Figures

Figure 1 - Vicinity Map

Mukilteo Multimodal Project
DMMP Sampling and Analysis Plan

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N

0 250 500 1,000 1,500 Feet

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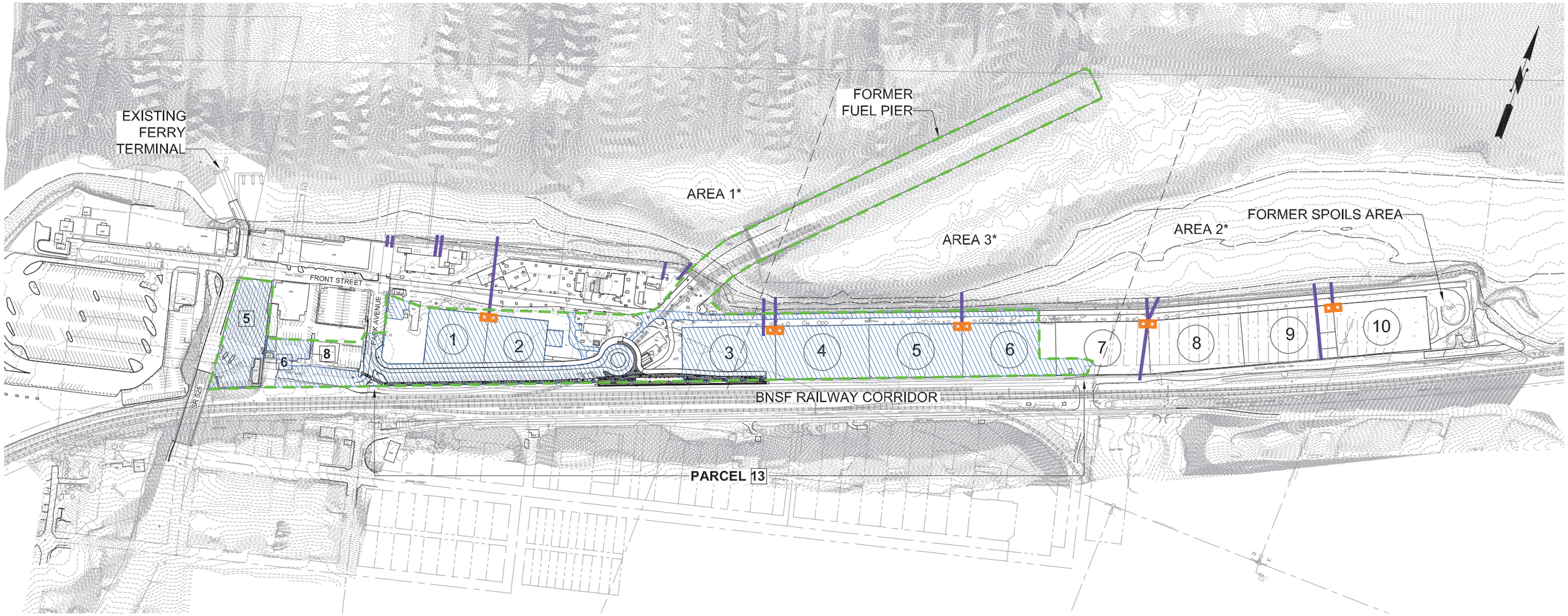

EXISTING CONDITIONS

SCALE: 1"=300'

LEGEND

1 = Tank pad number

Mukilteo Multimodal Project boundary

Pavement/Concrete Surface

Oil-water Separators

Outfall

5 Parcel Number for Reference

*Areas as identified in the "Mukilteo Multimodal Project Draft Environmental Impact Statement Hazardous Materials Discipline Report" January 2012

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MUKILTEO MULTIMODAL PROJECT: DMMP SAMPLING AND ANALYSIS PLAN

FIGURE 2: EXISTING CONDITIONS

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PROJECT NO. FAWAT-07-859
DATE: 11/1/2012
SHEET NO. 2

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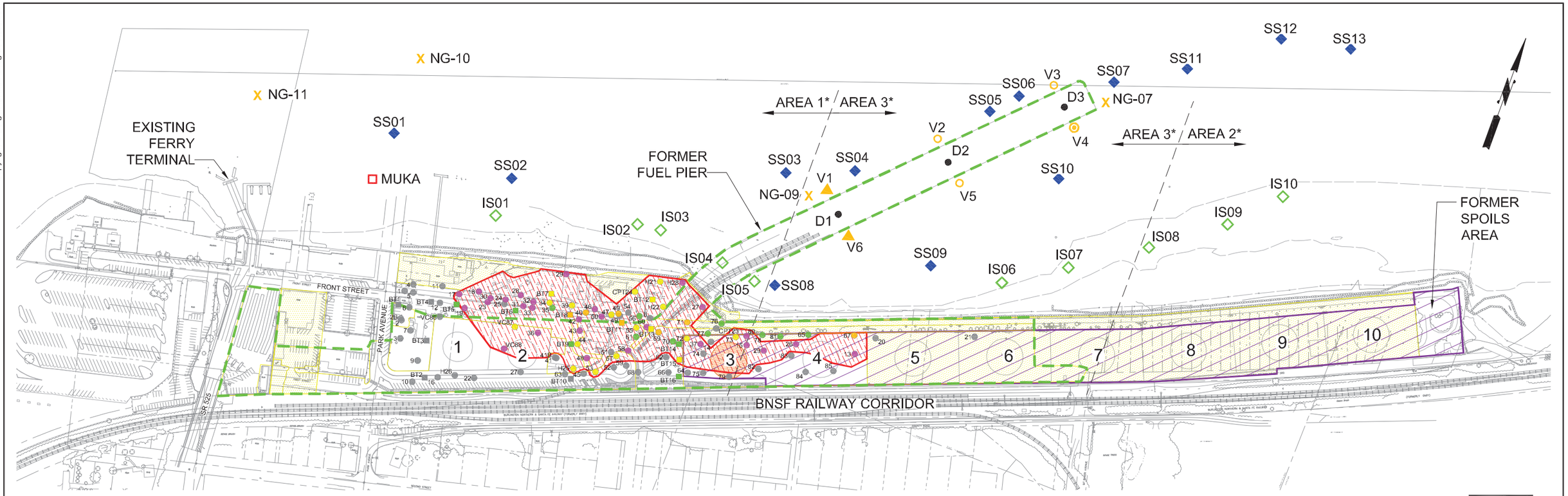

Perimeter Sediment Samples

YEAR	SAMPLE ID	DEPTH	COCs[1]
1983	MUKA	SURFACE	fluoranthene
1986	NG-07	SURFACE	acenaphthene
	NG-09		benzoic acid
	NG-10		phenol
	NG-11		acenaphthene, phenol, fluorene
2003	SS01 - SS13	SURFACE	No Exceedences
	IS01 - IS10		
2012	V1/V6	0-4' (composite)	chlordanes
	V2/V5		chlordanes, dioxins/furans
	V3/V4		chlordanes
	V1/V6	4-8' (composite)	No Exceedances
	V3/V4		chlordanes
	V4	8-12' (discrete)	++

++PAHs (indeno(1,2,3-c,d)pyrene, benzo(g,h,i)perylene, dibenz(a,h)anthracene), pyrene, total HPAHs

Under Pier Sediment Samples

YEAR	SAMPLE ID	DEPTH	COCs[1]
2012	D1	0-4' (discrete)	No Exceedences
	D2		
	D3		
	D2	4-8' (discrete)	Archived; not analyzed
	D3		

Soil Samples

Surface impacted soil: COCs = petroleum hydrocarbons, PAHs; confirmed 2007 [2]

8-12' bgs impacted soil: COCs = petroleum hydrocarbons, BTEX, PAHs; confirmed 2007 [2]

Suspected, impacted surface soil (petroleum hydrocarbons, pesticides, metals, PAHs)

Suspected, impacted soil 8-12' bgs (petroleum hydrocarbons, BTEX and/or PAHs)

Mukilteo multimodal project boundary

2006/2007ARCHAEOLOGICAL/GEOTECHNICAL INVESTIGATION LOCATIONS

- 72 > MTCA (boring)
- BT15 > MTCA (trench)
- 67 >200 ppm PID (boring)
- BT11 >200 ppm PID (trench)
- 13 Observation of impacted soils
- 65 <200 ppm PID (boring)
- BT14 <200 ppm PID (trench)
- 25 Boring locations (8/06; 9/06; 4/07), no impacts observed
- BT3 Approximate NWAA trench locations (7/06) no impacts observed

COCs = contaminants of concern
PAHs = polycyclic aromatic hydrocarbons
BTEX = benzene, toluene, ethylbenzene and xylene
bgs = below ground surface
NFA = no further action
SMS = sediment management standards
SQS = sediment quality standards
DMMP = dredge material management program
SL/ML = screening level/maximum level
MTCA = Model Toxics Control Act

Notes:
1. Sediment COCs encountered at concentrations greater than DMMP SL/ML and/or SMS SQS.
2. Soil COCs encountered at concentrations greater than MTCA A cleanup levels and/or site specific cleanup levels.
3. Ecology granted the site an NFA in 2006. Under the agreed order no cleanup levels were promulgated for petroleum hydrocarbons. There is the potential that shallow soil (0-8' bgs) and groundwater in the upland portion of the site are impacted by petroleum hydrocarbons, PAHs and BTEX based on the historical site use.
4. The sediment sample locations shown are approximate.

*Areas as identified in the "Mukilteo Multimodal Project Draft Environmental Impact Statement Hazardous Materials Discipline Report" January 2012

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MUKILTEO MULTIMODAL PROJECT SITE: DMMP SAMPLING AND ANALYSIS PLAN

FIGURE 3: CONFIRMED AND SUSPECTED CONTAMINANTS OF CONCERN: UPLAND SOIL & IN-WATER SEDIMENT

DRAWING NO. 3
PROJECT NO. FAWAT-07-859
DATE: 2/28/2013
SHEET NO. 3

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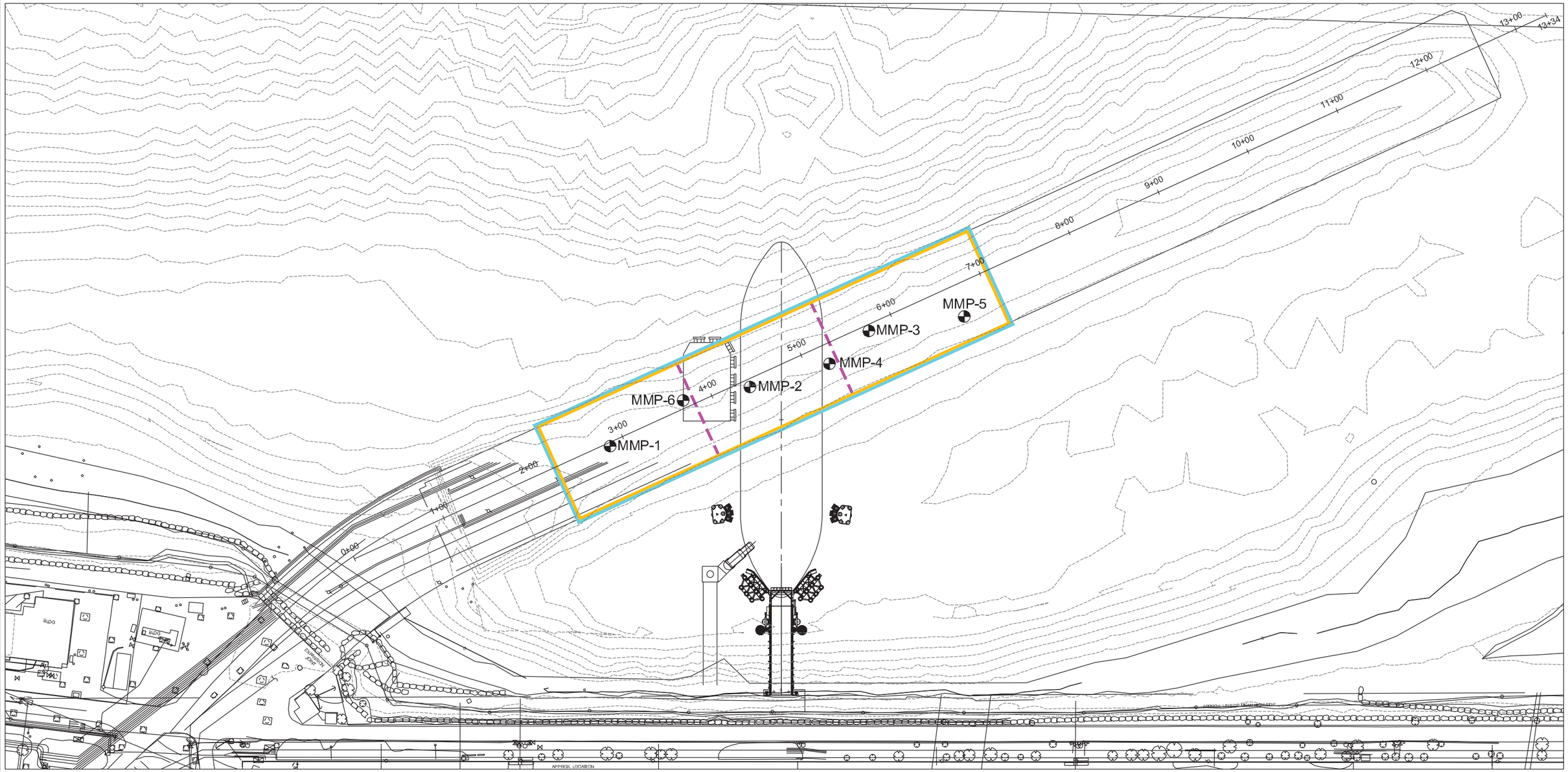

NOTES:

1. THE LOCATION OF FEATURES SHOWN ARE APPROXIMATE
2. THIS FIGURE IS FOR INFORMATION PURPOSES AND IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN THE ATTACHED DOCUMENT

SURFACE DMMU BOUNDARY

DMMU SUBUNIT BOUNDARY

BOUNDARY OF DREDGE PRISM

MMP-1 APPROXIMATE LOCATION OF VIBRACORE

MMP-4 THROUGH MMP-6 APPROXIMATE LOCATION OF ADDITIONAL VIBRACORES

50 0 50 100
scale feet

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MUKILTEO MULTIMODAL PROJECT SITE: DMMP SAMPLING AND ANALYSIS PLAN

FIGURE 4: SITE PLAN - DREDGE PRISM AND VIBRACORE LOCATIONS

DRAWING NO.	4
PROJECT NO.	FAWAT-07-859
DATE:	3/12/2013
SHEET NO.	4

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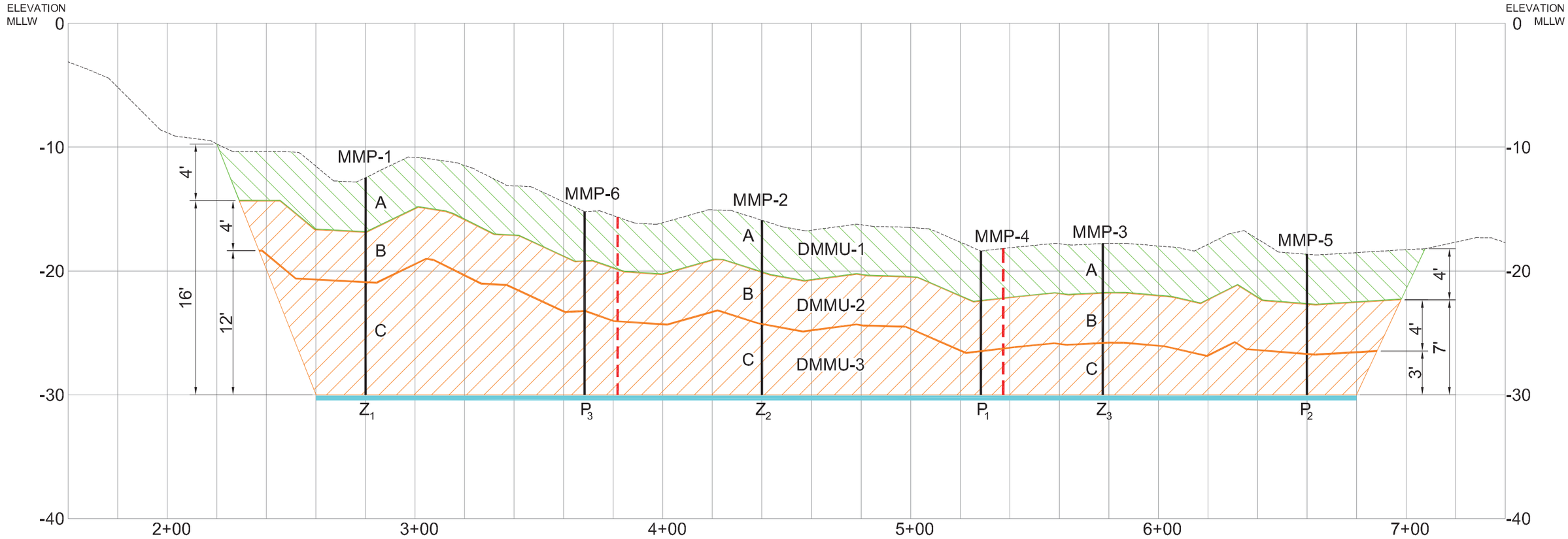

NOTES:

1. IF Z-SAMPLE COLLECTION IS NOT ACHIEVED FROM THE MMP-1 THROUGH MMP-3 VIBRACORES, UP TO 2 ADDITIONAL VIBRACORES, MMP-4 AND MMP-5, WILL BE COMPLETED TO COLLECT Z-SAMPLES IN ALTERNATE LOCATIONS OR POST-DREDGE SAMPLES WILL BE COLLECTED FROM Z_1 THROUGH Z_3 LOCATIONS.
2. THE LOCATION OF FEATURES SHOWN ARE APPROXIMATE.
3. THIS FIGURE IS FOR INFORMATION PURPOSES AND IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN THE ATTACHED DOCUMENT.
4. THE DREDGE PRISM IS ~480 FEET LONG BY ~120 FEET WIDE WITH A DESIGN DEPTH OF -30 FEET MLLW, INCLUDING 2 FEET OF OVERDREDGE.
5. SAMPLE COLLECTION WILL BE ATTEMPTED FROM THE UPPER 10 CENTIMETERS OF POST-DREDGE SURFACE.

	SURFACE MATERIAL (MODERATE RANKING)
	SUBSURFACE MATERIAL (HIGH RANKING)
	POST-DREDGE SURFACE MATERIAL
MLLW	MEAN LOWER LOW WATER
DMMU-1	DREDGE MATERIAL MANAGEMENT UNIT
MMP-1	APPROXIMATE VIBRACORE LOCATION
A	SUBUNIT IDENTIFICATION
Z_1	APPROXIMATE POST-DREDGE SURFACE SAMPLE LOCATION
P_1	POTENTIAL ALTERNATE Z-SAMPLE LOCATIONS
MMP-4 THROUGH MMP-6	APPROXIMATE LOCATION OF POTENTIAL ADDITIONAL VIBRACORE LOCATIONS

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MUKILTEO MULTIMODAL PROJECT SITE: DMMP SAMPLING AND ANALYSIS PLAN

FIGURE 5: SCHEMATIC DMMU PLAN

DRAWING NO.	5
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DATE:	2/28/2013
SHEET NO.	5

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Appendix A
2012 Sediment Sampling Analytical Data Results

Table 3-1 - Conventional Parameters

		0' - 4' intervals												4' - 8' intervals						8' - 12' intervals					
ANALYTE	UNITS	V1/V6	Q[1]	D1	Q[1]	V2/V5	Q[1]	D2	Q[1]	V3/V4	Q[1]	D3	Q[1]	V1/V6	Q[1]	V5	Q[1]	V3/V4	Q[1]	V1	Q[1]	V5	Q[1]	V4	Q[1]
CONVENTIONALS																									
Total Solids	%	68.7		69.8		55.8		59.6		65.4		85.2		76.1		68.3		66.9		92.9		87.6		64.7	
Preserved Total Solids	%	67.7		75.7		55.0		69.3		67.6		80.7		77.9		68.5		75.6		86.2		84.1		71.1	
Total Volatile Solids	%	2.94		2.6		5.31		5.5		2.72		1.45		1.88		2.72		2.68		0.68		0.67		3.71	
N-Ammonia	mg-N/kg dw	12.2		2.92		6.5		3.36		8.2		2.30		16.7		2.5		13.9		0.7		0.6		28.5	
Sulfide	mg/kg dw	218		153		376		159		409		6.99		32		402		246		6.8		1.19	U	530	
Acid Volatile Sulfide	mg/kg dw	231		173		15.6		18.8		12		56		126		707		136		6.2		1.14	U	474	
Total Organic Carbon	%	1.32		1.75		2.40		1.77		1.12		1.72		1.05		1.26		1.35		0.339		0.104		1.34	
GRAIN SIZE																									
Gravel	**%**	**16.5**		**25.1**		**25.6**		**26.5**		**30.5**		**30.7**		**6.7**		**16.6**		**34.2**		**4.2**		**26.2**		**34.5**	
Very Coarse Sand	%	14.2		16.5		20.9		16.7		22.0		14.9		11.0		15.3		22.3		14.5		19.0		14.3	
Coarse Sand	%	24.6		21.2		13.0		14.8		14.9		21.3		25.8		18.8		16.1		37.2		25.0		10.3	
Medium Sand	%	22.2		18.1		10.0		17.4		9.9		20.3		22.9		17.3		9.5		34.2		22.9		9.1	
Fine Sand	%	7.2		6.4		7.7		7.0		5.7		6.0		7.0		7.8		3.6		6.8		4.8		6.8	
Very Fine Sand	%	3.6		2.9		5.4		2.2		3.5		1.5		6.9		5.3		2.3		1.4		0.5		4.1	
Total Sand	**%**	**71.8**		**65.1**		**57.0**		**58.1**		**56.0**		**64.0**		**73.6**		**64.5**		**53.8**		**94.1**		**72.2**		**44.6**	
Coarse Silt	%	1.4		1.1		2.4		2.3		0.7		0.2		6.0		3.9		0.9		1.6	U	1.6	U	4.9	
Medium Silt	%	1.2		0.9		1.7		1.5		1.2		0.4		3.8		2.2		1.1		1.6	U	1.6	U	1.9	
Fine Silt	%	1.5		1.6		5.0		3.5		4.0		0.5		2.3		2.6		2.0		1.6	U	1.6	U	3.3	
Very Fine Silt	%	2.7		2.0		3.5		3.1		3.3		1.0		1.8		3.0		2.9		1.6	U	1.6	U	3.9	
8-9 Phi Clay	%	1.7		1.3		1.5		1.8		1.5		0.8		1.5		2.2		1.7		1.6	U	1.6	U	2.5	
9-10 Phi Clay	%	1.5		1.3		1.0		1.1		0.9		0.8		1.5		2.2		1.5		1.6	U	1.6	U	2.0	
> 10 Phi Clay	%	1.8		1.7		2.3		2.1		1.8		1.4		2.9		2.9		1.9		1.6	U	1.6	U	2.3	
Total Fines	**%**	**11.8**		**9.9**		**17.4**		**15.4**		**13.4**		**5.3**		**19.8**		**19.0**		**12.0**		**1.6**	**U**	**1.6**	**U**	**20.9**	

1) Qualifier (Q)

U - The target analyte was not detected at the reported concentration.

Table 3.1 source"Mukilteo Multimodal Project Y-10936 TAA; Sediment Sampling Data Report," by Parametrix for WSDOT, November 2012

Table 3-2 - Comparison to DMMP Criteria

	DMMP Screening Criteria			0' - 4' intervals												4' - 8' intervals						8' - 12' intervals					
ANALYTE	SL	ML	UNITS	V1/V6	Q[11]	D1	Q[11]	V2/V5	Q[11]	D2	Q[11]	V3/V4	Q[11]	D3	Q[11]	V1/V6	Q[11]	V5	Q[11]	V3/V4	Q[11]	V1	Q[11]	V5	Q[11]	V4	Q[11]
METALS (mg/kg)																											
Antimony	150	200	mg/kg dw	20	U	20	U	40	U	20	U	40	U	6	U	6	U	20	U	30	U	5	U	5	U	20	U
Arsenic	57	700	mg/kg dw	20	U	20	U	40	U	20	U	40	U	6	U	6	U	20	U	30	U	5	U	5	U	20	U
Cadmium	5.1	14	mg/kg dw	0.7	U	0.6	U	2	U	0.8	U	2	U	0.3		0.2	U	0.7	U	1	U	0.2	U	0.2	U	0.7	U
Chromium	260	- - -	mg/kg dw	31		23		15		51		22		24		35.2		33		23		21.3		22.9		25	
Copper	390	1300	mg/kg dw	12.8		11.9		12		13.3		10		10.2		17		17.9		20		6.1		7.7		22	
Lead	450	1200	mg/kg dw	7	U	6	U	20	U	8	U	20	U	14		4		10		20		2	U	2	U	25	
Mercury	0.41	2.3	mg/kg dw	0.03	U	0.04		0.03	U	0.05		0.03		0.03		0.08		0.07		0.03		0.02	U	0.03	U	0.25	
Nickel	- - -	- - -	mg/kg dw	29		27		16		36		21		27		34		35		24		26		38		26	
Selenium[1]	- - -	- - -	mg/kg dw	20	U	20	U	40	U	20	U	40	U	6	U	6	U	20	U	30	U	5	U	5	U	20	U
Silver	6.1	8.4	mg/kg dw	1.0	U	1.0	U	3	U	1.0	U	2	U	0.4	U	0.4	U	1	U	2	U	0.3	U	0.3	U	1.0	U
Zinc	410	3800	mg/kg dw	52		32		40		33		32		28		32		50		96		23		29		100	
ORGANOMETALLIC COMPOUNDS																											
Tributyltin ion (bulk)[2]	73	- - -	ug/kg dw	3.8	U	- - -		3.6	U	- - -		3.5	U	- - -		3.5	U	3.5	U	22.0		3.4	U	3.6	U	3.4	U
PAHs																											
Naphthalene	2100	2400	ug/kg dw	41		170		100		160		120		45		98		99		36		20	U	18	U	240	
Acenaphthylene	560	1300	ug/kg dw	20		43		45		65		35		24		22		41		25		20	U	18	U	53	
Acenaphthene	500	2000	ug/kg dw	26		110		23		41		37		36		46		30		16	J	20	U	18	U	160	
Fluorene	540	3600	ug/kg dw	28		100		42		55		64		47		54		50		29		20	U	18	U	150	
Phenanthrene	1500	21000	ug/kg dw	210		260		260		170		340		150		170		160		160		20	U	18	U	430	
Anthracene	960	13000	ug/kg dw	50		140		93		120		120		110		70		94		82		20	U	18	U	250	
Total LPAHs	**5200**	**29000**	**ug/kg dw**	**375**		**823**		**563**		**611**		**716**		**412**		**460**		**474**		**348**		**20**	**U**	**18**	**U**	**1283**	
2-Methylnaphthalene[3]	670	1900	ug/kg dw	20	U	32		15	J	42		25		11	J	25		22		10	J	20	U	18	U	50	
Fluoranthene	1,700	30000	ug/kg dw	550		340		980		360		1600		200		260		220		690		20	U	18	U	1200	
Pyrene	2,600	16000	ug/kg dw	760		1900		1000		1900		1900		1800		630		1200		1300		20	U	27		4700	
Benzo(a)anthracene	1300	5100	ug/kg dw	99		260		300		290		350		240		120		150		200		20	U	18	U	550	
Chrysene	1,400	21000	ug/kg dw	220		480		600		560		780		540		180		300		420		20	U	18	U	1000	
Total Benzofluoranthenes[4,5]	3200	9900	ug/kg dw	320		1600		870		1400		1400		1800		400		900		900		20	U	11	J	2700	
Benzo(a)pyrene	1,600	3600	ug/kg dw	140		690		330		590		570		820		200		420		370		20	U	18	U	1300	
Indeno(1,2,3-cd)pyrene	600	4400	ug/kg dw	60		310		160		310		290		340		87		170		180		20	U	18	U	530	
Dibenz(a,h)anthracene	230	1900	ug/kg dw	23		120		58		120		97		140		33		67		63		4.9	U	4.6	U	180	
Benzo(g,h,i)perylene	670	3200	ug/kg dw	61		300		150		320		280		340		94		170		180		20	U	18	U	570	
Total HPAHs	**12000**	**69000**	**ug/kg dw**	**2233**		**6000**		**4448**		**5850**		**7267**		**6220**		**2004**		**3597**		**4303**		**20**	**U**	**38**		**12730**	
CHLORINATED HYDROCARBONS																											
1,3-Dichlorobenzene	- - -	- - -	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	J	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
1,4-Dichlorobenzene	110	120	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
1,2-Dichlorobenzene	35	110	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
1,2,4-Trichlorobenzene	31	64	ug/kg dw	5	U	4.6	U	4.7	U	4.9	U	4.8	U	4.7	U	4.8	U	4.7	U	4.6	U	4.4	U	4.4	U	4.8	U
Hexachlorobenzene (HCB)	22	230	ug/kg dw	0.47	U	0.48	U	0.48	U	0.49	U	0.48	U	0.47	U	0.48	U	0.47	U	0.47	U	0.47	U	0.47	U	4.7	U
PHTHALATES[6]																											
Dimethyl phthalate	71	1400	ug/kg dw	5	U	4.6	U	4.7	U	4.9	U	4.8	U	4.7	U	4.8	U	4.7	U	4.6	U	4.9	U	4.6	U	4.8	U
Diethyl phthalate	200	1200	ug/kg dw	50	U	46	U	47	U	49	U	48	U	47	U	48	U	47	U	46	U	49	U	46	U	48	U
Di-n-butyl phthalate	1400	5100	ug/kg dw	20	U	19	U	19	U	20	U	19	U	19	U	19	U	19	U	18	U	20	U	18	U	19	U
Butyl benzyl phthalate	63	970	ug/kg dw	5	U	4.6	U	5.1	Q	3.3	J	2.8	J	4.7	U	4.8	U	4.7	U	4.6	U	3.4	J	4.6	U	4.8	U
Bis(2-ethylhexyl) phthalate	1300	8300	ug/kg dw	25	U	27		24	U	17	J	24	U	17	J	24	U	24	U	23	U	25	U	23	U	24	U
Di-n-octyl phthalate	6200	6200	ug/kg dw	20	U	19	U	19	U	20	U	19	U	19	U	19	U	19	U	18	U	20	U	18	U	19	U
PHENOLS																											
Phenol	420	1200	ug/kg dw	20		23		37		30		21		19	U	12	J	14	J	18	U	20	U	18	U	13	J
2-Methylphenol	63	77	ug/kg dw	5.0	U	5.9		3.6	J	24		4.8	U	4.7	U	4.8	U	4.7	U	4.6	U	4.9	U	4.6	U	4.8	U
4-Methylphenol	670	3600	ug/kg dw	40	U	16	J	13	J	23	J	32	J	37	U	27	J	11	J	37	U	40	U	36	U	22	J
2,4-Dimethylphenol	29	210	ug/kg dw	20	U	6.8	J	4.3	J	21		19	U	19	U	3.8	J	3.3	J	18	U	20	U	18	U	3.4	J
Pentachlorophenol	400	690	ug/kg dw	50	U	46	U	47	U	49	U	48	U	47	U	48	U	47	U	46	U	49	U	46	U	48	U
MISCELLANEOUS EXTRACTABLES																											
Benzyl alcohol	57	870	ug/kg dw	20	U	19	U	19	U	7.5	J	19	U	19	U	19	U	19	U	18	U	20	U	18	U	19	U
Benzoic acid	650	760	ug/kg dw	400	U	370	U	110	J	390	U	380	U	370	U	380	U	380	U	370	U	400	U	360	U	380	U
Dibenzofuran	540	1700	ug/kg dw	19	J	80		28		43		40		29		40		38		17	J	20	U	18	U	100	
Hexachloroethane	- - -	- - -	ug/kg dw	20	U	19	U	19	U	20	U	19	U	19	U	19	U	19	U	18	U	20	U	18	U	19	U
Hexachlorobutadiene	11	270	ug/kg dw	0.47	U	0.48	U	0.48	U	0.49	U	0.48	U	0.47	U	0.48	U	0.47	U	0.47	U	0.47	U	0.47	U	4.8	U
N-Nitrosodiphenylamine	28	130	ug/kg dw	20	U	19	U	19	U	20	U	19	U	4.8	J	19	U	19	U	18	U	20	U	18	U	6.7	J
VOCs																											
Trichloroethene	- - -	- - -	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
Tetrachloroethene	- - -	- - -	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
Ethylbenzene	- - -	- - -	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
m,p-Xylene	- - -	- - -	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
o-Xylene	- - -	- - -	ug/kg dw	1.1	U	1.2	U	1.3	U	1.4	U	1.1	U	1.2	U	1	U	1.1	U	0.9	U	0.9	U	0.9	U	1.1	U
Total Xylene[7]	**- - -**	**- - -**	**ug/kg dw**	**2.2**	**U**	**2.4**	**U**	**2.6**	**U**	**2.7**	**U**	2.3	U	**2.4**	**U**	**1.9**	**U**	**2.2**	**U**	1.9	U	**1.7**	**U**	**1.8**	**U**	**2.3**	**U**
PESTICIDES & PCBs																											
4,4'-DDD	16	- - -	ug/kg dw	1.5		0.96	U	0.96	U	0.97	U	0.96	U	0.95	U	1.8		0.93	U	0.94	U	0.94	U	0.93	U	9.5	U
4,4'-DDE	9	- - -	ug/kg dw	0.93	U	0.96	U	0.96	U	0.97	U	0.96	U	0.95	U	0.95	U	0.93	U	0.94	U	0.94	U	0.93	U	9.5	U
4,4'-DDT	12	- - -	ug/kg dw	1.4	UY	0.96	U	2.7	UY	0.97	U	2.6	UY	0.95	U	0.95	U	0.93	U	1.7	UY	0.94	U	0.93	U	9.5	U
Total DDT[8]	**- - -**	**69**	**ug/kg dw**	**1.5**		**0.96**	**U**	**2.7**	**UY**	**0.97**	**U**	**2.6**	**UY**	**0.95**	**U**	**1.8**		**0.93**	**U**	**1.7**	**UY**	**0.94**	**U**	**0.93**	**U**	**9.5**	**U**
Aldrin	9.5	- - -	ug/kg dw	0.47	U	0.48	U	0.48	U	0.49	U	0.48	U	0.47	U	0.48	U	0.47	U	0.47	U	0.47	U	0.47	U	4.7	U
cis-Chlordane	- - -	- - -	ug/kg dw	0.47	U	0.48	U	0.48	U	0.49	U	0.48	U	0.47	U	0.48	U	0.47	U	0.47	U	0.47	U	0.47	U	4.7	U
trans-Chlordane	- - -	- - -	ug/kg dw	1.1	UY	1.9	U	0.48	U	1.9	U	0.94	UY	1.9	U	0.48	U	0.47	U	0.61	UY	0.5	U	0.47	U	4.7	U
cis-Nonachlor	- - -	- - -	ug/kg dw	1.9	U	0.48	U	1.9	U	0.68	UY	1.9	U	0.47	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	19	U
trans-Nonachlor	- - -	- - -	ug/kg dw	7.1		1.9	U	11		2.2	UY	8.6		1.9	U	1.9	U	2.7		4.6		1.9	U	1.9	U	19	U
oxy Chlordane	- - -	- - -	ug/kg dw	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	19	U
Total Chlordane[4,9]	**2.8**	**- - -**	**ug/kg dw**	**7.1**		**1.9**	**U**	**11**		**2.2**	**UY**	**8.6**		**1.9**	**U**	**1.9**	**U**	**2.7**		**4.6**		**1.9**	**U**	**1.9**	**U**	**19**	**U**
Dieldrin	1.9	1700	ug/kg dw	0.93	U	0.96	U	0.96	U	0.97	U	0.96	U	0.95	U	0.95	U	0.93	U	0.94	U	0.94	U	0.93	U	9.5	U
Heptachlor	1.5	270	ug/kg dw	0.47	U	0.48	U	0.60	UY	0.49	U	0.63	UY	0.47	U	0.48	U	0.47	U	0.47	U	0.47	U	0.47	U	4.7	U
gamma-BHC (Lindane)	- - -	- - -	ug/kg dw	0.47	U	0.48	U	0.48	U	1.2	UY	0.48	U	0.47	U	0.48	U	0.47	U	0.47	U	0.47	U	0.47	U	4.7	U
Aroclor 1016	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Aroclor 1221	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Aroclor 1232	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Aroclor 1242	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Aroclor 1248	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Aroclor 1254	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Aroclor 1260	- - -	- - -	ug/kg dw	9.5	U	9.5	U	9.6	U	9.4	U	9.6	U	9.2	U	9.5	U	9.5	U	9.7	U	9.6	U	9.4	U	9.4	U
Total PCBs[10]	**130**	**3100**	**ug/kg dw**	**9.5**	**U**	**9.5**	**U**	**9.6**	**U**	**9.4**	**U**	**9.6**	**U**	**9.2**	**U**	**9.5**	**U**	**9.5**	**U**	**9.7**	**U**	**9.6**	**U**	**9.4**	**U**	**9.4**	**U**
PETROLEUM HYDROCARBONS																											
Gasoline Range Hydrocarbons	- - -	- - -	mg/kg dw	11	U	- - -		15	U	- - -		12	U	- - -		9.5	U	12	U	9	U	6.3	U	6.6	U	11	U
Diesel Range Hydrocarbons	- - -	- - -	mg/kg dw	44		- - -		37		- - -		24		- - -		17		34		25		5.4	U	5.6	U	120	
Motor Oil	- - -	- - -	mg/kg dw	100		- - -		46		- - -		28		- - -		33		72		39		11	U	11	U	300	

Non-Detect SL Exceedance U

SL Exceedance

1) As no SL value exists to trigger toxicity testing, this chemical will only be evaluated for its bioaccumulative potential.
2) Bulk sediment measurement of TBT is used only when porewater extraction cannot be accomplished.
3) 2-Methylnaphthalene is not included in the summation for total LPAH.
4) Components of benzofluoranthenes and chlordane were clarified at the 2007 SMARM.
5) Sum of b,j, k-Benzofluoranthenes.
6) Based on 1998 LAET/HAET's; see http://www.nws.usace.army.mil/PublicMenu/Doc_list.cfm?sitename=dmmo&pagename=17th_ARM_MAy_5_2004.
7) Sum of m,p and o-Xylenes.
8) Sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT.
9) Sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor and oxychlordane.
10) Sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260.
11) Qualifier (Q)
U - The target analyte was not detected at the reported concentration.
J - Estimated concentration when the value is less than the laboratory's established reporting limits.
UY - Compound not detected at or above reported concentration. However, the analyte reporting limit is raised due to a positive chromatographic interference thus the analyte may be present below the increased limit.
JM - Estimated (Maximum Possible) Concentration is less than the laboratory's established reporting limits

Table 3.2 source"Mukilteo Multimodal Project Y-10936 TAA; Sediment Sampling Data Report," by Parametrix for WSDOT, November 2012

Table 3-3 - Comparison to Washington State SMS

	SMS Screening Criteria			0' - 4' intervals												4' - 8' intervals						8' - 12' intervals					
ANALYTE	SQS	CSL	UNITS	V1/V6	Q[11]	D1	Q[11]	V2/V5	Q[11]	D2	Q[11]	V3/V4	Q[11]	D3	Q[11]	V1/V6	Q[11]	V5	Q[11]	V3/V4	Q[11]	V1	Q[11]	V5	Q[11]	V4	Q[11]
METALS (mg/kg)																											
Arsenic	57	93	mg/kg dw	20	U	20	U	40	U	20	U	40	U	6	U	6	U	20	U	30	U	5	U	5	U	20	U
Cadmium	5.1	6.7	mg/kg dw	0.7	U	0.6	U	2	U	0.8	U	2	U	0.3		0.2	U	0.7	U	1	U	0.2	U	0.2	U	0.7	U
Chromium	260	270	mg/kg dw	31		23		15		51		22		24		35.2		33		23		21.3		22.9		25	
Copper	390	390	mg/kg dw	12.8		11.9		12		13.3		10		10.2		17		17.9		20		6.1		7.7		22	
Lead	450	530	mg/kg dw	7	U	6	U	20	U	8	U	20	U	14		4		10		20		2	U	2	U	25	
Mercury	0.41	0.59	mg/kg dw	0.03	U	0.04		0.03	U	0.05		0.03		0.03		0.08		0.07		0.03		0.02	U	0.03	U	0.25	
Silver	6.1	6.1	mg/kg dw	1.0	U	1.0	U	3	U	1.0	U	2	U	0.4	U	0.4	U	1	U	2	U	0.3	U	0.3	U	1.0	U
Zinc	410	960	mg/kg dw	52		32		40		33		32		28		32		50		96		23		29		100	
PAHs																											
Naphthalene	99	170	mg/kg oc	3.1		9.7		4.2		9.0		10.7		2.6		9.3		7.9		2.7		5.9	U	17.3	U	17.9	
Acenaphthylene	66	66	mg/kg oc	1.5		2.5		1.9		3.7		3.1		1.4		2.1		3.3		1.9		5.9	U	17.3	U	4.0	
Acenaphthene	16	57	mg/kg oc	2.0		6.3		1.0		2.3		3.3		2.1		4.4		2.4		1.2	J	5.9	U	17.3	U	11.9	
Fluorene	23	79	mg/kg oc	2.1		5.7		1.8		3.1		5.7		2.7		5.1		4.0		2.1		5.9	U	17.3	U	11.2	
Phenanthrene	100	480	mg/kg oc	15.9		14.9		10.8		9.6		30.4		8.7		16.2		12.7		11.9		5.9	U	17.3	U	32.1	
Anthracene	220	1200	mg/kg oc	3.8		8.0		3.9		6.8		10.7		6.4		6.7		7.5		6.1		5.9	U	17.3	U	18.7	
Total LPAHs	**370**	**780**	**mg/kg oc**	**28**		**47**		**23**		**35**		**64**		**24**		**44**		**38**		**26**		**5.9**	**U**	**17.3**	**U**	**96**	
2-Methylnaphthalene[3]	38	64	mg/kg oc	1.5	U	1.8		0.6	J	2.4		2.2		0.6	J	2.4		1.7		0.7	J	5.9	U	17.3	U	3.7	
Fluoranthene	160	1200	mg/kg oc	41.7		19.4		40.8		20.3		142.9		11.6		24.8		17.5		51.1		5.9	U	17.3	U	89.6	
Pyrene	1,000	1400	mg/kg oc	57.6		108.6		41.7		107.3		169.6		104.7		60.0		95.2		96.3		5.9	U	26.0		350.7	
Benzo(a)anthracene	110	270	mg/kg oc	7.5		14.9		12.5		16.4		31.3		14.0		11.4		11.9		14.8		5.9	U	17.3	U	41.0	
Chrysene	110	460	mg/kg oc	16.7		27.4		25.0		31.6		69.6		31.4		17.1		23.8		31.1		5.9	U	17.3	U	74.6	
Total Benzofluoranthenes[4,5]	230	450	mg/kg oc	24.2		91.4		36.3		79.1		125.0		104.7		38.1		71.4		66.7		5.9	U	10.6	J	201.5	
Benzo(a)pyrene	99	210	mg/kg oc	10.6		39.4		13.8		33.3		50.9		47.7		19.0		33.3		27.4		5.9	U	17.3	U	97.0	
Indeno(1,2,3-cd)pyrene	34	88	mg/kg oc	4.5		17.7		6.7		17.5		25.9		19.8		8.3		13.5		13.3		5.9	U	17.3	U	39.6	
Dibenz(a,h)anthracene	12	33	mg/kg oc	1.7		6.9		2.4		6.8		8.7		8.1		3.1		5.3		4.7		1.4	U	4.4	U	13.4	
Benzo(g,h,i)perylene	31	78	mg/kg oc	4.6		17.1		6.3		18.1		25.0		19.8		9.0		13.5		13.3		5.9	U	17.3	U	42.5	
Total HPAHs	**960**	**5300**	**mg/kg oc**	**169**		**343**		**185**		**331**		**649**		**362**		**191**		**285**		**319**		**5.9**	**U**	**37**		**950**	
CHLORINATED HYDROCARBONS																											
1,4-Dichlorobenzene	3.1	9	mg/kg oc	0.08	U	0.07	U	0.05	U	0.08	U	0.10	U	0.07	U	0.10	U	0.09	U	0.07	U	0.27	U	0.87	U	0.08	U
1,2-Dichlorobenzene	2.3	2.3	mg/kg oc	0.08	U	0.07	U	0.05	U	0.08	U	0.10	U	0.07	U	0.10	U	0.09	U	0.07	U	0.27	U	0.87	U	0.08	U
1,2,4-Trichlorobenzene	0.81	1.8	mg/kg oc	0.38	U	0.26	U	0.20	U	0.28	U	0.43	U	0.27	U	0.46	U	0.37	U	0.34	U	1.30	U	4.23	U	0.36	U
Hexachlorobenzene (HCB)	0.38	2.3	mg/kg oc	0.04	U	0.03	U	0.02	U	0.03	U	0.04	U	0.03	U	0.05	U	0.04	U	0.03	U	0.14	U	0.45	U	0.35	U
PHTHALATES[6]																											
Dimethyl phthalate	53	53	mg/kg oc	0.4	U	0.3	U	0.2	U	0.3	U	0.4	U	0.3	U	0.5	U	0.4	U	0.3	U	1.4	U	4.4	U	0.4	U
Diethyl phthalate	61	110	mg/kg oc	3.8	U	2.6	U	2.0	U	2.8	U	4.3	U	2.7	U	4.6	U	3.7	U	3.4	U	14.5	U	44.2	U	3.6	U
Di-n-butyl phthalate	220	1700	mg/kg oc	1.5	U	1.1	U	0.8	U	1.1	U	1.7	U	1.1	U	1.8	U	1.5	U	1.3	U	5.9	U	17.3	U	1.4	U
Butyl benzyl phthalate	4.9	64	mg/kg oc	0.4	U	0.3	U	0.2	Q	0.2	J	0.3	J	0.3	U	0.5	U	0.4	U	0.3	U	1.0	J	4.4	U	0.4	U
Bis(2-ethylhexyl) phthalate	47	78	mg/kg oc	1.9	U	1.5		1.0	U	1.0	J	2.1	U	1.0	J	2.3	U	1.9	U	1.7	U	7.4	U	22.1	U	1.8	U
Di-n-octyl phthalate	58	4500	mg/kg oc	1.5	U	1.1	U	0.8	U	1.1	U	1.7	U	1.1	U	1.8	U	1.5	U	1.3	U	5.9	U	17.3	U	1.4	U
MISCELLANEOUS EXTRACTABLES																											
Dibenzofuran	15	58	mg/kg oc	1.4	J	4.6		1.2		2.4		3.6		1.7		3.8		3.0		1.3	J	5.9	U	17.3	U	7.5	
Hexachlorobutadiene	3.9	6.2	mg/kg oc	0.04	U	0.03	U	0.02	U	0.03	U	0.04	U	0.03	U	0.05	U	0.04	U	0.03	U	0.14	U	0.45	U	0.36	U
N-Nitrosodiphenylamine	11	11	mg/kg oc	1.5	U	1.1	U	0.8	U	1.1	U	1.7	U	0.3	J	1.8	U	1.5	U	1.3	U	5.9	U	17.3	U	0.5	J
Total PCBs[10]	**12**	**65**	**mg/kg oc**	**0.72**	**U**	**0.54**	**U**	**0.40**	**U**	**0.53**	**U**	**0.86**	**U**	**0.53**	**U**	**0.90**	**U**	**0.75**	**U**	**0.72**	**U**	**2.8**	**U**	**9.0**	**U**	**0.70**	**U**
Aroclor 1016	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
Aroclor 1221	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
Aroclor 1232	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
Aroclor 1242	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
Aroclor 1248	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
Aroclor 1254	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
Aroclor 1260	- - -	- - -	mg/kg oc	0.72	U	0.54	U	0.40	U	0.53	U	0.86	U	0.53	U	0.90	U	0.75	U	0.72	U	2.8	U	9.0	U	0.70	U
IONIZABLE ORGANIC COMPOUNDS																											
Phenol	420	1200	ug/kg dw	20		23		37		30		21		19	U	12	J	14	J	18	U	20	U	18	U	13	J
2-Methylphenol	63	63	ug/kg dw	5.0	U	5.9		3.6	J	24		4.8	U	4.7	U	4.8	U	4.7	U	4.6	U	4.9	U	4.6	U	4.8	U
4-Methylphenol	670	670	ug/kg dw	40	U	16	J	13	J	23	J	32	J	37	U	27	J	11	J	37	U	40	U	36	U	22	J
2,4-Dimethylphenol	29	29	ug/kg dw	20	U	6.8	J	4.3	J	21		19	U	19	U	3.8	J	3.3	J	18	U	20	U	18	U	3.4	J
Pentachlorophenol	360	690	ug/kg dw	50	U	46	U	47	U	49	U	48	U	47	U	48	U	47	U	46	U	49	U	46	U	48	U
Benzyl alcohol	57	73	ug/kg dw	20	U	19	U	19	U	7.5	J	19	U	19	U	19	U	19	U	18	U	20	U	18	U	19	U
Benzoic acid	650	650	ug/kg dw	400	U	370	U	110	J	390	U	380	U	370	U	380	U	380	U	370	U	400	U	360	U	380	U
CONVENTIONALS																											
Total Solids	- - -	- - -	%	68.7		69.8		55.8		59.6		65.4		85.2		76.1		68.3		66.9		92.9		87.6		64.7	
Preserved Total Solids	- - -	- - -	%	67.7		75.7		55.0		69.3		67.6		80.7		77.9		68.5		75.6		86.2		84.1		71.1	
Total Volatile Solids	- - -	- - -	%	2.94		2.6		5.31		5.5		2.72		1.45		1.88		2.72		2.68		0.68		0.67		3.71	
N-Ammonia	- - -	- - -	mg-N/kg dw	12.2		2.92		6.5		3.36		8.2		2.30		16.7		2.5		13.9		0.7		0.6		28.5	
Sulfide	- - -	- - -	mg/kg dw	218		153		376		159		409		6.99		32		402		246		6.8		1.19	U	530	
Acid Volatile Sulfide	- - -	- - -	mg/kg dw	231		173		15.6		18.8		12		56		126		707		136		6.2		1.14	U	474	
Total Organic Carbon	- - -	- - -	%	1.32		1.75		2.40		1.77		1.12		1.72		1.05		1.26		1.35		0.339		0.1		1.34	
GRAIN SIZE																											
Gravel	- - -	- - -	**%**	**16.5**		**25.1**		**25.6**		**26.5**		**30.5**		**30.7**		**6.7**		**16.6**		**34.2**		**4.2**		**26.2**		**34.5**	
Total Sand	- - -	- - -	%	71.8		65.1		57.0		58.1		56.0		64.0		73.6		64.5		53.8		94.1		72.2		44.6	
Total Fines	- - -	- - -	%	11.8		9.9		17.4		15.4		13.4		5.3		19.8		19.0		12.0		1.6	U	1.6	U	20.9	

1) As no SL value exists to trigger toxicity testing, this chemical will only be evaluated for its bioaccumulative potential.
2) Bulk sediment measurement of TBT is used only when porewater extraction cannot be accomplished.
3) 2-Methylnaphthalene is not included in the summation for total LPAH.
4) Components of benzofluoranthenes and chlordane were clarified at the 2007 SMARM.
5) Sum of b,j, k-Benzofluoranthenes.
6) Based on 1998 LAET/HAET's; see http://www.nws.usace.army.mil/PublicMenu/Doc_list.cfm?sitename=dmmo&pagename=17th_ARM_MAy_5_2004.
7) Sum of m,p and o-Xylenes.
8) Sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT.
9) Sum of cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor and oxychlordane.
10) Sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260.
11) Qualifier (Q)
U - The target analyte was not detected at the reported concentration.
J - Estimated concentration when the value is less than the laboratory's established reporting limits.
UY - Compound not detected at or above reported concentration. However, the analyte reporting limit is raised due to a positive chromatographic interference thus the analyte may be present below the increased limit.
JM - Estimated (Maximum Possible) Concentration is less than the laboratory's established reporting limits

Non-Detect SQS Exceedance U
SQS Exceedance

Table 3.3 source: "Mukilteo Multimodal Project Y-10936 TAA; Sediment Sampling Data Report," by Parametrix for WSDOT, November 2012

Table 3-4. Dioxin/Furan Results

				0' - 4' Interval								
	ANALYTE	TEF	Units	V1/V6	TEQ	Q	V2/V5	TEQ	Q	V3/V4	TEQ	Q
Dioxins	2,3,7,8-TCDD	1	pg/g dw	0.166	0.166	JM	0.168	0.168	JM	0.157	0.157	JM
	1,2,3,7,8-PeCDD	1	pg/g dw	0.535	0.535	J	0.585	0.585	J	0.52	0.52	J
	1,2,3,4,7,8-HxCDD	0.1	pg/g dw	0.6	0.06	J	0.737	0.0737	J	0.33	0.033	JM
	1,2,3,6,7,8-HxCDD	0.1	pg/g dw	1.69	0.169	J	3.16	0.316		1.9	0.19	J
	1,2,3,7,8,9-HxCDD	0.1	pg/g dw	1.19	0.119	J	1.65	0.165	J	1.02	0.102	JM
	1,2,3,4,6,7,8-HpCDD	0.01	pg/g dw	48.8	0.488		150	1.5		36.5	0.365	
	OCDD	0.0003	pg/g dw	479	0.1437		2400	0.72		342	0.1026	
Furans	2,3,7,8-TCDF	0.1	pg/g dw	1.09	0.109		1.44	0.144		1.4	0.14	
	1,2,3,7,8-PeCDF	0.03	pg/g dw	0.284	0.00852	JM	0.275	0.00825	J	0.247	0.00741	J
	2,3,4,7,8-PeCDF	0.3	pg/g dw	0.355	0.1065	J	0.355	0.1065	J	0.3	0.09	J
	1,2,3,4,7,8-HxCDF	0.1	pg/g dw	0.529	0.0529	J	0.699	0.0699	J	0.393	0.0393	J
	1,2,3,6,7,8-HxCDF	0.1	pg/g dw	0.367	0.0367	JM	0.361	0.0361	J	0.347	0.0347	J
	2,3,4,6,7,8-HxCDF	0.1	pg/g dw	0.452	0.0452	J	0.351	0.0351	J	0.402	0.0402	J
	1,2,3,7,8,9-HxCDF	0.1	pg/g dw	0.296	0.0296	J	0.178	0.0178	JM	0.104	0.0104	JM
	1,2,3,4,6,7,8-HpCDF	0.01	pg/g dw	6.36	0.0636		11.8	0.118		6.01	0.0601	
	1,2,3,4,7,8,9-HpCDF	0.01	pg/g dw	0.592	0.00592	J	0.964	0.00964	J	0.296	0.00296	JM
	OCDF	0.0003	pg/g dw	19.5	0.00585		49.2	0.01476		15.9	0.00477	
			Total TEQ		**2.14449**			**4.08775**			**1.89944**	

Qualifier (Q)

U - The target analyte was not detected at the reported concentration.

J - Estimated concentration when the value is less than the laboratory's established reporting limits.

UJY - Compound not detected at or above reported concentration but may be present below that limit because the analyte reporting limit is raised due to a positive chromatographic interference.

JM - Estimated (Maximum Possible) Concentration is less than the laboratory's established reporting limits

Table 3.source: "Mukilteo Multimodal Project Y-10936 TAA; Sediment Sampling Data Report," by Parametrix for WSDOT, November 2012

Table 3-5. Ordnance Residue

		0' - 12' intervals (March 7, 2012)						0' - 4' intervals (April 25, 2012)					
Analyte	Units	V1/V6	Q[1]	V2/V5	Q[1]	V3/V4	Q[1]	D1	Q[1]	D2	Q[1]	D3	Q[1]
Total Solids	%	80.7		69.7		70.9		69.7		62.6		81	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
1,3,5-Trinitrobenzene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
1,3-Dinitrobenzene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
3,5-Dinitroaniline	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
Nitrobenzene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
4-Amino-2,6-dinitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
2-Amino-4,6-dinitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
2,4,6-Trinitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
2,6-Dinitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
2,4-Dinitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
2-Nitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
3-Nitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
4-Nitrotoluene	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
Nitroglycerin	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.28	U	0.25	U	0.31	U
Pentaerythritol Tetranitrate	mg/Kg dw	0.33	U	0.38	U	0.38	U	0.4	U	0.4	U	0.4	U

1) Qualifier (Q)

U - The target analyte was not detected at the reported concentration

Table 3.5 source: "Mukilteo Multimodal Project Y-10936 TAA; Sediment Sampling Data Report," by Parametrix for WSDOT, November 2012

Appendix B
Sample Containers, Holding Times, Volume, and Chemical Analytical Methods and QA/QC Criteria

Table B-1. Sample Analytical Methods and Storage criteria.

SAMPLE TYPE	Analytical Methods	HOLDING TIME	SAMPLE SIZE (1)	TEMPERATURE (2)	CONTAINER	ARCHIVE(3)
Particle Size	**PSEP(1986)/ASTM D-422**	6 Months	100-200 g (75-150 ml)	4 degrees C	1-liter Glass (combined)	X
Total Solids	**2540 B-97 / PSEP(1986)**	14 Days	125 g (100 ml)	4 degrees C		
Total Volatile Solids	**160.4 / 2540 E PSEP(1986)**	14 Days	125 g (100 ml)	4 degrees C		
Total Organic Carbon	**Plumb,1981**	14 Days	125 g (100 ml)	4 degrees C		
Ammonia	**Plumb, 1981, 350.1 / 4500-NH3 G-97**	7 Days	25 g (20 ml)	4 degrees C		
Metals (except Mercury)	**6010 / 6020 / 7000 & 200 Series**	6 Months	50 g (40 ml)	4 degrees C	4 oz. glass jar	
		2 years		-18 degrees C		
Semi-volatiles, Pesticides and PCBs	**8082/8270**	14 Days until extraction	150 g (120 ml)	4 degrees C	8 oz. glass jar	
		1 Year until extraction		-18 degrees C		
		40 Days after extraction		4 degrees C		
Total Sulfides	**PSEP(1986)**	7 Days	50 g (40 ml)	4 degrees C (4)	125 ml Glass or polyethylene	
Mercury	**7470/7471**	28 Days	50 g (40 ml)	-18 degrees C	125 ml Teflon or polyethylene	

SAMPLE TYPE	Analytical Methods	HOLDING	SAMPLE SIZE (1)	TEMPERATURE (2)	CONTAINER	ARCHIVE(3)
Tributyltin (porewater)	**Krone/Unger**	7 Days	Sediment sufficient to collect 200-500 ml of porewater	4 degrees C (5)	Field: Polycarbonate, glass, or steel Lab (post extraction): Polycarbonate	
Volatile Organics	**524.2/624/8260/8260-SIM**	14 Days	100 g (2-40 ml jars)	4 degrees C	2-40 ml Glass	
Dioxins/Furans	**EPA 1613B**	1 year	8 oz	4 degrees C	8 oz glass (amber)	X
Bioassay	**10-day amphipod mortality test (acute toxicity)** **20-day juvenile infaunal growth test (chronic toxicity)** **Sediment larval test (acute toxicity)**	8 Weeks	5 liters	4 degrees C (5)	5-1 liter Glass or polyethylene	X; bioassay archives are not frozen

(1) Recommended minimum field sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retests.

(2) During transport to the lab, samples will be stored on ice. The mercury and archived samples will be frozen immediately upon receipt at the lab.

(3) For every DMMU, a 250 ml container is filled and frozen to run any or all of the analyses indicated.

(4) The sulfides sample will be preserved with 5 ml of 2 Normal zinc acetate for every 30 g of sediment.

(5) Headspace purged with nitrogen.

Table B-2. Laboratory Chemical Analytical QA/QC Requirements

Analysis Type	Method Blanks[1]	Replicates[1]	Triplicates[1]	CRM/RM	MS/MSD[1]	Surrogates[2]
Volatile Organics[3,4]	X	X[6]			X	X
Semivolatiles[3,4]	X[5]	X[6]		X	X	X
Pesticides/PCBs[3,4]	X[5]	X[6]		X	X	X
Dioxins/Furans	X[5]	X[6]		X	X	X
Metals	X	X[6]		X	X	
TBT	X				X	X
Ammonia	X		X			
Total Sulfides	X		X			
Total Organic Carbon	X		X	X		
Total Solids			X			
Total Volatile Solids			X			
Particle Size			X			

Notes:

CRM = Certified Reference Material; RM = Reference Material; MS/MSD = matrix spike/matrix spike duplicate

1 Frequency of Analysis (FOA) = 5 percent or one per batch, whichever is more frequent.

2 Surrogate spikes required for every sample, including matrix spiked samples, blanks, and reference materials.

3 Initial calibrations required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria.

4 Ongoing calibration required at the beginning of each work shift, every 10–12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.

5 FOA = one per extraction batch.

6 Matrix spike duplicates may be used.

Table B-3. Solid Phase Bioassay Performance Standards and Evaluation Guidelines						
Bioassay	**Negative Control Performance Standard**	**Reference Sediment Performance Standard**	**Dispersive Disposal Site Interpretation Guidelines**		**Nondispersive Disposal Site Interpretation Guidelines**	
			1-hit rule	2-hit rule	1-hit rule	2-hit rule
Amphipod	MC ≤10%	MR - MC ≤ 20%	MT - MC > 20% and MT vs. MR SS (p=.05) and		MT - MC > 20% and MT vs. MR SS (p=.05) and	
			MT - MR > 10%	NOCN	MT - MR > 30%	NOCN
Larval	NC÷I ≥0.70	NR÷NC ≥ 0.65	NT ÷ NC < 0.80 and NT/NC vs. NR/NC SS (p=.10) and		NT ÷ NC < 0.80 and NT/NC vs. NR/NC SS (p=.10) and	
			NR/NC - NT/NC > 0.15	NOCN	NR/NC - NT/NC > 0.30	NOCN
Neanthes growth	MC ≤ 10% and MIGC > 0.38	MR ≤ 20% and MIGR÷MIGC ≥ 0.80	MIGT ÷ MIGC < 0.80 and MIGT vs. MIGR SS (p=.05) and		MIGT ÷ MIGC < 0.80 and MIGT vs. MIGR SS (p=.05) and	
			MIGT/MIGR < 0.70	NOCN	MIGT/MIGR < 0.50	MIGT/MIGR < 0.70

M = mortality
N = normal larvae
I = initial count
MIG = mean individual growth rate (mg/individual/day)
SS = statistically significant
NOCN = no other conditions necessary
N/A = not applicable
Subscripts: R = reference sediment, C = negative control, T = test sediment