CENWS-OD-TS-DM

MEMORANDUM FOR RECORD 13 July 2004

SUBJECT: **DETERMINATION OF THE SUITABILITY OF SEDIMENT PROPOSED TO BE DREDGED FROM THE PORT OF BELLINGHAM HARRIS AVENUE SHIPYARD MTCA CLEANUP DREDGING PROJECT FOR OPEN-WATER DISPOSAL AT A PSDDA OPEN-WATER DISPOSAL SITE OR BENEFICIAL REUSE, AS EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT.**

1. The following summary reflects the consensus determination of the Agencies that comprise the regional Dredged Material Management Program (DMMP) for the State of Washington. The agencies include the Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency. The agencies are charged with determining the suitability of dredged material for in-water disposal and have evaluated the proposed dredging of 15,432 cubic yards from the Harris Avenue Shipyard MTCA cleanup dredging project in Bellingham Bay, Washington. This project is part of an Agreed Order Cleanup Action between the Department of Ecology and the Port of Bellingham.

2. The project was ranked high for testing purposes. The sampling and analysis plan was approved on July 14, 2003 by the DMMP agencies for an estimated total dredged material footprint volume of 15,432 cubic yards. The sampling was accomplished between February 24-25, 2004, and the approved SAP called for collecting two subsamples within each of the five Dredged Material Management Units (DMMU's.) using a 4-inch outside diameter vibracore sampler. Z-samples were also collected underlying each DMMU, each representing the top one-foot of the proposed new sediment surface after the dredging has been completed. The Z-samples were archived pending the analyses of the overlying DMMUs. Figures 1 and 2 depicts the vicinity map and location of each sample collected among the DMMUs being characterized. The composited samples were collected for both chemisty and potential biological testing. A tiered testing approach was used, and all samples for potential biological testing were archived at 4ºC pending completion of the chemical analyses.

3. Relevant dates for regulatory tracking purposes are included in Table 1.

Table 1. Regulatory Tracking Information and Dates

Initial SAP submittal date: Revised SAP submittal date:	June 19, 2003 September 15, 2003
SAP approval letter date:	July 14, 2003
Sampling date(s):	February 24-25, 2004
Sediment data characterization report submittal date:	June 25, 2004
DAIS Tracking Number	HARAS-1-A-F-200
Recency Determination Date: High (2 years)	February 2006

4. The Sampling and Analysis Plan approved by the Agencies for testing for the six DMMUs was followed, and quality assurance/quality control guidelines specified by the PSDDA Users Manual were generally complied with. The data gathered were deemed sufficient and acceptable for decision-making by the DMMP agencies based on best professional judgment.

5. Table 2 provides an analysis summary of the results of the conventional parameters analyzed for the five composited DMMUs and the results of the Z-sample analyzed for DMMU-2, and all analytes exceeding DMMP and SMS chemical guidelines. Table 3 contains a complete inventory of chemical testing results for the five composited DMMUs. Chemical analysis of the five DMMUs indicated that four of the five DMMUs had no detected or undetected DMMP exceedances of chemicals of concern. For the

remaining DMMU-2, arsenic and zinc exceeded the SL, Acenapthene, Fluorene, Phenanthrene, Total LPAH's, Fluoranthene, Pyrene, Benzo(a)anthracene, Total HPAH's exceeded the SL. Within DMMU-2 the Bioaccumulation Trigger was exceeded for Fluoranthene. Examining the chemistry quantitated in the DMMU-2 underlying Z-sample indicted that the TOC was extremely low at 0.081%. Because of the low TOC's the carbon-normalized PCBs indicated that the PCB bioaccumulation trigger was exceeded in this sample. However, carbon normalizing chemistry should not be accomplished when TOC's are less than 0.5 %. Therefore the BT exceedance noted is not a cause for concern. Also, as noted in Table 2, other carbon normalized chemicals exceeding SMS guidelines were an artifact of the low TOC's and the dry weight LAET's are the appropriate comparison. No SMS exceedances are noted using the AET values in Table 2 for the Z-sample underlying DMMU-2. Also, the slight SMS exceedance of PCB SQS in DMMU-3 is also an artifact of the low TOCs (0.25%), and the AET comparison is the appropriate comparison. No bioassay or bioaccumulation testing was performed on DMMU-2 and therefore this DMMU is determined to be unsuitable for unconfined-open-water disposal without that testing using Best-Professional-Judgement (BPJ).

6. The results of the chemical analysis for the five composited DMMUs, representing a total of 15,432 cy indicate that 3,697 cy is unsuitable for unconfined open-water disposal (e.g., DMMU-2) and 11,735 cy is suitable for unconfined open-water disposal (e.g., DMMU's 1A, 1B, 3, 4) at either the Bellingham open-water disposal site or the Rosario Straits dispersive disposal site.

7. This memorandum documents the suitability of sediment to be dredged from the Port of Bellingham's Harris Avenue Shipyard MTCA Cleanup Dredging Project for disposal at either the Bellingham Bay nondispersive or the Rosario Straits dispersive open-water disposal sites. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this project must be completed as part of the final project approval process. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under Section 404(b)(1) of the Clean Water Act.

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Concur:

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7/22/04 Date	Erika Hoffman, Environmental Protection Agency
7/22/04 Date	Tom Gries/Cinde Donahue, Washington Department of Ecology
7/28/2004 Date	Peter Leon, Washington Department of Natural Resources

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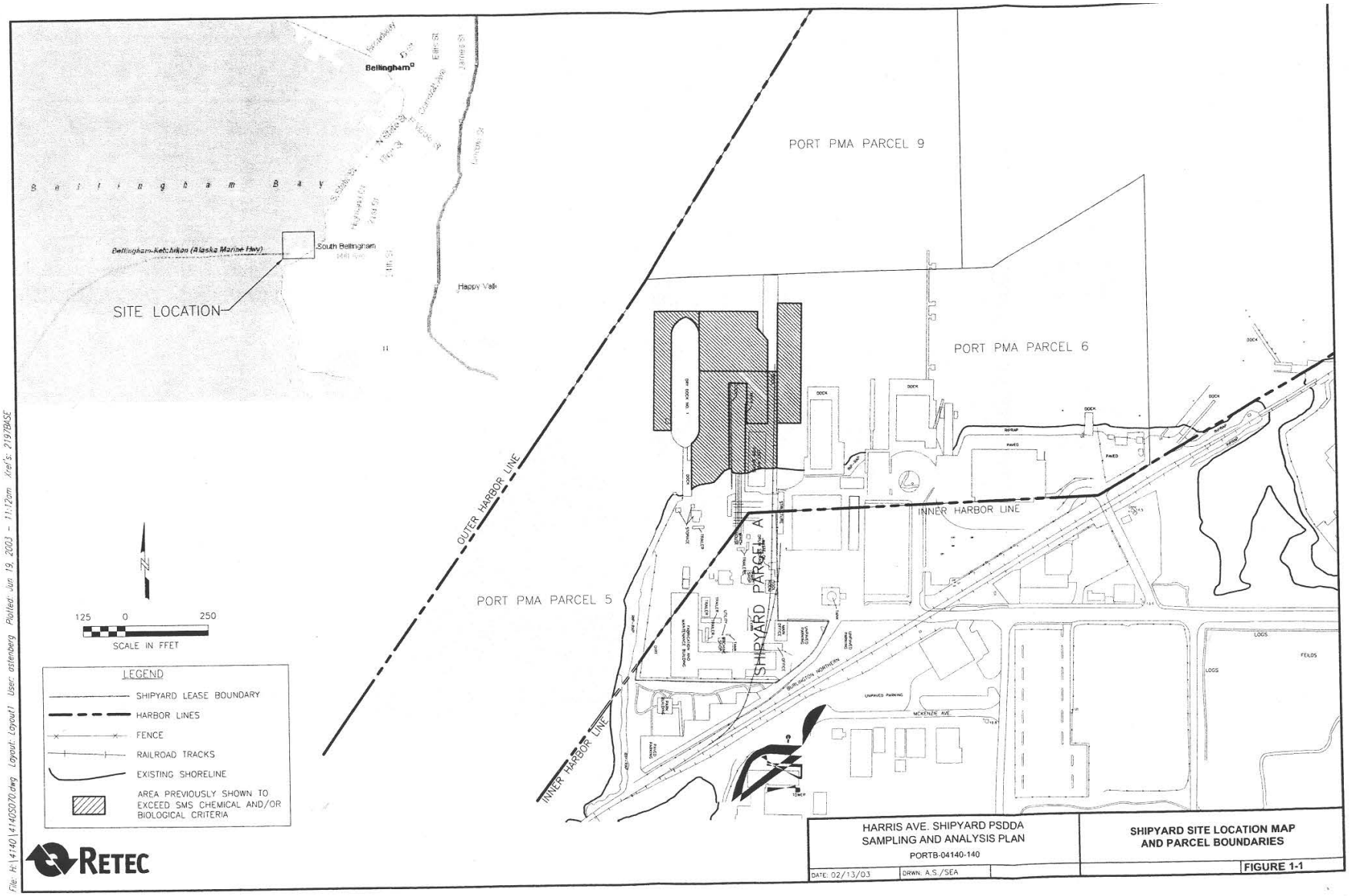

HARRIS AVE. SHIPYARD PSDDA
SAMPLING AND ANALYSIS PLAN
PORTB-04140-140

DATE: 02/13/03 | DRWN. A.S./SEA

SHIPYARD SITE LOCATION MAP AND PARCEL BOUNDARIES

FIGURE 1-1

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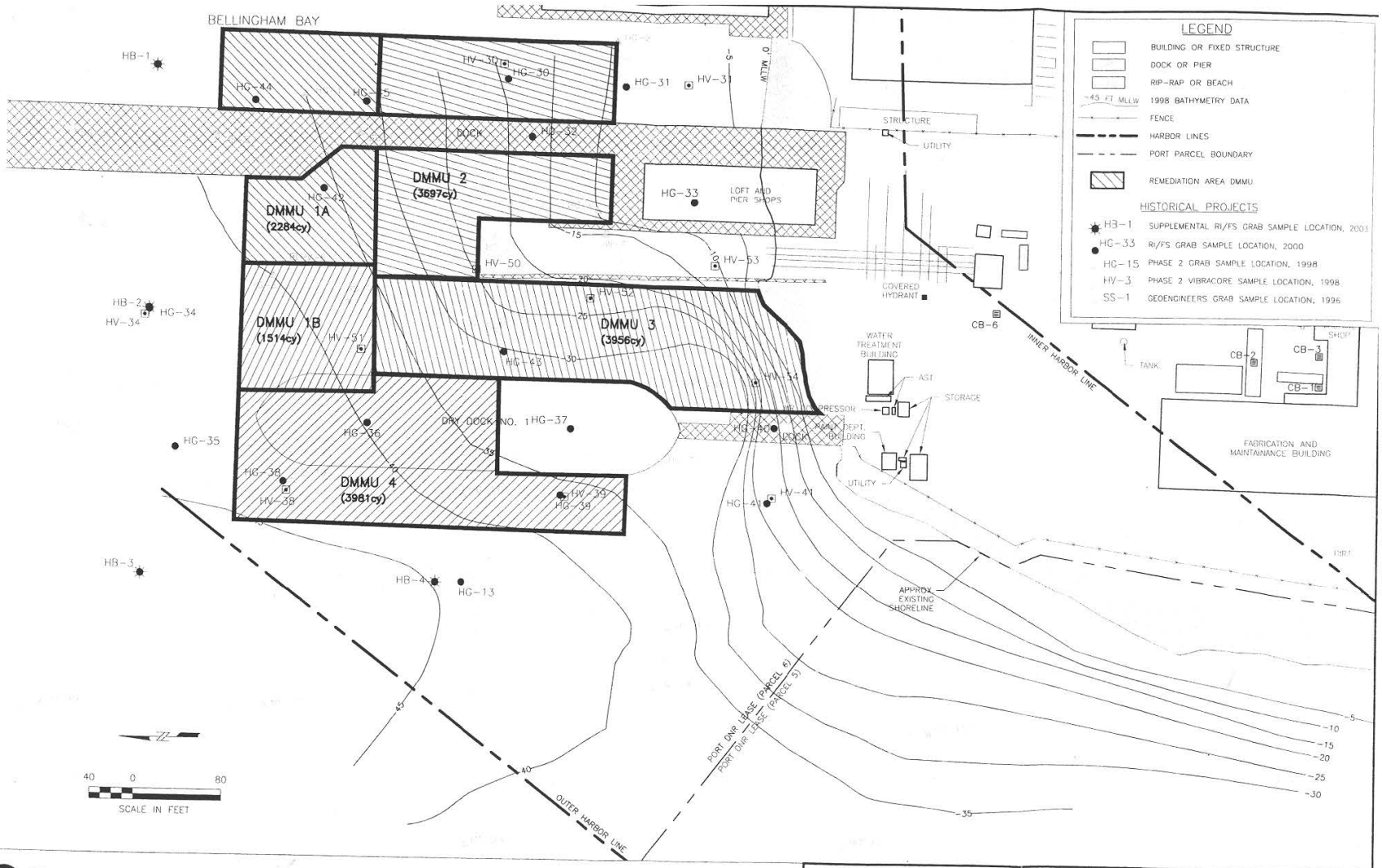

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HARRIS AVENUE SHIPYARD - PSDDA SEDIMENT CHARACTERIZATION REPORT PORTB-04140-430	HARRIS AVENUE SHIPYARD DREDGING AREAS
DATE: 06/09/04 DRWN: A.S./SEA	FIGURE 1-2

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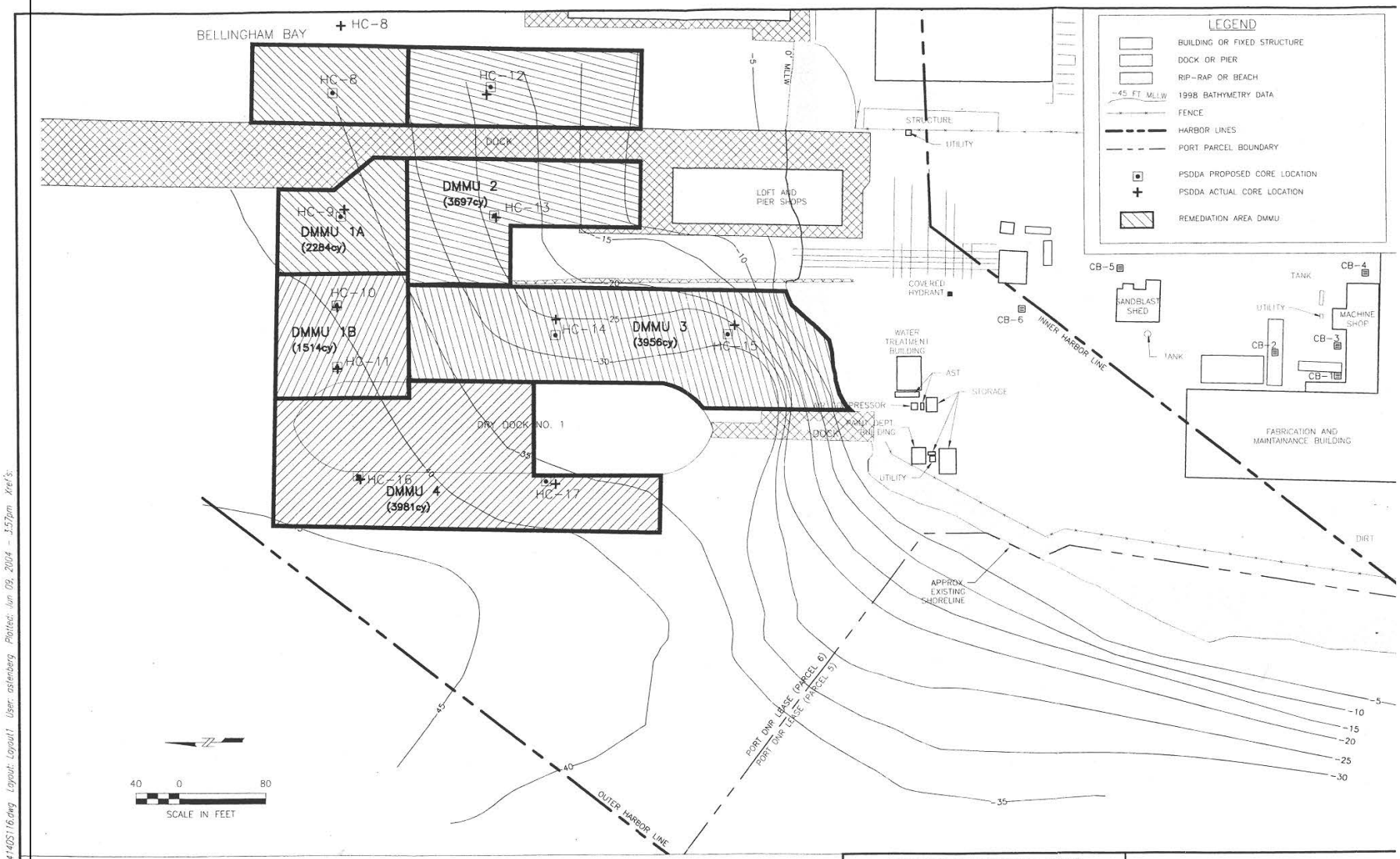

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HARRIS AVENUE SHIPYARD - PSDDA
SEDIMENT CHARACTERIZATION REPORT
PORTB-04140-430

DATE: 06/09/04 | DRWN: A.S./SEA

HARRIS AVENUE SHIPYARD
DMMU SAMPLING LOCATIONS

FIGURE 2-1

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Table 2. DMMP Sediment Testing Summary and Evaluation for Harris Avenue Shipyard Dredging Footprint.

								DMMU ID:	DMMU-1A			DMMU-1B			DMMU-2			DMMU-2 (Z-sample)			DMMU-3			DMMU-4		
	DMMP				SMS			AET (dry wgt(	dry wgt	TOC-norm	VQ	dry wgt	TOC-norm	VQ	dry wgt	TOC-norm	VQ	dry wgt	TOC-norm	VQ	dry wgt	TOC-norm	VQ	dry wgt	TOC-norm	VQ
CHEMICAL NAME	Units	SL	BT	ML	Unita	SQS	CSL	mg/kg	DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS	
Arsenic	mg/kg	57	0.5071	700	mg/kg	57	93								67	67										
Zinc	mg/kg	410	2,783	3,800	mg/kg	410	960								622	622										
TBT ion (porewater)	ug/L	0.15	0.15		ug/L	0.05			<0.022, <0.029			<0.022, <0.022			<0.028			NA			NA			<0.022		
TBT ion (bulk-sediment)*	ug/kg	73	73						<5.0		U	28.0			8.9			<5.1		U	55.2			10.7		
Acenaphthene	mg/kg	0.50		2	mg/kg	16	57	0.13 (echino)							1.4	100		<.020	**<25****	U						
Fluorene	mg/kg	0.54		3.6	mg/kg	23	79	0.12 (echino)							1.2	86		<.020	**<25****	U						
Phenanthrene	mg/kg	1.5		21	mg/kg	100	480								4.6	329										
Total LPAH	mg/kg	5.2		29	mg/kg	370	780								8.058	577										
Fluoranthene	mg/kg	1.7	4.6	30	mg/kg	160	1,200								6.3	450										
Indeno(1,2,3-cd)pyrene	mg/kg	0.6		4.4	mg/kg	34	88											<.020		U						
Dibenzo(a,h)anthracene	mg/kg	0.23		1.9	mg/kg	12	33	0.23 (oyster, Mic)										<.020	**<25****	U						
Pyrene	mg/kg	2.6	11.98	16	mg/kg	1,000	1,400								5.2	371										
Benzo(a)anthracene	mg/kg	1.3		5.1	mg/kg	110	270								1.3	92.9										
Total HPAH	mg/kg	12		69	mg/kg	960	5,300								16.99	1,214										
1,2,4-Trichlorobenzene	mg/kg	0.031		0.064	mg/kg	0.81	1.8	NV										<.005	**<1.2****	U						
Hexachlorobenzne	mg/kg	0.022	0.168	0.23	mg/kg	0.38	2.3	0.006 (bivalve)										<.001	**<1.2****	U						
Dibenzofuran	mg/kg	0.54		1.7	mg/kg	15	58	0.11 (echino)							0.21	15.0		<.020	**<25****	U						
Hexachlorobutadiene	mg/kg	0.029		0.27	mg/kg	3.9	6.2	0.0013 (echino)										<.001	**<25****	U						
N-Nitrosodiphenylamine	mg/kg	0.028		0.13	mg/kg	11	11	0.028 (benthic)										<.020	**<25****	U						
Butylbenzylphthalate	mg/kg	0.97			mg/kg	4.9	64	0.063 (Microtox)										<.020	**<25****	U						
Total PCBs	mg/kg	0.13	38***	3.1	mg/kg	12	65	0.13 (Microtox)										<0.04	**<49****	U	<0.04	**<16.0****	U			
Total Solids	%								72.2			74.7			78.5			84.8			85.0			72.9		
Total Volatile Solids	%								3.3			1.9			2.1			13.2			1.4			2.2		
Total Organic Carbon	%								1.2			1.6			1.4			**0.081****			**0.25****			0.57		
Total Ammonia	mg/kg								3.4			2.9			4.5			0.86			0.45			4.5		
Total Sulfides	mg/kg								120			140			11,000			1.5			<1.1			9.9		
Gravel	%								21.2			7.8			56.7						43.8			12.5		
Sand	%								62.3			70.5			31.0						50.0			65.9		
Silt	%								9.1			10.4			7.5						2.8			10.4		
Clay	%								7.4			11.1			4.9						3.4			11.1		
Fines (percent silt + clay)	%								16.5			21.5			12.4						6.2			21.5		
Eohaustorius estuarius hits:																										
Mytilus galloprovincialis hits:																										
Neanthes arenaceodentata hits:																										
Bioassay Determination: (P/F)															Not Tested											
BTs eyesceeded:									no			no			yes						no			no		
Bioaccumulation conducted:									no			no			no						no			no		
Bioaccumulation Determination:															Not Tested											
ML Rule exceeded:									no			no			no						no			no		
PSDDA Determination:									**PASS**			**PASS**			**FAIL(B)**	**SQS**		**PASS(bpj)**			**PASS**			**PASS**		
DMMU Volume:	cy								2,284			1,514			3,697						3,956			3,981		
Rank									H			H			H						H			H		
Mean Core sampling depth	ft								3.0			3.0			3.0			3 to 4			3.0			3.0		
Maximum sampling depth (mudline)									4.0			4.0			4.0			4.0			4.0			4.0		
DMMU ID:									DMMU-1A			DMMU-1B			DMMU-2			DMMU-2 (Z-sample)			DMMU-3			DMMU-4		

Legend:

SL = Screening Level exceedance
BT = Bioaccumulation Trigger exceedance
P = Pass (Suitable for UCOWD)
F(B) = Failure (UCOWD Unsuitable wo biological testing)
SQS = Sediment Quality Standards exceedance (SMS)
CSL = Cleanup Screening Level exceedance (SMS)
VQ = Validation Qualifier
UCOWD = Unconfined open-water disposal

* bulk sediment TBT performed due to inability to collect sufficient porewater samples. TBT-chloride converted to TBT(ion) by multiplying by 0.89.
** TOC < 0.5%, therefore dry weight comparisons to SMS guidelines are appropriate guidelines, and there are no dry weight guideline exceedances.
*** carbon nomalized bioaccumulation trigger value: mg/kg-TOC-normalized
NA = Not analyzed
NV = no value

Total Volume:	15,432	cy
Failed .	3,697	cy
Pass	11,735	cy

Table 3-2 Summary of PSDDA Investigation Chemical Concentrations

Parameter	SMS Criteria		PSDDA Criteria			HC-1A-S1			HC-1B-S1			HC-2-S1		
	SQS	MCUL	SL	BT	ML									
Conventionals														
Total Solids (%)	nv	nv	nv	nv	nv	**72.2**			**74.7**			**78.5**		
Total Volatile Solids(%)	nv	nv	nv	nv	nv	**3.3**			**1.9**			**2.1**		
Total Organic Carbon (%)	nv	nv	nv	nv	nv	**1.2**			**1.6**			**1.4**		
Ammonia (mg/kg)	nv	nv	nv	nv	nv	**3.4**			**2.9**			**4.5**		
Total Sulfides (mg/kg)	nv	nv	nv	nv	nv	**120**			**140**			**11,000**		
Metals	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*			*(mg/kg)*			*(mg/kg)*		
Antimony	nv	nv	150	nv	200	<7		U	<7		U	<7		U
Arsenic	57	93	57	507.1	700	**10**			**10**			**67**		
Cadmium	5.1	6.7	5.1	11.3	14	**0.3**			**0.4**			**0.9**		
Chromium	260	270	nv	267	nv	**26.1**		J	**30.3**		J	**47.9**		J
Copper	390	390	390	1,027	1,300	**19.9**			**43.9**			**195**		
Lead	450	530	450	975	1,200	**9**			**10**			**86**		
Mercury	0.41	0.59	0.41	1.5	2.3	**0.08**			**0.09**			**0.12**		
Nickel	nv	nv	140	370	370	**24**			**29**			**29**		
Silver	6.1	6.1	6.1	6.1	8.4	<0.4		U	<0.4		U	<0.4		U
Zinc	410	960	410	2,783	3,800	**38.4**			**55.2**			**622**		
Porewater Organotins [1]	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*			*(µg/L)*			*(µg/L)*		
Monobutyl Tin	nv	nv	nv	nv	nv	<0.045		UG	**0.340**		J	<0.055		UG
Dibutyl Tin	nv	nv	nv	nv	nv	<0.045		UG	**0.890**		J	<0.055		UG
Tributyl Tin	0.05	nv	0.15	0.15	nv	<0.022		UG	<0.022		UG	<0.028		UG
Porewater Organotins [1] ***(reextracted)***	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*			*(µg/L)*			*(µg/L)*		
Monobutyl Tin	nv	nv	nv	nv	nv	<0.060		UG	<0.045		UG	N/A		
Dibutyl Tin	nv	nv	nv	nv	nv	<0.060		UG	<0.045		UG	N/A		
Tributyl Tin	0.05	nv	0.15	0.15	nv	<0.029		UG	<0.022		UG	N/A		
Organotins *	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*			*(µg/kg)*			*(µg/kg)*		
Monobutyl Tin	nv	nv	nv	nv	nv	<5.0		U	<5.3		U	<5.0		U
Dibutyl Tin	nv	nv	nv	nv	nv	<5.0		UG	**16.9**		J	<5.0		UG
Tributyl Tin	nv	nv	nv	nv	nv	<5.0		U	**28.0**			**8.9**		
LPAH	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Naphthalene	99	170	2.1	nv	2.4	<0.020	<1.7	U	<0.019	<1.2	U	**0.041**	**2.9**	
Acenaphthylene	66	66	0.56	nv	1.3	<0.020	<1.7	U	<0.019	<1.2	U	**0.037**	**2.6**	
Acenaphthene	16	57	0.5	nv	2	<0.020	<1.7	U	<0.019	<1.2	U	**1.4**	**100**	
Fluorene	23	79	0.54	nv	3.6	<0.020	<1.7	U	<0.019	<1.2	U	**1.2**	**86**	
Phenanthrene	100	480	1.5	nv	21	**0.024**	**2.0**		**0.037**	**2.3**		**4.6**	**329**	
Anthracene	220	1200	0.96	nv	13	<0.020	<1.7	U	<0.019	<1.2	U	**0.780**	**55.7**	
2-Methylnaphthalene	38	64	0.67	nv	1.9	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Total LPAH	370	780	5.2	nv	29	**0.024**	**12.0**		**0.037**	**9.4**		**8.058**	**577**	
HPAH	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Fluoranthene	160	1200	1.7	4.6	30	**0.048**	**4.0**		**0.069**	**4.3**		**6.300**	**450**	
Pyrene	1000	1400	2.6	11.98	16	**0.057**	**4.8**		**0.071**	**4.4**		**5.200**	**371**	
Benzo(a)anthracene	110	270	1.3	nv	5.1	**0.022**	**1.8**		**0.036**	**2.3**		**1.300**	**92.86**	
Chrysene	110	460	1.4	nv	21	**0.035**	**2.9**		**0.057**	**3.6**		**1.000**	**71.43**	
Benzofluoranthenes	230	450	3.2	nv	9.9	**0.062**	**5.2**		**0.082**	**5.1**		**1.740**	**124.3**	
Benzo(a)pyrene	99	210	1.6	nv	3.6	**0.030**	**2.5**		**0.040**	**2.5**		**0.850**	**60.7**	
Indeno(1,2,3-cd)pyrene	34	88	0.6	nv	4.4	<0.020	<1.7	U	**0.023**	**1.4**		**0.260**	**18.6**	
Dibenzo(a,h)anthracene	12	33	0.23	nv	1.9	<0.020	<1.7	U	<0.019	<1.2	U	**0.110**	**7.86**	
Benzo(g,h,i)perylene	31	78	0.67	nv	3.2	<0.020	<1.7	U	**0.022**	**1.4**		**0.230**	**16.4**	
Total HPAH	960	5300	12	nv	69	**0.254**	**26.2**		**0.400**	**26.2**		**16.990**	**1.214**	
Chlorinated Hydrocarbons	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
1,3-Dichlorobenzene	nv	nv	0.17	nv	nv	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
1,4-Dichlorobenzene	3.1	9	0.11	nv	0.12	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
1,2-Dichlorobenzene	2.3	2.3	0.035	nv	0.11	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
1,2,4-Trichlorobenzene	0.81	1.8	0.031	nv	0.064	<0.005	<0.4	U	<0.005	<0.3	U	<0.006	<0.4	U
Hexachlorobenzene	0.38	2.3	0.022	0.168	0.23	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
Phthalates	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Dimethyl phthalate	53	53	1.4	nv	nv	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Diethyl phthalate	61	110	1.2	nv	nv	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Di-n-butyl phthalate	220	1700	5.1	nv	nv	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Butyl benzyl phthalate	4.9	64	0.97	nv	nv	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Bis(2-ethylhexyl)phthalate	47	78	8.3	nv	nv	<0.020	<1.7	U	<0.019	<1.2	U	**0.041**	**2.9**	
Di-n-octyl phthalate	58	4500	6.2	nv	nv	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Phenols	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*			*(mg/kg)*			*(mg/kg)*		
Phenol	0.42	1	0.42	nv	1.2	<0.020		U	<0.019		U	<0.019		U
2-Methylphenol	0.063	0.063	0.063	nv	0.077	<0.020		U	<0.019		U	<0.019		U
4-Methylphenol	0.67	0.67	0.67	nv	3.6	<0.020		U	<0.019		U	<0.019		U
2,4-Dimethylphenol	0.029	0.029	0.029	nv	0.21	<0.020		U	<0.019		U	<0.019		U
Pentachlorophenol	0.36	0.69	0.4	0.504	0.69	<0.099		U	<0.096		U	<0.097		U
Miscellaneous Extractables	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*			*(mg/kg)*			*(mg/kg)*		
Benzyl alcohol	0.057	0.073	0.057	nv	0.87	<0.020		UG	<0.019		UG	<0.019		UG
Benzoic acid	0.65	0.65	0.65	nv	0.76	<0.200		U	<0.190		U	<0.190		U
Miscellaneous Extractables	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Dibenzofuran	15	58	0.54	nv	1.7	<0.020	<1.7	U	<0.019	<1.2	U	**0.210**	**15.0**	
Hexachloroethane	nv	nv	1.4	nv	14	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Hexachlorobutadiene	3.9	6.2	0.029	nv	0.27	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
N-Nitrosodiphenylamine	11	11	0.028	nv	0.13	<0.020	<1.7	U	<0.019	<1.2	U	<0.019	<1.4	U
Volatile Organics	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*			*(mg/kg)*			*(mg/kg)*		
Trichloroethene	nv	nv	0.16	nv	1.6	<0.001		U	<0.001		U	<0.001		U
Tetrachlorethene	nv	nv	0.057	nv	0.21	<0.001		U	<0.001		U	<0.001		U
Ethylbenzene	nv	nv	0.01	nv	0.05	<0.001		U	<0.001		U	<0.001		U
Total xylenes	nv	nv	0.04	nv	0.16	<0.002		U	<0.002		U	<0.002		U
Pesticides	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
DDT	nv	nv	0.0069	0.05	0.069	<0.006	<0.5	U	<0.006	<0.4	U	<0.011	<0.79	Y
Aldrin	nv	nv	0.01	nv	nv	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
alpha-chlordane	nv	nv	0.01	0.037	nv	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
dieldrin	nv	nv	0.01	nv	nv	<0.002	<0.2	U	<0.002	<0.1	U	<0.002	<0.1	U
heptachlor	nv	nv	0.01	nv	nv	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
alpha-BHC	nv	nv	nv	10 **	nv	<0.001	<0.083	U	<0.001	<0.063	U	<0.009	<0.614	Y
gamma-BHC (Lindane)	nv	nv	0.01	nv	nv	<0.001	<0.08	U	<0.001	<0.06	U	<0.001	<0.07	U
Aroclor 1016	nv	nv	nv	nv	nv	<0.020	<1.7	U	<0.020	<1.3	U	<0.020	<1.4	U
Aroclor 1242	nv	nv	nv	nv	nv	<0.020	<1.7	U	<0.020	<1.3	U	<0.020	<1.4	U
Aroclor 1248	nv	nv	nv	nv	nv	<0.020	<1.7	U	<0.020	<1.3	U	<0.020	<1.4	U
Aroclor 1254	nv	nv	nv	nv	nv	<0.020	<1.7	U	<0.020	<1.3	U	**0.058**	**4.1**	
Aroclor 1260	nv	nv	nv	nv	nv	<0.020	<1.7	U	<0.020	<1.3	U	<0.076	<5.4	Y
Aroclor 1221	nv	nv	nv	nv	nv	<0.039	<3.3	U	<0.039	<2.4	U	<0.039	<2.8	U
Aroclor 1232	nv	nv	nv	nv	nv	<0.020	<1.7	U	<0.020	<1.3	U	<0.020	<1.4	U
Total PCBs ***	12	65	0.13	38**	3.1		<3.3	U	<0.039	<2.4	U	**0.058**	**4.1**	

Notes:
Bold values at or above laboratory detection limit
Underlined values exceed the SQS value in SMS or the SL value of PSDDA
Double underlined values exceed the CSL
Data has been validated according to QA-2 protocols.
[1] Bulk and porewater TBT were originally reported as TBT-chloride (in ppb) and converted to TBT (in ppb) by multiplying by 0.89.
* These non-detected values are above the SQS criteria when carbon normalized. Please refer to values in Table 4-1 for comparisons of dry weight concentrations to AET values.
** This value is normalized to total organic carbon, and is expressed in mg/kg (TOC normalized).
*** Total PCBs are calculated by summing detected concentrations of Aroclors.
nv - No value currently established under PSDDA.
NA = Not analyzed
U = Undetected
Y = Raised reporting limit due to background interference
J = Estimated concentration
UG = Undetected, reporting limit may be biased low
UJ = Undetected, reporting limit is estimated, direction of bias is not determined

Table 3-2 Summary of PSDDA Investigation Chemical Concentrations

Parameter	SMS Criteria		PSDDA Criteria			HC-2-S2			HC-3-S1			HC-4-S1		
	SQS	MCUL	SL	BT	ML									
Conventionals														
Total Solids (%)	nv	nv	nv	nv	nv		**84.8**			**85**			**72.9**	
Total Volatile Solids(%)	nv	nv	nv	nv	nv		**13.2**			**1.4**			**2.2**	
Total Organic Carbon (%)	nv	nv	nv	nv	nv		**0.081**			**0.25**			**0.57**	
Ammonia (mg/kg)	nv	nv	nv	nv	nv		**0.86**			**0.45**			**4.5**	
Total Sulfides (mg/kg)	nv	nv	nv	nv	nv		**1.5**			<1.10	U		**9.90**	
Metals	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*		*(mg/kg)*			*(mg/kg)*			*(mg/kg)*	
Antimony	nv	nv	150	nv	200		<10	U		<6	U		<7	U
Arsenic	57	93	57	507.1	700		<10	U		**14**			**8**	
Cadmium	5.1	6.7	5.1	11.3	14		<0.6	U		**0.3**			**0.3**	
Chromium	260	270	nv	267	nv		**36**			**34.6**	J		**35.1**	J
Copper	390	390	390	1,027	1,300		**10.4**			**79.1**			**33.1**	
Lead	450	530	450	975	1,200		<6	U		**39**			**12**	
Mercury	0.41	0.59	0.41	1.5	2.3		<0.05	U		<0.05	U		**0.08**	
Nickel	nv	nv	140	370	370		17			**55**			**32**	
Silver	6.1	6.1	6.1	6.1	8.4		<0.9	U		<0.4	U		<0.4	U
Zinc	410	960	410	2,783	3,800		**18**			**189**			**53.9**	
Porewater Organotins [1]	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*		*(µg/L)*			*(µg/L)*			*(µg/L)*	
Monobutyl Tin	nv	nv	nv	nv	nv		NA			N/A			<0.045	UG
Dibutyl Tin	nv	nv	nv	nv	nv		NA			N/A			<0.045	UG
Tributyl Tin	0.05	nv	0.15	0.15	nv		NA			N/A			<0.022	UG
Porewater Organotins [1] ***(reextracted)***	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*	*(µg/L)*		*(µg/L)*			*(µg/L)*			*(µg/L)*	
Monobutyl Tin	nv	nv	nv	nv	nv		NA			N/A			<0.045	UG
Dibutyl Tin	nv	nv	nv	nv	nv		NA			N/A			<0.045	UG
Tributyl Tin	0.05	nv	0.15	0.15	nv		NA			N/A			<0.022	UG
Organotins *	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*	*(µg/kg)*		*(µg/kg)*			*(µg/kg)*			*(µg/kg)*	
Monobutyl Tin	nv	nv	nv	nv	nv		<5.1	U		<5.3	U		<5.2	U
Dibutyl Tin	nv	nv	nv	nv	nv		<5.1	U		**14.2**	J		<5.2	UG
Tributyl Tin	nv	nv	nv	nv	nv		<5.1	U		**55.2**			**10.7**	
LPAH	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Naphthalene	99	170	2.1	nv	2.4	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Acenaphthylene	66	66	0.56	nv	1.3	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Acenaphthene	16	57	0.5	nv	2	<0.020	<25*	U	<0.020	<8.0	U	<0.020	<3.5	U
Fluorene	23	79	0.54	nv	3.6	<0.020	<25*	U	<0.020	<8.0	U	<0.020	<3.5	U
Phenanthrene	100	480	1.5	nv	21	<0.020	<25	U	**0.120**	**48.0**		**0.040**	**7.0**	
Anthracene	220	1200	0.96	nv	13	<0.020	<25	U	**0.033**	**13**		<0.020	<3.5	U
2-Methylnaphthalene	38	64	0.67	nv	1.9	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Total LPAH	370	780	5.2	nv	29	<0.020	<25	U	**0.153**	**101**		**0.040**	**28**	
HPAH	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Fluoranthene	160	1200	1.7	4.6	30	<0.020	<25	U	**0.540**	**216**		**0.094**	**16**	
Pyrene	1000	1400	2.6	11.98	16	<0.020	<25	U	**0.390**	**156**		**0.079**	**14**	
Benzo(a)anthracene	110	270	1.3	nv	5.1	<0.020	<25	U	**0.069**	**28**		**0.042**	**7.4**	
Chrysene	110	460	1.4	nv	21	<0.020	<25	U	**0.190**	**76.0**		**0.054**	**9.5**	
Benzofluoranthenes	230	450	3.2	nv	9.9	<0.020	<25	U	**0.240**	**96.0**		**0.077**	**14**	
Benzo(a)pyrene	99	210	1.6	nv	3.6	<0.020	<25	U	**0.083**	**33**		**0.038**	**6.7**	
Indeno(1,2,3-cd)pyrene	34	88	0.6	nv	4.4	<0.020	<25	U	**0.035**	**14**		<0.020	<3.5	U
Dibenzo(a,h)anthracene	12	33	0.23	nv	1.9	<0.020	<25*	U	<0.020	<8.0	U	<0.020	<3.5	U
Benzo(g,h,i)perylene	31	78	0.67	nv	3.2	<0.020	<25	U	**0.029**	**12**		<0.020	<3.5	U
Total HPAH	960	5300	12	nv	69	<0.020	<25	U	**1.576**	**638**		**0.384**	**78**	
Chlorinated Hydrocarbons	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
1,3-Dichlorobenzene	nv	nv	0.17	nv	nv	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
1,4-Dichlorobenzene	3.1	9	0.11	nv	0.12	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
1,2-Dichlorobenzene	2.3	2.3	0.035	nv	0.11	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
1,2,4-Trichlorobenzene	0.81	1.8	0.031	nv	0.064	<0.005	<1.2*	U	<0.004	<2	U	<0.004	<0.7	U
Hexachlorobenzene	0.38	2.3	0.022	0.168	0.23	<0.001	<1.2*	U	<0.001	<0.4	U	<0.001	<0.2	U
Phthalates	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Dimethyl phthalate	53	53	1.4	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Diethyl phthalate	61	110	1.2	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Di-n-butyl phthalate	220	1700	5.1	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Butyl benzyl phthalate	4.9	64	0.97	nv	nv	<0.020	<25*	U	<0.020	<8.0	U	<0.020	<3.5	U
Bis(2-ethylhexyl)phthalate	47	78	8.3	nv	nv	<0.020	<25	U	**0.053**	**21**		**0.033**	**5.8**	
Di-n-octyl phthalate	58	4500	6.2	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Phenols	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*		*(mg/kg)*			*(mg/kg)*			*(mg/kg)*	
Phenol	0.42	1	0.42	nv	1.2		<0.020	U		<0.020	U		<0.020	U
2-Methylphenol	0.063	0.063	0.063	nv	0.077		<0.020	U		<0.020	U		<0.020	U
4-Methylphenol	0.67	0.67	0.67	nv	3.6		<0.020	U		<0.020	U		<0.020	U
2,4-Dimethylphenol	0.029	0.029	0.029	nv	0.21		<0.020	U		<0.020	U		<0.020	U
Pentachlorophenol	0.36	0.69	0.4	0.504	0.69		<0.099	U		<0.098	U		<0.098	U
Miscellaneous Extractables	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*		*(mg/kg)*			*(mg/kg)*			*(mg/kg)*	
Benzyl alcohol	0.057	0.073	0.057	nv	0.87		<0.020	U		<0.020	UG		<0.020	UG
Benzoic acid	0.65	0.65	0.65	nv	0.76		<0.200	U		<0.200	U		<0.200	U
Miscellaneous Extractables	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Dibenzofuran	15	58	0.54	nv	1.7	<0.020	<25*	U	<0.020	<8.0	U	<0.020	<3.5	U
Hexachloroethane	nv	nv	1.4	nv	14	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Hexachlorobutadiene	3.9	6.2	0.029	nv	0.27	<0.001	<25*	U	<0.001	<0.4	U	<0.001	<0.2	U
N-Nitrosodiphenylamine	11	11	0.028	nv	0.13	<0.020	<25*	U	<0.020	<8.0	U	<0.020	<3.5	U
Volatile Organics	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*		*(mg/kg)*			*(mg/kg)*			*(mg/kg)*	
Trichloroethene	nv	nv	0.16	nv	1.6		<0.001	U		<0.001	U		<0.001	U
Tetrachlorethene	nv	nv	0.057	nv	0.21		<0.001	U		<0.001	U		<0.001	U
Ethylbenzene	nv	nv	0.01	nv	0.05		<0.001	U		<0.001	U		<0.001	U
Total xylenes	nv	nv	0.04	nv	0.16		**0.002**			<0.002	U		<0.002	U
Pesticides	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
DDT	nv	nv	0.0069	0.05	0.069	<0.006	<7.4	U	<0.006	<2.4	U	<0.007	<1.2	Y
Aldrin	nv	nv	0.01	nv	nv	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
alpha-chlordane	nv	nv	0.01	0.037	nv	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
dieldrin	nv	nv	0.01	nv	nv	<0.002	<2.5	U	<0.002	<0.8	U	<0.002	<0.4	U
heptachlor	nv	nv	0.01	nv	nv	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
alpha-BHC	nv	nv	nv	10 **	nv	<0.001	<1.2	U	**0.012**	**4.8**		<0.001	<0.175	U
gamma-BHC (Lindane)	nv	nv	0.01	nv	nv	<0.001	<1.2	U	<0.001	<0.4	U	<0.001	<0.2	U
Aroclor 1016	nv	nv	nv	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Aroclor 1242	nv	nv	nv	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Aroclor 1248	nv	nv	nv	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Aroclor 1254	nv	nv	nv	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Aroclor 1260	nv	nv	nv	nv	nv	<0.020	<25	U	<0.020	<8.0	U	**0.026**	**4.6**	
Aroclor 1221	nv	nv	nv	nv	nv	<0.040	<49	U	<0.040	<16.0	U	<0.039	<6.8	U
Aroclor 1232	nv	nv	nv	nv	nv	<0.020	<25	U	<0.020	<8.0	U	<0.020	<3.5	U
Total PCBs ***	12	65	0.13	38**	3.1	<0.040	<49*	U	<0.040	<16.0*	U	**0.026**	**4.6**	

Notes:

Bold values at or above laboratory detection limit

Underlined values exceed the SQS value in SMS or the SL value of PSDDA

Double underlined values exceed the CSL

Data has been validated according to QA-2 protocols.

[1] Bulk and porewater TBT were originally reported as TBT-chloride (in ppb) and converted to TBT (in ppb) by multiplying by 0.89.

* These non-detected values are above the SQS criteria when carbon normalized. Please refer to values in Table 4-1 for comparisons of dry weight concentrations to AET values.

** This value is normalized to total organic carbon, and is expressed in mg/kg (TOC normalized).

*** Total PCBs are calculated by summing detected concentrations of Aroclors.

nv - No value currently established under PSDDA.

NA = Not analyzed

U = Undetected

Y = Raised reporting limit due to background interference

J = Estimated concentration

UG = Undetected, reporting limit may be biased low

UJ = Undetected, reporting limit is estimated, direction of bias is not determined