646 N	123 58.94617 W	46 57.50227 N	123 58.89715 W	46 57.53803 N	123 58.84865 W	46 57.56027 N	123 58.80990 W	46 57.58550 N	123 58.74667 W
North Channel Reach																
	Station Location															
	1		2		3		4		5		6		7		8	
DMMU	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.
NC-C7	46 57.60802 N	123 58.68006 W	46 57.64037 N	123 58.60760 W	46 57.65339 N	123 58.52092 W	46 57.66047 N	123 58.45045 W	46 57.66976 N	123 58.38078 W	46 57.67855 N	123 58.30746 W	46 57.68857 N	123 58.23601 W	46 57.69685 N	123 58.16410 W
NC-C8	46 57.71029 N	123 58.04689 W	46 57.76095 N	123 57.93687 W	46 57.73802 N	123 57.86067 W	46 57.78705 N	123 57.77762 W	46 57.76552 N	123 57.67178 W	46 57.80907 N	123 57.58903 W	46 57.78660 N	123 57.4957 W	46 57.82978 N	123 57.44919 W
NC-C9	46 57.79886 N	123 57.40164 W	46 57.83971 N	123 57.37661 W	46 57.85447 N	123 57.28169 W	46 57.87110 N	123 57.19307 W	46 57.88719 N	123 57.10103 W	46 57.90464 N	123 57.00735 W	46 57.91998 N	123 56.91546 W	46 57.93785 N	123 56.82287 W
NC-C10	46 57.95283 N	123 56.72792 W	46 57.92228 N	123 56.63969 W	46 57.97880 N	123 56.58735 W	46 57.94645 N	123 56.49714 W	46 58.00643 N	123 56.42732 W	46 57.98299 N	123 56.30788 W	46 57.98938 N	123 56.25309 W	46 58.00810 N	123 56.17122 W
NC-C11	46 58.05720 N	123 55.87097 W	46 58.06932 N	123 55.81213 W	46 58.08482 N	123 55.73093 W	46 58.09297 N	123 55.67222 W	46 58.10513 N	123 55.61330 W	46 58.11477 N	123 55.54296 W	46 58.11778 N	123 55.47914 W	46 58.12351 N	123 55.42151 W
Hoquiam Reach																
	Station Location															
	1		2		3		4		5		6		7		8	
DMMU	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.
HO-C12	46 58.12402 N	123 55.38881 W	46 58.12790 N	123 55.31861 W	46 58.13110 N	123 55.24913 W	46 58.13296 N	123 55.16663 W	46 58.12865 N	123 55.08068 W	46 58.12541 N	123 55.01163 W	46 58.12050 N	123 54.91241 W	46 58.11716 N	123 54.82906 W
HO-C13	46 58.11164 N	123 54.75173 W	46 58.10844 N	123 54.67406 W	46 58.10472 N	123 54.60019 W	46 58.10133 N	123 54.52976 W	46 58.14407 N	123 54.45762 W	46 58.14036 N	123 54.38275 W	46 58.13741 N	123 54.31268 W	46 58.13643 N	123 54.23947 W
HO-C14	46 58.13136 N	123 54.16644 W	46 58.12883 N	123 54.09533 W	46 58.12563 N	123 54.02566 W	46 58.12256 N	123 53.95275 W	46 58.11821 N	123 53.87907 W	46 58.11385 N	123 53.80150 W	46 58.10932 N	123 53.69127 W	46 58.11123 N	123 53.62076 W
HO-C15	46 58.11012 N	123 53.54590 W	46 58.11019 N	123 53.50968 W	46 58.11123 N	123 53.47397 W	46 58.11092 N	123 53.40082 W	46 58.11098 N	123 53.34118 W	46 58.06347 N	123 53.30467 W	46 58.11206 N	123 53.27336 W	46 58.11112 N	123 53.19217 W
HO-C16	46 58.06115 N	123 52.89749 W	46 58.06633 N	123 52.82406 W	46 58.06661 N	123 52.77624 W	46 58.06588 N	123 52.71727 W	46 58.06508 N	123 52.66469 W	46 58.06792 N	123 52.60823 W	46 58.06458 N	123 52.54507 W	46 58.05524 N	123 52.44744 W
HO-C17	46 58.04008 N	123 51.83763 W	46 58.03628 N	123 51.81574 W	46 58.03582 N	123 51.80366 W	46 58.04104 N	123 51.84959 W	46 58.04617 N	123 51.89535 W	46 58.04251 N	123 51.86261 W	46 58.03821 N	123 51.82638 W	46 58.03397 N	123 51.79095 W
Cow Point Reach																
	Station Location															
	1		2		3		4		5		6		7		8	
DMMU	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.
CP-C18	46 58.37352 N	123 48.43653 W	46 58.41552 N	123 48.38972 W	46 58.40425 N	123 48.32210 W	46 58.46204 N	123 48.22951 W	46 58.45024 N	123 48.15165 W	46 58.49501 N	123 48.08978 W	46 58.49901 N	123 47.99404 W	46 58.53704 N	123 47.89880 W
CP-C19	46 58.53092 N	123 47.86050 W	46 58.55335 N	123 47.80465 W	46 58.56622 N	123 47.75834 W	46 58.58533 N	123 47.69130 W	46 58.60362 N	123 47.62358 W	46 58.61625 N	123 47.55540 W	46 58.62794 N	123 47.49393 W	46 58.65699 N	123 47.48240 W
CP-C20	46 58.65319 N	123 47.24964 W	46 58.65696 N	123 47.15365 W	46 58.63674 N	123 47.06134 W	46 58.60482 N	123 47.00185 W	46 58.57830 N	123 46.97733 W	46 58.54871 N	123 46.95375 W	46 58.52531 N	123 46.93355 W	46 58.53045 N	123 46.79483 W

Table 2-2 Actual Sampling Locations

Aberdeen Reach																
DMMU	Station Location															
	1		2		3		4		5		6		7		8	
	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.
AB-C21	46 57.63338 N	123 50.16070 W	46 57.64376 N	123 50.11127 W	46 57.65486 N	123 50.05839 W	46 57.66718 N	123 50.00039 W	46 57.68292 N	123 49.92848 W	46 57.70400 N	123 49.84232 W	46 57.73848 N	123 49.75397 W	46 57.73540 N	123 49.63015 W
AB-C22	46 57.79600 N	123 49.59880 W	46 57.77958 N	123 49.54342 W	46 57.83989 N	123 49.49504 W	46 57.85988 N	123 49.39593 W	46 57.92349 N	123 49.33927 W	46 57.94464 N	123 49.23790 W	46 58.01129 N	123 49.17568 W	46 58.04048 N	123 49.06230 W
AB-C23	46 58.08920 N	123 49.03269 W	46 58.08957 N	123 48.96916 W	46 58.13515 N	123 48.94786 W	46 58.13847 N	123 48.88034 W	46 58.18803 N	123 48.84780 W	46 58.18868 N	123 48.78763 W	No sample collected. See text		46 58.35280 N	123 48.48332 W
South Aberdeen Reach																
DMMU	Station Location															
	1		2		3		4		5		6		7		8	
	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.
SA-C24	46 58.37352 N	123 48.43653 W	46 58.41552 N	123 48.38972 W	46 58.40425 N	123 48.32210 W	46 58.46204 N	123 48.22951 W	46 58.45024 N	123 48.15165 W	46 58.49501 N	123 48.08978 W	46 58.49901 N	123 47.99404 W	46 58.53704 N	123 47.89880 W
SA-C25	46 58.53092 N	123 47.86050 W	46 58.55335 N	123 47.80465 W	46 58.56622 N	123 47.75834 W	46 58.58533 N	123 47.69130 W	46 58.60362 N	123 47.62358 W	46 58.61625 N	123 47.55540 W	46 58.62794 N	123 47.49393 W	46 58.65699 N	123 47.48240 W
SA-C26	46 58.65319 N	123 47.24964 W	46 58.65696 N	123 47.15365 W	46 58.63674 N	123 47.06134 W	46 58.60482 N	123 47.00185 W	46 58.57830 N	123 46.97733 W	46 58.54871 N	123 46.95375 W	46 58.52531 N	123 46.93355 W	46 58.53045 N	123 46.79483 W
SA-C27	46 58.45175 N	123 46.81939 W	46 58.35569 N	123 46.84526 W	46 58.28389 N	123 46.78112 W	46 58.20799 N	123 46.75812 W	46 58.16310 N	123 46.74560 W	46 58.12635 N	123 46.73397 W	46 58.08558 N	123 46.72216 W	46 58.04214 N	123 46.70653 W
SA-C28	46 58.02563 N	123 46.70009 W	46 57.99167 N	123 46.69009 W	46 57.94272 N	123 46.67031 W	46 57.89768 N	123 46.63615 W	46 57.86133 N	123 46.60883 W	46 57.80458 N	123 46.56408 W	46 57.74472 N	123 46.56221 W	46 57.71651 N	123 46.47682 W
Reference Station																
GH S7	47 00.34937 N	124 05.79166 W	---	---	---	---	---	---	---	---	---	---	---	---	---	GH S7

Table 2-5 Depths of Collected Grab Samples (MLLW)

DMMU	Depth of Sampling Location (-ft MLLW)							
	1	2	3	4	5	6	7	8
Crossover Reach								
XR-C1	32.70	30.20	25.40	23.81	23.41	22.51	22.75	23.71
XR-C2	24.60	25.50	26.90	28.37	29.90	31.60	33.28	34.00
XR-C3	36.24	35.86	35.82	39.02	35.00	36.58	34.80	37.04
XR-C4	37.66	37.92	36.20	38.36	36.82	38.59	36.30	37.87
XR-C5	36.85	36.23	35.44	34.37	34.53	34.95	30.17	27.66
XR-C6	28.87	30.01	30.47	30.02	26.76	26.97	29.37	28.07
North Channel Reach								
NC-C7	24.86	32.63	32.03	32.15	31.67	33.25	33.83	35.21
NC-C8	35.55	38.37	36.05	38.70	38.75	37.76	38.50	36.75
NC-C9	39.90	37.90	37.98	36.28	33.76	30.89	33.10	35.50
NC-C10	34.37	46.20	34.89	36.29	36.60	39.50	39.40	39.51
NC-C11	27.19	24.73	26.15	21.56	24.11	26.52	26.27	28.37
Hoquiam Reach								
HO-C12	26.99	28.15	30.32	31.88	32.85	34.51	36.17	36.83
HO-C13	35.70	36.30	36.29	37.72	33.66	33.23	32.35	30.28
HO-C14	31.75	30.14	31.55	30.06	30.56	29.98	28.94	28.02
HO-C15	29.86	29.78	28.38	28.67	31.26	38.57	33.80	37.20
HO-C16	34.88	36.53	32.17	31.11	31.16	33.76	35.40	38.17
HO-C17	36.61	37.12	36.70	36.46	35.99	37.47	36.57	33.91
Cow Point Reach								
CP-C18	36.80	34.00	32.60	30.80	29.60	28.60	28.30	31.60
CP-C19	29.40	30.40	33.00	35.70	34.10	27.30	31.60	33.20
CP-C20	30.20	21.30	19.60	20.00	25.60	27.90	28.40	29.20
Aberdeen Reach								
AB-C21	22.80	21.10	20.50	21.80	22.70	25.05	27.30	30.70
AB-C22	27.70	30.30	31.90	30.20	32.00	31.50	36.10	32.20
AB-C23	33.43	32.69	32.28	32.78	32.37	33.67	see text	33.97
South Aberdeen Reach								
SA-C24	33.14	36.38	31.74	32.60	33.50	34.35	32.42	33.93
SA-C25	33.91	33.78	33.58	33.60	33.92	34.44	38.27	35.13
SA-C26	32.50	29.46	29.17	26.17	23.65	20.62	21.69	30.63
SA-C27	32.60	31.33	31.83	29.96	29.78	29.92	28.66	26.40
SA-C28	35.80	36.20	27.56	27.38	24.44	26.69	27.56	29.14
Reference Station								
GH S7	15.50	—	—	—	—	—	—	—

Table 2-6 Results of Field Grain Size Estimates

DMMU	Field Grain Size Estimate	
	Percent Sand	Percent Fines
Crossover Reach		
XR-C1	82	18
XR-C2	83	17
XR-C3	82	18
XR-C4	80	20
XR-C5	74	26
XR-C6	53	47
North Channel Reach		
NC-C7	92	8
NC-C8	64	36
NC-C9	59	41
NC-C10	46	54
NC-C11	81	19
Hoquiam Reach		
HO-C12	81	19
HO-C13	54	46
HO-C14	48	52
HO-C15	64	36
HO-C16	21	79
HO-C17	19	81

DMMU	Field Grain Size Estimate	
	Percent Sand	Percent Fines
Cow Point Reach		
CP-C18	18	82
CP-C19	20	80
CP-C20	10	90
Aberdeen Reach		
AB-C21	31	69
AB-C22	88	12
AB-C23	98	2
South Aberdeen Reach		
SA-C24	90	10
SA-C25	75	25
SA-C26	16	84
SA-C27	80	20
SA-C28	89	11
Reference Station		
S7	29	71