Preliminary Sediment Data Summary

I&J Waterway
Bellingham, Washington

Prepared by:

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RETEC Project Number: PORTB-18448-210

Prepared for:

Port of Bellingham
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Table of Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

This document presents a summary of preliminary chemical, physical, and biological testing on sediments in the I&J Waterway, Bellingham, Washington. This preliminary data from surface and subsurface sediment investigations was collected by the Port of Bellingham as part of the work required to complete the Remedial Investigation/Feasibility Study (RI/FS) for the I&J Waterway Site. All investigations were conducted according to the Department of Ecology (Ecology) approved Sediments RI/FS Work Plan (RETEC, 2005) as required for the Site under Agreed Order No. DE 1090.

This data summary is intended to provide an update on data collection efforts conducted as part of the RI/FS. As summarized in the October 10, 2006 letter to Ecology, recent decisions by regulatory agencies on other sites may affect the scope and content of the RI/FS. The goal of this data summary is to discuss with the Department of Ecology the data collected to this point to identify future site activities required to complete the RI/FS.

The report includes surface and subsurface sediment chemical and biological data collected as part of RI/FS work. Surface sediment sampling and testing was conducted according to Appendix A: Sampling and Analysis Plan (SAP) of the RI/FS Work Plan. Subsurface sediment sampling and testing was conducted according to Appendix B: I&J Waterway PSDDA Sediment Characterization Sampling and Analysis Plan. A summary of historic surface sediment sampling analytical data is provided in Attachment B of Appendix B of the RI/FS Work Plan.

2 Surface Sediment Testing Results

Surface sediment was collected on August 29, 30, and 31, 2005 from 13 stations in the I&J Waterway and 2 reference locations in Samish Bay. Sediment was collected from the top 12 centimeters using a hydraulic VanVeen grab sampler. Chemical, physical, and biological samples were collected from sediment composited from a single grab. Sampling was conducted according to the Sampling and Analysis Plan (SAP) contained in Appendix A of the I&J Waterway Sediments RI/FS Work Plan.

A second round of sampling was conducted on March 13 and 14, 2006 from nine stations requiring bioassay retesting. Sampling methods were identical to the August 2005 sampling event. Bioassay test results from both rounds of sampling are discussed in Section 2.3.

Analytical data reports for surface sediment testing are provided in Appendix A. All analytical data has been validated according to QA-2 protocols. The validation reports are contained in Appendix B. Bioassay data reports are provided in Appendix C.

2.1 Field Physical Observations

Physical observations of grab samples were recorded on field logs at each sampling station. Table 2-1 provides a summary of information contained on these field logs. Observations included water depth, sediment texture, sediment fauna, and the presence of anthropogenic debris in sediments. Sampling locations are illustrated on Figure 2-1.

2.1.1 Water Depth

Water depths were measured at each sampling station using a lead-line and a depth sounder, where applicable. Water depths were corrected to MLLW. Measurements of current mudline elevations are generally consistent with measurements collected during Phase 2 sediment sampling (ThermoRetec, 2001) and recent bathymetric surveys conducted in October 2005.

2.1.2 Surface Sediment Texture

Grain size information is contained in Table 2-2. Fines content, comprised of clay and silt fractions, was high at most stations. All stations, except for SS-11, contained at least 30 percent fines. Samples SS-01 through SS-05, SS-07, SS-08, SS-09, and SS-13 contained greater than 75 percent fines. Sample SS-11 had approximately 81 percent sand, and samples SS-06 and SS-10 contained 39 to 40 percent sand. The high fines content of surface sediments is consistent with grain size analysis observed during the Phase 2 study (ThermoRetec, 2001).

Gravel was present in a number of samples, although the presence of broken shells likely influenced the measured gravel fraction in samples IJW-SS-06, IJW-SS-10, and IJW-SS-12, which were collected adjacent to or under piers. Gravel percentages ranged from 14.2 to 31.3 percent by weight in these samples.

2.1.3 Vegetation and Fauna

Biota were noted during field observations in the majority of surface grab samples. Clams, mussels, barnacles, small and large worms, and tube worms were commonly observed in grab samples. Less commonly observed biota included sea anemones, kelp, and foraminifera. Table 2-1 provides a summary of biota observed in specific sample locations. Eelgrass blades were observed in samples SS-01, SS-05, SS-07, SS-09, SS-10, and SS-12, but these blades were not rooted and appeared to represent wind drift of blades from nearby eel grass areas south of the Site study area.

2.1.4 Debris

Anthropogenic debris was encountered in a number of surface grabs. Debris was generally located in sample locations adjacent to piers. Debris included small plastic fragments at locations SS-03, SS-04, SS-06, and SS-13 and rope at SS-03. Occasional wood debris was noted in most of the samples. A 2.2 foot long stick was collected from SS-01. Numerous fish bones were present in samples IJW-SS-02 and IJW-SS-06.

2.2 Surface Sediment Chemistry Testing and Distribution

Chemical analyses were conducted for Sediment Management Standards (SMS) constituents to define the horizontal extent of contamination. Analytes included heavy metals (including nickel), semivolatile organics, conventional parameters, polychlorinated biphenyls (PCBs), and volatile organics. Concentrations were compared to Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL) criteria. Nickel concentrations were compared to Dredged Material Management Program (DMMP) screening level (SL) because no SMS criteria exists. Surface sediment chemistry data results are summarized in Table 2-2, and exceedances of RI/FS Work Plan screening levels are identified in Figure 2-1.

2.2.1 Metals

Of the heavy metals included in RI/FS testing, only nickel exceeded the RI/FS Work Plan screening levels. Elevated nickel concentrations were noted in several of the samples collected from the head of the Waterway. Samples SS-07 through SS-12 contained concentrations above the DMMP SL of 140 mg/kg. Sample SS-10 contained concentrations above the DMMP

bioaccumulation trigger (BT) and maximum level (ML), each of which are 370 mg/kg.

Elevated nickel concentrations are consistent with historic data, which indicate that elevated nickel concentrations were observed only at the head of the Waterway (ThermoRetec, 2001) near the location of the former Olivine ore handling operation. Historic values ranged from 731 to 1,120 mg/kg in the vicinity of IJW-SS-10 during the 2001 sampling effort.

2.2.2 Semivolatile Organic Compounds

Semivolatile organic compounds (SVOCs) were analyzed in all surface sediment collected. Analytes included polycyclic aromatic hydrocarbons (PAHs), phthalates, phenols, and miscellaneous extractables, as shown in Table 2-2.

Only one station had samples that were above the SQS for PAH compounds. Sample IJW-SS-06 contained concentrations of acenaphthene, dibenz(a,h)anthracene, fluorene, phenanthrene, chrysene, fluoranthene, and total HPAHs greater than the respective SQS values for these compounds (Figure 2-1). No PAHs were detected above CSL criteria, which is consistent with findings from the Phase 2 sampling that showed similar concentrations of SVOCs near this station (ThermoRetec, 2001). Dibenzofuran also exceeded the SQS at this location. The measured concentrations at IJW-SS-06 were in excess of the SQS, but were well below the CSL.

Concentrations of phthalate compounds were significantly lower than during previous Phase 2 sediment sampling (ThermoRetec, 2001). Only bis(2-ethylhexyl)phthalate was detected above the SQS values at one location. In sample IJW-SS-06, bis(2-ethylhexyl)phthalate concentrations (392.5 ppm-TOC) exceeded the both the SQS (45 ppm-TOC) and the CSL (78 ppm-TOC). Figure 2-2 shows the distribution of surface sediment phthalate concentrations measured in the current sampling effort.

No phenol compounds were measured in excess of SMS criteria. Of the miscellaneous extractables analyzed, only dibenzofuran was detected in excess of SMS criteria. No chlorinated hydrocarbons were measured in excess of SMS criteria.

Conventional Parameters

Conventional parameters analyzed included ammonia, pH, total solids, total volatile solids, total sulfides, and total organic carbon.

Ammonia concentrations in surface sediment ranged from 4.06 to 68 mg/kg-N with an average value of 31.3 mg/kg-N. Measurements were taken to provide the bioassay laboratory with baseline ammonia levels for testing. Values were within the range typical for Puget Sound.

Total solids ranged from 23.2 to 72.3 percent. These values are consistent with historic data that ranged from 32 to 76 percent. Total volatile solids ranged from 5.92 to 9.82 percent, with an average value of 8.51 percent. Total sulfides ranged from 1,000 to 4,500 mg/kg with an average value of 3,500 mg/kg.

Total organic carbon content ranged from 2.01 to 3.87 percent. These values are consistent with values typically found in Bellingham Bay, an average of 2.0 percent (Ecology, 1998). These values are also consistent with historic data collected in Whatcom Waterway, which indicates an average TOC content of 3.2 percent (Anchor, 2000).

Volatile Organics and PCB Distribution

No volatile organics or PCB concentrations were measured in excess of criteria.

2.3 Surface Sediment Bioassay Testing

2.3.1 Sediment Recollection

Bioassay testing was conducted on nine of the 13 samples collected in August 2005. Seven samples were selected based on chemical concentrations above Work Plan criteria (samples SS-06 through SS-12) for PAHs, phthalates, and/or nickel. Samples SS-07 through SS-12 were selected for bioassay testing based on elevated nickel concentrations. No SMS criteria has been established for nickel, however, the Work Plan uses the DMMP criteria of 140 ppm. Ecology required testing for two additional samples (SS-04 and SS-13).

Bioassay testing in October 2005 consisted of the following three tests for the nine I&J Waterway samples along with two reference samples, as required in the RI/FS Work Plan: 10 day amphipod (*Eohaustorius estuarius*) survival test, 20-day juvenile polychaete (*Neanthes arenaceodentata*) growth test, and 96-hour blue mussel (*Mytilus galloprovincialis*) larval development test. Results of the juvenile polychaete and larval development tests did not meet quality control criteria and were therefore required to be repeated. Results of the amphipod test were acceptable. Because standard hold times on sediment had expired, sediment resampling and testing was necessary.

Surface sediment was recollected on March 13 and 14, 2006 from the same nine I&J Waterway stations that required bioassay testing and 2 reference locations in Samish Bay. Because samples were collected from the same stations as the first round of sampling, Ecology only required conventional and grain size analysis rather than retesting of the full suite of chemical tests.

Surface sediment grab descriptions from the March 2006 sampling are provided in Table 2-1. Conventional chemistry and grain size data are

presented in Table 2-3. Sediment descriptions and conventional and grain size data are similar to the first round of sampling.

2.3.2 Bioassay Results

Amphipod survival, larval development, and juvenile polychaete testing was initiated within designated hold time on October 25, 2005. However, because larval development and juvenile polychaete testing did not meet quality control criteria, they were repeated within designated hold times on recollected sediment on March 21 and 22, 2006, respectively. Results of amphipod testing from October 2005 and larval development and juvenile polychaete testing from March 2006 are presented in this section.

Test samples were compared to the reference sample with the closest grain size match. Therefore, samples SS-06, SS-11, and SS-12 were compared to RR-01, which contained 15 percent and 8 percent fines for the October 2005 and March 2006 samples, respectively. All other samples were compared to RR-02, which contained 90 percent and 92 percent fines for the October 2005 and March 2006 samples, respectively.

Results of bioassay testing are contained in Tables 2-4, 2-5, and 2-6. Table 2-7 provides an assessment of performance criteria for control and reference samples. A summary of SMS decision criteria is contained in Table 2-8, and Table 2-9 provides an assessment of which samples fail SQS and CSL criteria, which is also shown on Figure 2-3. As shown in Table 2-9, statistical testing was conducted in accordance with the SMS/DMMP Bioassay Statistics Program (Biostat) developed by the Corps of Engineers.

10-Day Amphipod Test

Results of the 10-day amphipod survival test using *Eohaustorius estuarius* are presented in Table 2-4. Results are presented from testing performed on sediment collected in October 2005. The test was run according to Puget Sound Estuary Protocols (PSEP) and met SMS quality control requirements for the control and reference samples, as shown in Table 2-7.

Bioassay endpoint evaluations were determined using statistical testing and criteria outlined in Table 2-8. As shown in Table 2-9, all samples passed SMS criteria.

20-Day Juvenile Polychaete Growth Testing

Results of the 20-day juvenile polychaete growth test using *Neanthes arenaceodentata* are presented in Table 2-5. Results are presented from testing performed on sediment collected in March 2006. The test was run according to PSEP; all quality control requirements were met (Table 2-7).

As shown in Table 2-9, samples SS-06 and SS-12 failed SQS criteria. All other samples passed SMS criteria.

Larval Development Testing

Results of the larval normality test using *Mytilus galloprovincialis* are presented in Table 2-6. Results are presented from testing performed on sediment collected in March 2006. The test was run according to PSEP; however, the reference toxicant test was run incorrectly. In the absence of acceptable reference toxicant testing for this round, reference toxicant data from before and after this test were requested and were within acceptable ranges. As shown in Table 2-7, all other quality control criteria for control and reference samples were met.

As shown in Table 2-9, samples SS-4, SS-6 through SS-10, and SS-13 failed CSL criteria. Samples SS-11 and SS-12 passed SMS criteria.

3 Subsurface Sediment Testing Results

The subsurface sediment investigation was conducted according to the SAP contained in Appendix B of the I&J Waterway Sediments RI/FS Work Plan. The sampling and analysis program was designed to generate data useful to the RI/FS while at the same time satisfying testing requirements established by the DMMP to evaluate suitability for open-water disposal.

Sediment coring locations were identified in the Work Plan within six Dredge Material Management Units (DMMU). Based on chemical and bioassay results, investigation of subsurface sediment in DMMUs 1 and 2 was not necessary because surface sediment chemical concentrations did not exceed SMS criteria in these DMMUs. Therefore, sediment was collected on June 12, 13, and 14, 2006 from four (4) surface DMMUs and one (1) subsurface DMMU (DMMU 4B), as shown in Figure 3-1. Sediment core samples were composited within each DMMU, submitted for chemical and physical analysis, and archived for potential bioassay testing. Surface sediment from two (2) reference stations located in Samish Bay was also collected for potential bioassay testing.

Chemical analytical data collected during RI/FS activities and data validation reports are provided in Appendix A and B, respectively. All analytical data has been validated according to QA-2 protocols. Bioassay lab reports are contained in Appendix C, and subsurface sediment core logs are provided in Appendix D.

3.1 Subsurface Chemical Results

Chemical analyses were conducted on I&J Waterway subsurface sediments from DMMUs 3, 4A, 4B, 5, and 6. Composites were collected from four cores within each unit for analysis of DMMP constituents plus tributyl tin (See Table 3-1). One composite of the upper intervals of DMMUs 3, 4, 5, and 6 was initially analyzed for dioxin/furans, followed by analysis of subsequent, individual DMMU samples for dioxin/furans (See Table 3-2). Grain size and conventional data are presented in Table 3-3.

3.1.1 Metals

Mercury exceeded SQS criteria in DMMUs 4A and 4B and CSL criteria in DMMUs 3, 5, and 6. Nickel was above the Screening Level (SL) in DMMU 4A, but was not above criteria in any other units. No metals were above the BT or the ML, as defined by the DMMP.

3.1.2 SVOCs

SVOCs detected above criteria included bis(2-ethylhexyl)phthalate and 2, 4-dimethlyphenol in DMMU 6. Bis(2-ethylhexyl)phthalate was above the ML when compared to dry-weight DMMP criteria and above the CSL when compared to organic carbon-normalized SMS criteria. The concentration of 2,4-dimethylphenol was above the CSL (SMS criteria) and above the SL (DMMP criteria) in DMMU 6. No other SVOCs were above any criteria.

3.1.3 Other Analytes

Concentrations of volatile organics, pesticides, PCBs, and bulk and porewater tributyl tin were within acceptable ranges.

3.1.4 Dioxin/Furans

Dioxin and furan congener concentrations are provided in Table 3-2. Results are presented for dioxin/furan analysis of a composite sample comprised of sediment from DMMUs 3, 4A, 5, and 6 and for individual DMMU samples, which was conducted subsequent to the composite test. Toxic equivalency concentrations (TECs) have been determined using toxic equivalency factors (TEFs), as required by the DMMP.

Total TECs for the sediment composite (IJ-C-S1) was 18.4 TEC. Individual samples from each of the DMMUs ranged from 18.0 to 32.4 TEC.

3.1.5 Conventionals and Grain Size

Conventional and grain size concentrations are summarized in Table 3-3. All samples contained greater than 50 percent fines (total clay and silt). Concentrations of sulfides were elevated in DMMU 3 and DMMU 5. Total organic carbon was above seven percent in DMMUs 4A and 6. Ammonia was slightly elevated in all samples.

3.2 Subsurface Bioassay Testing

Four surface DMMUs (DMMU-3, 4A, 5, 6) and one subsurface DMMU (DMMU-4B) were tested for the standard suite of marine bioassay tests required for characterization of sediment for open water disposal under the DMMP, as shown in Figure 3-1. These DMMUs were selected for bioassay testing based on preliminary chemical results above SL thresholds, as discussed in Section 3.1. Chemical concentrations above the SL include mercury at DMMUs 3, 4A, 4B, 5, and 6. Nickel was also elevated in DMMU-4B as was bis(2-ethylhexyl)phthalate and 2,4-dimethyphenol at DMMU-6. No chemicals exceeded the BT threshold.

Bioassay testing was initiated on all DMMU samples by August 7, 2006, which was within the maximum 8-week holding time limits. All five DMMU samples were tested in addition to two reference samples for the following tests: 10 day amphipod (*Eohaustorius estuarius*) survival test, 20-day

juvenile polychaete (*Neanthes arenaceodentata*) growth test, and 96-hour larval development test using blue mussel (*Mytilus galloprovincialis*) or sand dollar (*Dendraster excentricus*). The preferred test species for the larval development test was the blue mussel, however, spawning was unable to be induced, so testing was initiated on sand dollars, as specified in the SAP.

Results of bioassay testing are shown in Tables 3-4, 3-5, and 3-6. Table 3-7 provides performance criteria for control and reference samples and decision criteria for dispersive and non-dispersive DMMP disposal sites. Table 3-8 provides a comparison of DMMU samples to reference and control results, and Table 3-9 provides a summary of bioassay result interpretation. Statistical testing was conducted with Biostat, developed by the Corps of Engineers. Test results were compared to criteria for dispersive and non-dispersive disposal sites using reference sample RR-01, which is a suitable reference sample and passed acceptability criteria for all tests. All tests were run according to PSEP and met DMMP quality control requirements.

3.2.1 10-Day Amphipod Test

Results of the 10-day amphipod survival test using *Eohaustorius estuarius* are presented in Table 3-4. All samples passed criteria for dispersive and non-dispersive disposal sites (Table 3-8).

3.2.2 20-Day Juvenile Polychaete Growth Testing

Results of the 20-day juvenile polychaete growth test using *Neanthes arenaceodentata* are presented in Table 3-5. As shown in Table 3-8, samples from DMMU-3, 4A, and 4B passed dispersive and non-dispersive criteria. Samples DMMU-5 and DMMU-6 failed the 1-hit criteria (higher failure) for dispersive disposal sites. Each of these samples also failed the 2-hit criteria (lower failure) for non-dispersive disposal sites.

3.2.3 Larval Development Testing

Results of the larval development test using *Dendraster excentricus* are presented in Table 3-6. DMMU-3, 4A, 5, and 6 had 1-hit failures for dispersive disposal sites, but DMMU-4B passed dispersive criteria. For non-dispersive disposal sites, DMMU-3 and 5 contained 1-hit failures while DMMU-4A and 6 had 2-hit failures. DMMU-4B passed non-dispersive disposal site criteria.

3.3 Conclusions

Table 3-9 provides a summary of interpretations of test results compared to dispersive and non-dispersive disposal site bioassay criteria. For dispersive disposal sites (e.g. Rosario Straits), sediment from DMMU-3, 4A, 5, and 6 are unsuitable for disposal, based on higher level 1-hit failures. DMMU-4B passes bioassay criteria for open-water disposal at dispersive disposal sites.

For non-dispersive disposal sites (e.g. Bellingham Bay), DMMU-3 and DMMU-5 are unsuitable for disposal because of 1-hit failures. DMMU-6 is also unsuitable for non-dispersive disposal due to two failures of 2-hit criteria (polychaete and larvae). DMMU-4A and DMMU-4B are both suitable for open-water disposal at non-dispersive disposal sites based on bioassay results.

The above interpretations are identified based on bioassay test results. Disposal determinations for individual DMMUs do not consider the potential impact of dioxin/furan concentrations, which may change the suitability of open-water disposal based on DMMP review of the dioxin issue.

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Tables

Table 2-1. Summary Description of Surface Grab Samples at the I & J Waterway

Sample ID	Date Collected	Field Observations of Sample						Sample Recovery Details			
		Color	Soil Type	Biological	Odor	Sheen	Comments	Recovery Depth (cm)	Depth of Sample (cm)	Mudline Elevation (MLLW ft)*	Water Depth-Leadline (ft)
IJW-SS-01	8/31/2005	black	clayey silt	nepthys worms	sulfide-like	occasional spotty sheen	1 blade eel grass, 2, 2 foot long sticks with barnacles, 4 cm living clam	23	0-12	15.3	16.0
IJW-SS-02	8/31/2005	black	clayey silt, trace fines	spionids and nepthys worms, fish vertebrae, clams	hydrocarbon-like	none	organic rootlets, fish vertebrae archived	24	0-12	15.7	17.3
IJW-SS-03	9/1/2005	black	clayey silt, trace very fine sand	abundant dead mussel shells, occasional clam shells	moderate to strong sulfide-like	occasional spotty iridescent sheen	occasional wood stick fragments up to 2", rope and plastic bag	23	0-12	10.4	10.6
IJW-SS-04	9/1/2005	black	clayey silt, trace fine sand	none	moderate sulfide-like odor	when mixed composite had occasional spotty iridescent sheen	small piece of plastic observed (not archived)	28	0-12	17.6	17.9
	3/13/2006	black	silt with trace sand	trace rootlets, polychaete worm	none	none	jaws close, good sample	27.5	0-12	17.2	23.1
IJW-SS-05	8/31/2005	black	clayey silt	5, 2" living clams spionid worms	very slight sulfide-like odor	none	occasional rootlets, brown circular specs (forams) from 0-3mm, eel grass	24	0-12	14.7	19.3
IJW-SS-06	8/31/2005	black	very shelly silt	barnacles, mussels, crab carapace, shells up 2", fish vertebrae	very strong sulfide-like odor	spotty iridescent sheen	wood fragments, aparent plastic pieces (archived), spotty iridescent sheen observed in water while sampling	17	0-12	15.7	23.1
	3/13/2006	black	silt with trace sand, abundant shell fragments	abundant mussel shells, polychaete worms, eel grass, rootlets, wood fragments, intact shells 3-5 cm	mild sulfide-like odor	spotty iridescent sheen	jaws close with sediment in teeth, shell fragments on surface, apparent fish bones from 2-9 cm depth (archived) (15% of recovered sediment), small 9 cm rope recovered	24	0-12	13.2	18.3
IJW-SS-07	8/31/2005	black (top 1-2mm is gray)	clayey silt	bittium snail shell	slight sulfide-like odor	none	occasional to abundant rootlets/sticks, leaf litter, brown circular specs (forams) from 0-3mm, eel grass	25	0-12	13.6	19.8
	3/13/2006	black	clayey silt with trace sand	3 blades of eel grass, tace ocassional rootlets, 1- 7 cm clam shell (cockle clam)	slight sulfide-like odor	none	good grab, jaws close with sediment in teeth and blades of grass	28.5	0-12	14.7	19.4
IJW-SS-08	9/1/2005	black	clayey silt, trace fine sand	abundant spionid worms	none	sheen in composite	occasional wood fragments, rootlets, and shells	23	0-12	12.2	15.4
	3/13/2006	black	clayey silt	one 5 cm L shell, 3 cm mollusk shell, one piece of eel grass, 3 cm wood fragments, occasional rootlets, 8 cm branch polychaete worm	slight sulfide-like odor	none	great recovery, jaws close with abundant living gastropods, eel grass blades	27	0-12	14.0	21.1
IJW-SS-09	8/31/2005	black	clayey silt, trace very fine sand	none	none	none	eel grass blades	30	0-12	14.7	23.2
	3/13/2006	black	clayey silt	3 eel grass blades, 1 3" leaf, one anemone, 3 cm clam shell, whole shell, occasional rootlets, occasional polychaete, 30 cm branch, 2-12cm wood fragments	none	none	jaws close good grab	29	0-12	15.6	20.3
IJW-SS-10	9/1/2005	black	clayey silt, trace sandy gravel (<2")	trace clam shells, alive and dead,occasional nepthys worms	slight sulfide-like odor	occasional spotty iridescent sheen	abundant 2" clams, eel grass blades	21	0-12	4.2	4.8
	3/13/2006	black and green mottled	slightly sandy (medium grained) clayey silt	occasional barnacles, few shells up to 3 cm, 1/2 shell mollusks with barnacles 4 cm, one 6" cobble with barnacles, trace shell fragments 2-5 cm, occasional wood fragments 3-4 cm	none	none	good grab, jaws close on wood, barnacles, and mollusk	26	0-12	4.0	10.0
IJW-SS-11	8/31/2005	black	silty fine sand, trace clay, abundant gravel at 8-12 cm up to 5"	shells up to 2", nereid worm	slight to moderate sulfide-like odor	none	abundant wood fragments up to 5"	14	0-12	0.7	8.8
	3/13/2006	black	silty sand	shell fragments up to 3 cm, branches 8 cm, brachiopod 3 cm, occasional woody fragments, eel grass, polychaete worm	slight to moderate sulfide-like odor	none	jaws partially close due to wood fragments, occasional shells to 1 1/2", wood fragments, branches to 4"	22.5	0-12	2.2	7.5
IJW-SS-12	9/1/2005	black	clayey gravelly silt	barnacles, occasional shells up to 1", abundant spionid worms	very slight sulfide-like odor	none	composite is shelly clayey gravelly silt, eel grass blades	21	0-12	4.6	9.7
	3/13/2006	black	shelly sandy silt	substantial (30-50) shell fragments 1/2 cm, occasional rootlets, trace eel grass blades, polychaete worms.	none	none	good grab, jaws close, lots of surface water, sea anemone present, block with barnacles, eel grass blades, polychaetes	21	0-12	9.4	16.0
IJW-SS-13	9/1/2005	black	silt, trace clay and fine sand	none	strong sulfide-like odor	occasional spotty iridescent sheen	wood fragment, wirey piece of black plastic 3"	21	0-12	15.4	16.4
	3/13/2006	black	clayey silt with trace sand	one 30 cm piece of plant material (not eel grass)	strong sulfide-like odor	none	good grab, jaws close	27.5	0-12	15.7	23.0
IJW-RR-01	9/2/2005	dark grey	silty coarse sand	abundant spionid worms, occasional teribellid worms, 2"clam shell	none	none	none	25	0-12	48.2	48.7
	3/14/2006	grayish black	silty sand	occasional polychaetes and rootlets, ocassional 1 mm shell frament s	none	none	good grab, jaws close	25	0-12	46.9	52.6
IJW-RR-02	9/2/2005	olive brown	slightly sandy clayey silt	occasional spionid worms	none	none	brown circular specs (forams) from 0-1cm	28	0-12	56.0	57.1
	3/14/2006	grayish brown	slightly clayey silt with trace sand	occasional polychaetes and rootlets	none	none	good grab, jaws close, good seal	27.5	0-12	55.6	60.6

Notes:
All samples collected using hydraulic grab sampler.
The mudline elevations were calculated using leadline and height of tide elevations on the collection date
* Height of tide was determined using the XTide program provided online by the Biological Sciences Department, University of South Carolina, Columbia, South Carolina (http://tbone.biol.sc.edu/tide/sitesel.html)

Table 2-2. Surface Sediment Chemistry Results - September 2005

Compound / Sample ID / Sample Depth / Sample Date	SMS Criteria SQS	SMS Criteria CSL	IJW-SS-01 0-0.4' 9/1/2005	IJW-SS-02 0-0.4' 9/1/2005	IJW-SS-03 0-0.4' 8/31/2005	IJW-SS-04 0-0.4' 8/31/2005	IJW-SS-05 0-0.4' 8/31/2005	IJW-SS-06 0-0.4' 9/1/2005	IJW-SS-07 0-0.4' 8/31/2005
Conventionals									
Ammonia - mg-N/kg	--	--	**37.2**	**26.2**	**20.3**	**31.3**	**47.6**	**62.7**	**38.9**
pH	--	--	**7.64**	**7.85**	**7.95**	**7.92**	**7.93**	**8.04**	**7.86**
Total Solids - %	--	--	**30.2**	**31.6**	**34.5**	**23.2**	**36**	**41.6**	**33.3**
Sulfide - mg/kg	--	--	**3,600**	**3,200**	**3,900**	**4,900**	**3,500**	**3,400**	**3,600**
Total Organic Carbon -%	--	--	**2.32**	**2.39**	**2.46**	**2.34**	**2.24**	**2.14**	**2.45**
Total Solids - %	--	--	**34.7**	**35.2**	**38.2**	**31**	**36.6**	**47.2**	**32.7**
Total Volatile Solids - %	--	--	**8.75**	**8.31**	**8.61**	**8.74**	**8.12**	**7.45**	**8.92**
Grain Size - %									
Gravel	--	--	**0.2**	**0.2**	**2.9**	< 0.01	< 0.01	**26.9**	**0.4**
Sand	--	--	**15.2**	**15.3**	**20.2**	**18.5**	**15**	**40.7**	**17.2**
Silt	--	--	**53.2**	**49.2**	**47.5**	**55.2**	**55.1**	**25.3**	**55.7**
Clay	--	--	**31.5**	**35.2**	**29.4**	**26.4**	**29.9**	**7.2**	**26.7**
Total Fines	--	--	**84.7**	**84.4**	**76.9**	**81.6**	**85.0**	**32.5**	**82.4**
Metals (EPA 6000/7000) - mg/kg									
Antimony	--	--	< 20 R	< 10 R	< 10 R	< 20 R	< 10 R	< 30 R	< 10 R
Arsenic	**57**	**93**	< 20	< 10	**20**	< 20	**20**	< 30	**10**
Cadmium	**5.1**	**6.7**	**0.7**	**0.7**	**0.9**	**0.7**	**0.8**	< 1	**0.8**
Chromium	**260**	**270**	**74**	**75**	**75**	**74**	**75**	**38**	**72**
Copper	**390**	**390**	**71**	**68**	**84**	**67**	**72**	**61**	**73**
Lead	**450**	**530**	**15**	**16**	**20**	**17**	**17**	**10**	**20**
Mercury	**0.41**	**0.59**	**0.40**	**0.30**	**0.30**	**0.40**	**0.4**[4]	**0.17**	**0.40**
Nickel	**140**[3]	**140**[3]	**117**	**122**	**117**	**119**	**125**	**57**	***174***
Silver	**6.1**	**6.1**	< 0.9	< 0.9	< 0.8	< 1	< 0.8	< 2	< 0.9
Zinc	**410**	**960**	**140**	**142**	**174**	**148**	**150**	**138**	**164**
LPAH - ppm-OC									
2-Methylnaphthalene	**38**	**64**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**6.5**	< 2.4
Acenaphthene	**16**	**57**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**29.0** J	< 2.4
Acenaphthylene	**66**	**66**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	< 2.8	< 2.4
Anthracene	**220**	**1200**	< 2.5	< 2.5	**6.5**	< 4.2	< 2.7	**60.7**	< 2.4
Fluorene	**23**	**79**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**38.3**	< 2.4
Naphthalene	**99**	**170**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**6.1**	< 2.4
Phenanthrene	**100**	**480**	**4.7**	< 2.5	**6.1**	**6.8**	**4.2**	**205.6**	**3.8**
Total LPAH	**370**	**780**	**4.7**	< 2.5	**12.6**	**6.8**	**4.2**	**346.3**	**3.8**
HPAH - ppm-OC									
Benzo(A)Pyrene	**99**	**210**	< 2.5	< 2.5	**6.1**	< 4.2	**2.9**	**84.1**	**3.9**
Total Benzofluoranthene	**230**	**450**	**6.3**	< 2.5	**21.5**	**12.0**	**8.3**	**154.2**	**11.4**
Benzo(G,H,I)Perylene	**31**	**78**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**22.4**	< 2.4
Benzo(A)Anthracene	**110**	**270**	**3.1**	< 2.5	**11.0**	**6.0**	**4.4**	**107.5**	**4.5**
Dibenz(A,H)Anthracene	**12**	**33**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**13.6**	< 2.4
Chrysene	**110**	**460**	**6.0**	**3.4**	**21.5**	**10.3**	**8.5**	**121.5**	**8.2**
Fluoranthene	**160**	**1200**	**9.1**	**4.1**	**22.0**	**15.0**	**8.9**	**345.8**	**12.2**
Indeno(1,2,3-Cd)Pyrene	**34**	**34**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**28.0**	< 2.4
Pyrene	**1000**	**1400**	**7.8**	**3.3**	**30.5**	**16.7**	**8.0**	**196.3**	**9.8**
Total HPAH	**960**	**5300**	**32.2**	**10.9**	**112.6**	**59.9**	**41.0**	**1073.4**	**50.0**
Chlorinated Hydrocarbons - ppm-OC									
1,2,4-Trichlorobenzene	**0.81**	**1.8**	< 2.54[2]	< 2.51[2]	< 4.02[2]	< 4.23[2]	< 2.68[2]	< 2.76[2]	< 2.41[2]
1,2-Dichlorobenzene	**2.3**	**2.3**	< 2.54[2]	< 2.51[2]	< 4.02[2]	< 4.23[2]	< 2.67[2]	< 2.76[2]	< 2.41[2]
1,4-Dichlorobenzene	**3.1**	**9**	< 2.54	< 2.51	< 4.02[1]	< 4.23[1]	< 2.68	< 2.76	< 2.41
Hexachlorobenzene	**0.38**	**2.3**	< 2.54[2]	< 2.51[2]	< 4.02[2]	< 4.23[2]	< 2.68[2]	< 2.76[2]	< 2.41[2]
M-Dichlorobenzene	--	--	< 2.54	< 2.51	< 4.02	< 4.23	< 2.68	< 2.76	< 2.41
Phthalates - ppm-OC									
Benzyl Butyl Phthalate	**4.9**	**64**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	< 2.8	< 2.4
Bis(2-Ethylhexyl)Phthalate	**47**	**78**	**10.3**	**2.6**	**16.3**	**9.4**	**5.8**	***392.5***	**10.2**
Diethyl Phthalate	**61**	**110**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	< 2.8	< 2.4
Dimethyl Phthalate	**53**	**53**	< 2.5	< 2.5	< 4.0	**9.0**	< 2.7	**3.0**	< 2.4
Di-N-Butylphthalate	**220**	**1700**	**35.8** UB	**34.3** UB	**26.0** UB	**55.6** UB	**35.7** UB	**46.7** UB	**34.7** UB
Di-N-Octyl Phthalate	**58**	**4500**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	< 2.8	< 2.4
Phenols - mg/kg									
Phenol	**0.42**	**1.0**	< 0.059	< 0.06	< 0.099	< 0.099	< 0.06	< 0.059	< 0.059
2-Methylphenol	**0.063**	**0.063**	< 0.059	< 0.06	< 0.099[2]	< 0.099[2]	< 0.06	< 0.059	< 0.059
4-Methylphenol	**0.67**	**0.67**	< 0.059	< 0.06	< 0.099	< 0.099	< 0.06	**0.085**	< 0.059
2,4-Dimethylphenol	**0.029**	**0.029**	< 0.059[2]	< 0.06[2]	< 0.099[2]	< 0.099[2]	< 0.06[2]	< 0.059[2]	< 0.059[2]
Pentachlorophenol	**0.36**	**0.69**	< 0.3	< 0.3	< 0.5[1]	< 0.49[1]	< 0.3	< 0.3	< 0.3
Miscellaneous Extractables - mg/kg									
Benzyl alcohol	**0.057**	**0.073**	< 0.059[1]	< 0.06[1]	< 0.099[2]	< 0.099[2]	< 0.06[1]	< 0.059[1]	< 0.059[1]
Benzoic acid	**0.65**	**0.65**	< 0.59	< 0.6	< 0.99[2]	< 0.99[2]	< 0.6	< 0.59	< 0.59
Misc Extractables - ppm-OC									
Dibenzofuran	**15**	**58**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	**23.8**	< 2.4
Hexachloro-1,3-Butadiene	**3.9**	**6.2**	< 2.5	< 2.5	< 4.0[1]	< 4.23[1]	< 2.7	< 2.8	< 2.4
Hexachloroethane	--	--	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	< 2.8	< 2.4
N-Nitrosodiphenylamine	**11**	**11**	< 2.5	< 2.5	< 4.0	< 4.2	< 2.7	< 2.8	< 2.4
Volatile Organics - mg/kg									
Ethylbenzene	--	--	< 0.0034	< 0.0031	< 0.0028	< 0.0039	< 0.0028	< 0.0017	< 0.0026
M,P-Xylene	--	--	< 0.0034	< 0.0031	< 0.0028	< 0.0039	< 0.0028	< 0.0017	< 0.0026
O-Xylene	--	--	< 0.0034	< 0.0031	< 0.0028	< 0.0039	< 0.0028	< 0.0017	< 0.0026
Tetrachloroethene	--	--	< 0.0034	< 0.0031	< 0.0028	< 0.0039	< 0.0028	< 0.0017	< 0.0026
Trichloroethylene	--	--	< 0.0034	< 0.0031	< 0.0028	< 0.0039	< 0.0028	< 0.0017	< 0.0026
PCBs - ppm-OC									
Aroclor 1016	--	--	< 0.86	< 0.84	< 0.73	< 0.85	< 0.89	< 0.93	< 0.82
Aroclor 1221	--	--	< 0.86	< 0.84	< 0.73	< 0.85	< 0.89	< 0.93	< 0.82
Aroclor 1232	--	--	< 0.86	< 0.84	< 0.73	< 0.85	< 0.89	< 0.93	< 0.82
Aroclor 1242	--	--	< 0.86	< 0.84	< 0.73	< 0.85	< 0.89	< 0.93	< 0.82
Aroclor 1248	--	--	< 0.86	< 0.84	< 0.73	< 0.85	< 0.89	< 0.93	< 0.82
Aroclor 1254	--	--	< 0.86	< 0.84	< 0.73	< 1.28 Y	< 0.89	**1.50**	< 0.82
Aroclor 1260	--	--	< 0.86	< 0.84	< 0.73	< 0.85	< 0.89	< 0.93	< 0.82
Total PCBs	**12**	**65**	< 0.86	< 0.84	< 0.73	< 1.28 Y	< 0.89	**1.50**	< 0.82

Notes:

[1] = Value is non-detect. RDL exceeds SQS Criteria. MDL passes criteria.

[2] = Value is non-detect. RDL exceeds both SQS and CSL Criteria. MDL passes criteria.

[3] = No SQS criteria exists for the element nickel. As such, the PSDDA criteria is used in place.

[4] = This sample is the average of an intial run (0.50 mg/kg) and a duplicate analysis (0.30 mg/kg)

-- = No criteria value established

< = Below laboratory instrument detection limit

Y = Reporting limit is raised due to instrument activity. Compound not detected.

B = Analyte was detected in the blank as well as the sample.

Bold = value exceeds laboratory detection limit

Bold and underline = value exceeds SQS Criteria

Bold, underline, italics = value exceeds CSL Criteria

Data has been validated according to QA-2 protocols.

Table 2-2. Surface Sediment Chemistry Results - September 2005

Compound / Sample ID / Sample Depth / Sample Date	SMS Criteria SQS	SMS Criteria CSL	IJW-SS-08 0-0.4' 9/1/2005	IJW-SS-09 0-0.4' 8/31/2005	IJW-SS-10 0-0.4' 9/1/2005	IJW-SS-11 0-0.4' 9/1/2005	IJW-SS-12 0-0.4' 9/1/2005	IJW-SS-13 0-0.4' 9/1/2005	IJW-RR-01 0-0.4' 9/2/2005	IJW-RR-02 0-0.4' 9/2/2005
Conventionals										
Ammonia - mg-N/kg	--	--	**44**	**33.9**	**9.02**	**6.55**	**28.4**	**68**	**4.06**	**23.2**
pH	--	--	**7.85**	**7.89**	**7.99**	**7.63**	**7.79**	**7.84**	**7.94**	**7.82**
Total Solids - %	--	--	**38.3**	**25.4**	**53.9**	**63.4**	**54.5**	**25.5**	**72.3**	**34.3**
Sulfide - mg/kg	--	--	**3,300**	**4,000**	**2,100**	**1000**	**1,900**	**4,500**	**22**	**480**
Total Organic Carbon -%	--	--	**2.75**	**2.01**	**2.79**	**3.18**	**3.87**	**2.45**	**1.34**	**1.25**
Total Solids - %	--	--	**39.3**	**30.8**	**53.5**	**66.9**	**56**	**25.4**	**72.9**	**36.9**
Total Volatile Solids - %	--	--	**8.51**	**9**	**7**	**5.92**	**6.28**	**9.82**	**1.91**	**7.43**
Grain Size - %										
Gravel	--	--	< 0.01	< 0.01	**14.2**	**7.2**	**31.3**	< 0.01	< 0.01	< 0.01
Sand	--	--	**17.5**	**15.4**	**39.3**	**81.6**	**28.7**	**15.2**	**84.5**	**10.1**
Silt	--	--	**49.3**	**58.2**	**31.7**	**5.5**	**23.6**	**66.5**	**9.5**	**55.7**
Clay	--	--	**33.3**	**26.2**	**14.8**	**5.8**	**16.3**	**18.3**	**5.9**	**34.2**
Total Fines	--	--	**82.6**	**84.4**	**46.5**	**11.3**	**39.9**	**84.8**	**15.4**	**89.9**
Metals (EPA 6000/7000) - mg/kg										
Antimony	--	--	< 10 R	< 20 R	< 9 R	< 8 R	< 8 R	< 20 R	< 7	< 10
Arsenic	**57**	**93**	**20**	< 20	**16**	< 8	**14**	< 20	< 7	< 10
Cadmium	**5.1**	**6.7**	**0.9**	**0.8**	**0.6**	< 0.3	**0.6**	**0.9**	**0.4**	< 0.5
Chromium	**260**	**270**	**73**	**74**	**47**	**23**	**54**	**71**	**18**	**48**
Copper	**390**	**390**	**74**	**72**	**52**	**20**	**62**	**70**	**8**	**33**
Lead	**450**	**530**	**22**	**19**	**29**	**17**	**40**	**17**	**4**	**13**
Mercury	**0.41**	**0.59**	**0.40**	**0.30**	**0.23**	**0.08**	**0.22**	**0.40**	< 0.07	**0.10**
Nickel	**140** [3]	**140** [3]	***156***	***192***	***511***	***211***	***152***	**133**	**22**	**40**
Silver	**6.1**	**6.1**	< 0.7	< 0.9	< 0.5	< 0.5	< 0.5	< 1	< 0.4	< 0.8
Zinc	**410**	**960**	**166**	**153**	**142**	**69.7**	**139**	**159**	**36**	**98**
LPAH - ppm-OC										
2-Methylnaphthalene	**38**	**64**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Acenaphthene	**16**	**57**	< 2.1	**3.2**	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Acenaphthylene	**66**	**66**	< 2.1	< 2.9	**5.0**	< 1.8	**2.5**	< 2.4	< 1.5	< 1.6
Anthracene	**220**	**1200**	**2.8**	**4.2**	**9.7**	**3.5**	**4.4**	< 2.4	< 1.5	< 1.6
Fluorene	**23**	**79**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Naphthalene	**99**	**170**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Phenanthrene	**100**	**480**	**5.1**	**8.0**	**19.0**	**11.3**	**6.2**	**6.5**	< 1.5	< 1.6
Total LPAH	**370**	**780**	**7.9**	**15.4**	**33.7**	**14.8**	**13.1**	**6.5**	< 1.5	< 1.6
HPAH - ppm-OC										
Benzo(A)Pyrene	**99**	**210**	**5.5**	**4.8**	**27.6**	**11.3**	**8.8**	< 2.4	**1.9**	< 1.6
Total Benzofluoranthene	**230**	**450**	**18.5**	**15.4**	**96.8**	**28.3**	**28.4**	**7.0**	**1.7**	< 1.6
Benzo(G,H,I)Perylene	**31**	**78**	< 2.1	< 2.9	**5.7**	**3.0**	< 1.5	< 2.4	< 1.5	< 1.6
Benzo(A)Anthracene	**110**	**270**	**7.6**	**6.5**	**25.4**	**11.0**	**11.4**	**3.1**	**2.0**	< 1.6
Dibenz(A,H)Anthracene	**12**	**33**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Chrysene	**110**	**460**	**15.6**	**13.4**	**71.7**	**16.0**	**19.4**	**5.7**	**1.9**	< 1.6
Fluoranthene	**160**	**1200**	**16.0**	**18.9**	**86.0**	**37.7**	**33.6**	**11.8**	**4.1**	< 1.6
Indeno(1,2,3-Cd)Pyrene	**34**	**34**	< 2.1	< 2.9	**6.5**	**3.5**	**1.9**	< 2.4	< 1.5	< 1.6
Pyrene	**1000**	**1400**	**14.2**	**12.9**	**121.9**	**26.4**	**22.7**	**7.3**	**3.4**	< 1.6
Total HPAH	**960**	**5300**	**77.4**	**71.9**	**441.6**	**137.3**	**126.2**	**35.0**	**15.1**	< 1.6
Chlorinated Hydrocarbons - ppm-OC										
1,2,4-Trichlorobenzene	**0.81**	**1.8**	< 2.11 [2]	< 2.94 [2]	< 3.51 [2]	< 1.82 [2]	< 1.50 [1]	< 2.41 [2]	< 1.49 [1]	< 1.60 [1]
1,2-Dichlorobenzene	**2.3**	**2.3**	< 2.11	< 2.94 [2]	< 3.51 [2]	< 1.82	< 1.50	< 2.41 [2]	< 1.49	< 1.60
1,4-Dichlorobenzene	**3.1**	**9**	< 2.11	< 2.94	< 3.51 [1]	< 1.82	< 1.50	< 2.41	< 1.49	< 1.60
Hexachlorobenzene	**0.38**	**2.3**	< 2.11 [1]	< 2.94 [2]	< 3.51 [2]	< 1.82 [1]	< 1.50 [1]	< 2.41 [2]	< 1.49 [1]	< 1.60 [1]
M-Dichlorobenzene	--	--	< 2.11	< 2.94	< 3.51	< 1.82	< 1.50	< 2.41	< 1.49	< 1.60
Phthalates - ppm-OC										
Benzyl Butyl Phthalate	**4.9**	**64**	< 2.1	< 2.9	< 3.5	**2.4**	< 1.5	< 2.4	< 1.5	< 1.6
Bis(2-Ethylhexyl)Phthalate	**47**	**78**	**10.2**	**7.5**	**21.9**	**28.9**	**14.0**	**11.8**	< 1.5	**3.0**
Diethyl Phthalate	**61**	**110**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Dimethyl Phthalate	**53**	**53**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Di-N-Butylphthalate	**220**	**1700**	**28.7 UB**	**46.8 UB**	**35.1 UB**	**26.4 UB**	**23.0 UB**	**26.9 UB**	**67.9 B**	**80.0 B**
Di-N-Octyl Phthalate	**58**	**4500**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Phenols - mg/kg										
Phenol	**0.42**	**1.0**	< 0.058	< 0.059	< 0.098	< 0.058	< 0.058	< 0.059	< 0.02	**0.024**
2-Methylphenol	**0.063**	**0.063**	< 0.058	< 0.059	< 0.098 [2]	< 0.058	< 0.058	< 0.059	< 0.02	< 0.02
4-Methylphenol	**0.67**	**0.67**	< 0.058	< 0.059	< 0.098	< 0.058	< 0.058	< 0.059	< 0.02	**0.055**
2,4-Dimethylphenol	**0.029**	**0.029**	< 0.058 [2]	< 0.059 [2]	< 0.098 [2]	< 0.058 [2]	< 0.058 [2]	< 0.059 [2]	< 0.02	< 0.02
Pentachlorophenol	**0.36**	**0.69**	< 0.29	< 0.3	< 0.49 [1]	< 0.29	< 0.29	< 0.3	< 0.097	< 0.099
Miscellaneous Extractables - mg/kg										
Benzyl alcohol	**0.057**	**0.073**	< 0.058 [1]	< 0.059 [1]	< 0.098 [2]	< 0.058 [1]	< 0.058 [1]	< 0.059 [1]	< 0.02	< 0.02
Benzoic acid	**0.65**	**0.65**	< 0.58	< 0.59	< 0.98 [2]	< 0.58	< 0.58	< 0.59	< 0.2	< 0.2
Misc Extractables - ppm-OC										
Dibenzofuran	**15**	**58**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Hexachloro-1,3-Butadiene	**3.9**	**6.2**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Hexachloroethane	--	--	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
N-Nitrosodiphenylamine	**11**	**11**	< 2.1	< 2.9	< 3.5	< 1.8	< 1.5	< 2.4	< 1.5	< 1.6
Volatile Organics - mg/kg										
Ethylbenzene	--	--	< 0.0026	< 0.0033	< 0.0020	< 0.0014	< 0.0016	< 0.0036	< 0.0013	< 0.0029
M,P-Xylene	--	--	< 0.0026	< 0.0033	< 0.0020	< 0.0014	< 0.0016	< 0.0036	< 0.0013	< 0.0029
O-Xylene	--	--	< 0.0026	< 0.0033	< 0.0020	< 0.0014	< 0.0016	< 0.0036	< 0.0013	< 0.0029
Tetrachloroethene	--	--	< 0.0026	< 0.0033	< 0.0020	< 0.0014	< 0.0016	< 0.0036	< 0.0013	< 0.0029
Trichloroethylene	--	--	< 0.0026	< 0.0033	< 0.0020	< 0.0014	< 0.0016	< 0.0036	< 0.0013	< 0.0029
PCBs - ppm-OC										
Aroclor 1016	--	--	< 0.69	< 1.00	< 0.72	< 0.63	< 0.49	< 0.82	< 1.42	< 1.60
Aroclor 1221	--	--	< 0.69	< 1.00	< 0.72	< 0.63	< 0.49	< 0.82	< 1.42	< 1.60
Aroclor 1232	--	--	< 0.69	< 1.00	< 0.72	< 0.63	< 0.49	< 0.82	< 1.42	< 1.60
Aroclor 1242	--	--	< 0.69	< 1.00	< 0.72	< 0.63	< 0.49	< 0.82	< 1.42	< 1.60
Aroclor 1248	--	--	< 0.69	< 1.00	< 0.72	< 0.63	< 0.49	< 0.82	< 1.42	< 1.60
Aroclor 1254	--	--	< 0.69	< 1.00	< 0.72	< 0.63	< 0.75 Y	< 0.82	< 1.42	< 1.60
Aroclor 1260	--	--	< 0.69	**1.54 J**	< 0.72	< 0.63	< 0.75 Y	< 0.82	< 1.42	< 1.60
Total PCBs	**12**	**65**	< 0.69	**1.54**	< 0.72	< 0.63	< 0.75 Y	< 0.82	< 1.42	< 1.60

Notes:

[1] = Value is non-detect. RDL exceeds SQS Criter
[2] = Value is non-detect. RDL exceeds both SQS a
[3] = No SQS criteria exists for the element nickel. A
[4] = This sample is the average of an intial run (0.50
-- = No criteria value established
< = Below laboratory instrument detection limit
Y = Reporting limit is raised due to instrument activit
B = Analyte was detected in the blank as well as the
Bold = value exceeds laboratory detection limit
Bold and underline = value exceeds SQS Criteria
Bold, underline, italics = value exceeds CSL Crite
Data has been validated according to QA-2 protocol

Table 2-3. Surface Sediment Conventional and Grain Size Data - March 2006

Sample ID	Conventionals						Grain Size			
	Ammonia mg-N/kg	pH	Sulfide mg/kg	Total Organic Carbon %	Total Solids %	Total Volatile Solids %	Gravel %	Sand %	Silt %	Clay %
IJW-SS-04	10.1	7.88	2200	2.63	41.1	7.38	0.1	5.9	52.9	41.2
IJW-SS-06	20.0	7.62	890	3.29	45.1	8.15	30.7	32	23.4	13.7
IJW-SS-07	19.5	7.95	2000	1.72	36.5	8.10	0	10.3	53.9	35.6
IJW-SS-08	21.4	7.78	2300	2.35	41.8	7.62	0.4	8.5	49.7	41.4
IJW-SS-09	18.9	7.74	2900	2.38	38.7	7.69	0.4	10.3	49.4	40.1
IJW-SS-10	7.85	7.72	1200	3.43	49.8	7.93	13.2	26.9	37.2	22.7
IJW-SS-11	5.32	7.63	200	4.04	65.8	5.49	8.9	74.5	9.2	7.5
IJW-SS-12	24.9	7.80	610	2.41	58.2	5.80	32.8	27.2	17.9	22.1
IJW-SS-13	17.2	7.84	3500	2.27	37.1	7.57	0.7	8.8	45.9	44.5
IJW-RR-01	5.19	7.76	67	1.22	73.0	1.79	0	82.4	9.8	7.7
IJW-RR-02	8.36	7.68	590	1.67	36.7	7.03	0	7.7	55.4	36.8

Notes:

-- = No criteria value established

< = Below laboratory instrument detection limit

Sediment samples collected from 0-12 cm on March 13 and 14.

Table 2-4. Summary of Surface Sediment Bioassay 10- Day Amphipod Testing (*Eohaustorius estuarius*) [1]

Sample Location	Replicate	Initial Count	Final Count	Percent Mortality
Control-1	A	20	20	0
	B	20	19	5
	C	20	20	0
	D	20	17	15
	E	20	18	10
	Mean			**6**
Control-2	A	20	19	5
	B	20	20	0
	C	20	19	5
	D	20	20	0
	E	20	20	0
	Mean			**2**
IJW-RR-01	A	20	19	5
	B	20	18	10
	C	20	19	5
	D	20	16	20
	E	20	20	0
	Mean			**8**
IJW-RR-02	A	20	16	20
	B	20	13	35
	C	20	14	30
	D	20	15	25
	E	20	18	10
	Mean			**24**
IJW-SS-04	A	20	20	0
	B	20	17	15
	C	20	19	5
	D	20	19	5
	E	20	18	10
	Mean			**7**
IJW-SS-06	A	20	20	0
	B	20	15	25
	C	20	18	10
	D	20	18	10
	E	20	19	5
	Mean			**10**
IJW-SS-07	A	20	17	15
	B	20	20	0
	C	20	19	5
	D	20	18	10
	E	20	18	10
	Mean			**8**
IJW-SS-08	A	20	13	35
	B	20	19	5
	C	20	15	25
	D	20	14	30
	E	20	17	15
	Mean			**22**

Table 2-4. Summary of Surface Sediment Bioassay 10- Day Amphipod Testing (*Eohaustorius estuarius*) [1]

Sample Location	Replicate	Initial Count	Final Count	Percent Mortality
IJW-SS-09	A	20	18	10
	B	20	19	5
	C	20	13	35
	D	20	17	15
	E	20	18	10
	Mean			**15**
IJW-SS-10	A	20	17	15
	B	20	16	20
	C	20	16	20
	D	20	18	10
	E	20	18	10
	Mean			**15**
IJW-SS-11	A	20	19	5
	B	20	9	55
	C	20	16	20
	D	20	18	10
	E	20	20	0
	Mean			**18**
IJW-SS-12	A	20	20	0
	B	20	17	15
	C	20	18	10
	D	20	18	10
	E	20	19	5
	Mean			**8**
IJW-SS-13	A	20	15	25
	B	20	20	0
	C	20	14	30
	D	20	14	30
	E	20	15	25
	Mean			**22**

Notes:

[1] Test results from the October 2005 sampling event.

Table 2-5. Summary of Surface Sediment Bioassay 20-Day Growth Juvenile Polychaete Testing (*Neanthes arenaceodentata*) [2]

Sample Location	Replicate	Initial Count	Final Count	Percent Survival	Total Worm Weight (mg)	Average Weight Per Worm (mg)	Mean Individual Growth Rate (mg/ind/day)
Control-1	A	5	5	100	78.80	15.76	0.78
	B	5	5	100	75.21	15.04	0.75
	C	5	5	100	93.87	18.77	0.93
	D	5	5	100	83.48	16.70	0.83
	E	5	5	100	70.58	14.12	0.70
	Mean			**100**	**80.39**	**16.08**	**0.80**
Control-2	A	5	5	100	67.79	13.56	0.67
	B	5	5	100	76.28	15.26	0.76
	C	5	5	100	66.85	13.37	0.66
	D	5	5	100	91.75	18.35	0.91
	E	5	5	100	56.32	11.26	0.56
	Mean			**100**	**71.80**	**14.36**	**0.71**
IJW-RR-01	A	5	5	100	89.07	17.81	0.89
	B	5	5	100	69.45	13.89	0.69
	C	5	5	100	134.75	26.95	1.34
	D	5	5	100	72.44	14.49	0.72
	E	5	5	100	114.83	22.97	1.14
	Mean			**100**	**96.11**	**19.22**	**0.96**
IJW-RR-02	A	5	4	80	89.78	22.45	1.12
	B	5	5	100	59.42	11.88	0.59
	C	5	4	80	73.21	18.30	0.91
	D	5	5	100	90.31	18.06	0.90
	E	5	5	100	76.21	15.24	0.76
	Mean			**92**	**77.79**	**17.19**	**0.86**
IJW-SS-04	A	5	5	100	101.68	20.34	1.01
	B	5	5	100	76.75	15.35	0.76
	C	5	5	100	81.63	16.33	0.81
	D	5	4	80	73.51	18.38	0.91
	E	5	5	100	79.13	15.83	0.79
	Mean			**96**	**82.54**	**17.24**	**0.86**
IJW-SS-06	A	5	6	120	81.94	13.66	0.68
	B	5	5	100	68.67	13.73	0.68
	C	5	5	100	72.16	14.43	0.72
	D	5	5	100	63.35	12.67	0.63
	E	5	5	100	47.79	9.56	0.47
	Mean			**104**	**66.78**	**12.81**	**0.64**
IJW-SS-07	A	5	5	100	83.87	16.77	0.83
	B	5	5	100	73.56	14.71	0.73
	C	5	5	100	79.50	15.90	0.79
	D	5	5	100	71.58	14.32	0.71
	E	5	5	100	92.36	18.47	0.92
	Mean			**100**	**80.17**	**16.03**	**0.80**
IJW-SS-08	A	5	5	100	74.09	14.82	0.74
	B	5	5	100	84.62	16.92	0.84
	C	5	4	80	71.66	17.92	0.89
	D	5	5	100	67.98	13.60	0.68
	E	5	5	100	61.27	12.25	0.61
	Mean			**96**	**71.92**	**15.10**	**0.75**
IJW-SS-09	A	5	5	100	60.49	12.10	0.60
	B	5	5	100	70.70	14.14	0.70
	C	5	5	100	79.69	15.94	0.79
	D	5	5	100	89.97	17.99	0.90
	E	5	5	100	67.91	13.58	0.68
	Mean			**100**	**73.75**	**14.75**	**0.73**

Table 2-5. Summary of Surface Sediment Bioassay 20-Day Growth Juvenile Polychaete Testing (*Neanthes arenaceodentata*) [2]

Sample Location	Replicate	Initial Count	Final Count	Percent Survival	Total Worm Weight (mg)	Average Weight Per Worm (mg)	Mean Individual Growth Rate (mg/ind/day)
IJW-SS-10	A	5	5	100	57.94	11.59	0.58
	B	5	6	120	50.84	8.47	0.42
	C	5	5	100	75.54	15.11	0.75
	D	5	3	60	34.14	11.38	0.57
	E	5	5	100	74.14	14.83	0.74
	Mean			**96**	**58.52**	**12.28**	**0.61**
IJW-SS-11	A	5	5	100	99.32	19.86	0.99
	B	5	5	100	77.22	15.44	0.77
	C	5	5	100	85.81	17.16	0.85
	D	5	5	100	102.93	20.59	1.03
	E	5	5	100	81.28	16.26	0.81
	Mean			**100**	**89.31**	**17.86**	**0.89**
IJW-SS-12	A	5	5	100	77.22	15.44	0.77
	B	5	5	100	61.71	12.34	0.61
	C	5	5	100	50.66	10.13	0.50
	D	5	5	100	75.64	15.13	0.75
	E	5	5	100	68.69	13.74	0.68
	Mean			**100**	**66.78**	**13.36**	**0.66**
IJW-SS-13	A	5	5	100	79.28	15.86	0.79
	B	5	4	80	65.49	16.37	0.81
	C	5	5	100	77.45	15.49	0.77
	D	5	5	100	50.53	10.11	0.50
	E	5	5	100	76.07	15.21	0.76
	Mean			**96**	**69.76**	**14.61**	**0.73**

Notes:

[2] Test results from the March 2006 sampling event.

Table 2-6. Summary of Surface Sediment Bioassay Larval Normality Testing (*Mytilis galloprovincialis*) [2]

Site	Replicate	Initial Number of Embryos, T=0	Number Normal	Number Abnormal	Total Number	N_C/Mean Initial
Sea Water Control	A	278	214	25	239	0.77
	B	278	264	30	294	0.95
	C	278	246	34	280	0.88
	D	278	250	24	274	0.90
	E	278	260	39	299	0.94
	Mean	278	247	30	277	**0.89**

Site	Replicate	Initial Number of Embryos, T=0	Number Normal	Number Abnormal	Total Number	N_C/Mean Initial
Sediment Control	A	278	262	36	298	0.94
	B	278	222	25	247	0.80
	C	278	191	19	210	0.69
	D	278	210	27	237	0.76
	E	278	217	35	252	0.78
	F	278	212	26	238	0.76
	G	278	217	17	234	0.78
	H	278	188	35	223	0.68
	I	278	215	23	238	0.77
	Mean	278	215	27	242	**0.77**

Site	Replicate	Number Normal	Number Abnormal	Total Number	N_{R1}/N_C
Reference (RR-01)	A	193	20	213	0.78
	B	140	12	152	0.57
	C	172	9	181	0.70
	D	175	12	187	0.71
	E	189	13	202	0.77
	Mean	173.8	13	187	**0.70**

Site	Replicate	Number Normal	Number Abnormal	Total Number	N_{R2}/N_C
Reference (RR-02)	A	157	16	173	0.64
	B	200	40	240	0.81
	C	166	10	176	0.67
	D	188	27	215	0.76
	E	169	16	185	0.68
	Mean	176	22	198	**0.71**

Table 2-6. Summary of Surface Sediment Bioassay Larval Normality Testing (*Mytilis galloprovincialis*) [2]

Site	Replicate	Number Normal	Number Abnormal	Total Number	Mean Normal Survival (N_T/N_{R1})	Mean Normal Survival (N_T/N_{R2})
SS-04	A	99	31	130	-	0.56
	B	117	19	136	-	0.66
	C	127	24	151	-	0.72
	D	99	26	125	-	0.56
	E	136	20	156	-	0.77
	Mean	116			**-**	**0.66**
SS-06	A	57	80	137	0.33	-
	B	84	49	133	0.48	-
	C	73	65	138	0.42	-
	D	75	56	131	0.43	-
	E	87	77	164	0.50	-
	Mean	75			**0.43**	**-**
SS-07	A	159	29	188	-	0.90
	B	109	40	149	-	0.62
	C	58	38	96	-	0.33
	D	91	36	127	-	0.52
	E	89	70	159	-	0.51
	Mean	101			**-**	**0.58**
SS-08	A	150	29	179	-	0.85
	B	128	59	187	-	0.73
	C	127	49	176	-	0.72
	D	93	41	134	-	0.53
	E	89	40	129	-	0.51
	Mean	117			**-**	**0.67**
SS-09	A	145	52	197	-	0.82
	B	90	58	148	-	0.51
	C	120	49	169	-	0.68
	D	105	74	179	-	0.60
	E	100	68	168	-	0.57
	Mean	112			**-**	**0.64**
SS-10	A	161	30	191	-	0.91
	B	67	91	158	-	0.38
	C	146	58	204	-	0.83
	D	71	66	137	-	0.40
	E	158	115	273	-	0.90
	Mean	121			**-**	**0.69**
SS-11	A	153	33	186	0.88	-
	B	188	58	246	1.08	-
	C	195	48	243	1.12	-
	D	140	31	171	0.81	-
	E	141	71	212	0.81	-
	Mean	163			**0.94**	**-**
SS-12	A	175	40	215	1.01	-
	B	133	10	143	0.77	-
	C	174	33	207	1.00	-
	D	146	34	180	0.84	-
	E	89	66	155	0.51	-
	Mean	143			**0.83**	**-**
SS-13	A	125	12	137	-	0.71
	B	84	17	101	-	0.48
	C	135	18	153	-	0.77
	D	96	70	166	-	0.55
	E	137	56	193	-	0.78
	Mean	115			**-**	**0.66**

Notes:

[2] Test results from the March 2006 sampling event.

Replicates were run using standard method

N = normal counts

Subscripts: R1 = reference sediment RR-01, R2 = reference sediment RR-02, C = negative control

Table 2-7. Reference and Control Bioassay Performance Standards

Biological Test	Control		Reference	
	Criteria	Pass or Fail?	Criteria	Pass or Fail?
Amphipod	The control has a mortality of less than 10 percent (M_C < 10%)	*Pass*	The reference has a mortality of less than 25 percent (M_R < 25%)	*Pass*
Juvenile Polychaete	The control has a mortality of less than 10 percent and a target mean individual growth rate of 0.72 mg per individual per day. Control growth rates below 0.38 mg per individual per day will be considered a QA/QC failure (PSDDA, 1996) (M_C < 10% and MIG ≥ 0.38 mg)	*Pass* *	The reference has a mean individual growth rate greater than or equal to 80 percent of the growth rate measured in the control ($MIG_R/MIG_C \geq 0.80$)	*Pass*
Larval	The control has a mean normal survivorship of greater than 70 percent of the initial count ($N_C/I \geq 0.70$)	*Pass*	The reference has a mean normal survivorship of greater than or equal to 65 percent of the mean normal survivorship measured in the control ($N_R/N_C \geq 0.65$)	*Pass*

Source: (Ecology, 1998b)

M = mortalilty, MIG = mean individual growth rate, N = normal counts, I = initial count

Subscripts: C = negative control, R = reference sediment

* = One of two control mean individual growth rates was below target levels (0.72 mg/ind/day), however, each was above QA/QC levels (0.38 mg/ind/day).

Table 2-8. Sediment Management Standards Biological Effects Criteria[1]

Biological Test	SQS Biological Criteria	CSL Biological Criteria
Amphipod	The test sediment has a significantly higher (t-test, p = 0.05) mean mortality than the reference sediment, and the test sediment mean mortality exceeds 25 percent ($M_T > 25\%$)	The test sediment has a significantly higher (t-test, p = 0.05) mean mortality than the reference sediment, and the test sediment mean mortality is more than 30 percent greater ($M_R - M_T > 30\%$) than the reference sediment mean mortality
Juvenile Polychaete	The mean individual growth rate in the test sediment is less than 70 percent of the mean individual growth rate in the reference sediment ($MIG_T/MIG_R < 0.70$), and the test sediment biomass is significantly different (t-test, p = 0.05) from the reference sediment biomass	The mean individual growth rate in the test sediment is less than 50 percent of the mean individual growth rate in the reference sediment ($MIG_T/MIG_R < 0.50$), and the test sediment biomass is significantly different (t-test, p = 0.05) from the reference sediment biomass
Larval	The test sediment has a mean survivorship of normal larvae that is significantly less (t-test, p = 0.05) than the mean normal survivorship in the reference sediment, and the mean normal survivorship as a percentage of the negative control is less than 85% than the mean normal survivorship in the reference sediment as a percentage of the negative control [$(N_T/N_R) < 0.85$]	The test sediment has a mean survivorship of normal larvae that is significantly less (t-test, p = 0.05) than the mean normal survivorship in the reference sediment, and the mean normal survivorship as a percentage of the negative control is less than 70% than the mean normal survivorship in the reference sediment as a percentage of the negative control [$(N_T/N_R) < 0.70$]

[1] SMS Bioassay Evaluation Endpoints - Ecology, 1998b

M = mortalilty, MIG = mean individual growth rate, N = normal counts, I = initial count
Subscripts: C = negative control, R = reference sediment

Table 2-9. I&J Waterway Surface Sediment Bioassay Endpoint Evaluation

Bioassay Test	Site	Statistical Difference Present (Yes/No) [1] t-test, p=0.05		Fails SQS Effect Criteria (Yes/No)		Fails CSL Effect Criteria (Yes/No)		SQS/CSL Bioligical Criteria (Pass/Fail) [2]
		RR-01	RR-02	RR-01	RR-02	RR-01	RR-02	
Amphipod [3]				M_T > 25%, Absolute		M_R-M_T>30%		
	SS-04	--	No	--	No	--	No	Pass
	SS-06	No	--	No	--	No	--	Pass
	SS-07	--	No	--	No	--	No	Pass
	SS-08	--	No	--	No	--	No	Pass
	SS-09	--	No	--	No	--	No	Pass
	SS-10	--	No	--	No	--	No	Pass
	SS-11	No	--	No	--	No	--	Pass
	SS-12	No	--	No	--	No	--	Pass
	SS-13	--	No	--	No	--	No	Pass
Juvenile Polychaete				MIG_T/MIG_R<0.70		MIG_T/MIG_R<0.50		
	SS-04	--	No	--	No	--	No	Pass
	SS-06	Yes	--	Yes	--	No	--	**SQS**
	SS-07	--	No	--	No	--	No	Pass
	SS-08	--	No	--	No	--	No	Pass
	SS-09	--	No	--	No	--	No	Pass
	SS-10	--	Yes	--	No	--	No	Pass
	SS-11	No	--	No	--	No	--	Pass
	SS-12	Yes	--	Yes	--	No	--	**SQS**
	SS-13	--	No	--	No	--	No	Pass
Larval				(N_T/N_R)<0.85		(N_T/N_R)<0.70		
	SS-04	--	Yes	--	Yes	--	Yes	**CSL**
	SS-06	Yes	--	Yes	--	Yes	--	**CSL**
	SS-07	--	Yes	--	Yes	--	Yes	**CSL**
	SS-08	--	Yes	--	Yes	--	Yes	**CSL**
	SS-09	--	Yes	--	Yes	--	Yes	**CSL**
	SS-10	--	Yes	--	Yes	--	Yes	**CSL**
	SS-11	No	--	No	--	No	--	Pass
	SS-12	No	--	Yes	--	No	--	Pass
	SS-13	--	Yes	--	Yes	--	Yes	**CSL**

[1] Statistical analyses conducted using DMMP/SMS Bioassay Statistics Program Beta v2.0c developed by the Corps of Engineers, Seattle District.

[2] SQS and CSL Biological Criteria for each bioassay are stated in Table 6.

[3] Amphipod results are from the August 2005 sampling event.

M = mortalilty, N = normal counts, MIG = mean individual growth rate

Subscripts: R = reference sediment, T = test sediment, C = negative control

RR-01 = Reference station 1 (16% fines)

RR-02 = Reference station 2 (92% fines)

Table 3-1 Summary of Subsurface Sediment Chemical Concentrations

Parameter	SMS Criteria		DMMP Criteria			DMMU3			DMMU4A			DMMU4B		
	SQS	CSL	Screening Level (SL)	Bioaccum-mulation Trigger (BT)	Maximum Level (ML)	IJ-C3-S1			IJ-C4-S1			IJ-C4-S2		
Conventionals														
Total Solids (%)	NV	NV	NV	NV	NV	**48.4**			**57.5**			**48.5**		
Total Volatile Solids(%)	NV	NV	NV	NV	NV	**7.75**			**23.76**			**10.11**		
Total Organic Carbon (%)	NV	NV	NV	NV	NV	**2.98**			**7.08**			**2.45**		
Ammonia (mg-N/kg)	NV	NV	NV	NV	NV	**62.2**			**50.9**			**41.6**		
Total Sulfides (mg/kg)	NV	NV	NV	NV	NV	**2,000**		**J**	**160**		**J**	**310**		**J**
Metals - mg/kg						*(mg/kg)*			*(mg/kg)*			*(mg/kg)*		
Antimony	NV	NV	150	150	200	9		UR	10		UR	8		UR
Arsenic	57	93	57	507.1	700	**10**			**10**			8		U
Cadmium	5.1	6.7	5.1	11.3	14	**0.6**			**0.6**			**0.4**		
Chromium	260	270	NV	267	NV	**68.3**			**60**			**44.4**		
Copper	390	390	390	1,027	1,300	**62.3**			**55.9**			**44.2**		
Lead	450	530	450	975	1,200	**22**			**26**			**25**		
Mercury	0.41	0.59	0.41	1.5	2.3	**0.70**			**0.43**			**0.54**		
Nickel	NV	NV	140	370	370	**108**			**223**			**97**		
Silver	6.1	6.1	6.1	6.1	8.4	0.6		U	0.6		U	0.5		U
Zinc	410	960	410	2,763	3,800	**128**		**J**	**113**		**J**	**80.1**		**J**
Porewater Organotins						*(ug/L)*			*(ug/L)*			*(ug/L)*		
Monobutyl Tin	NV	NV	NV	NV	NV	**0.075**		**UB**	**0.065**		**UJ**	**0.13**		**UB**
Dibutyl Tin	NV	NV	NV	NV	NV	<0.029		U	<0.029		U	<0.029		U
Tributyl Tin	NV	NV	0.15	NV	NV	**0.13**		**UB**	**0.028**		**J**	**0.12**		**UB**
Bulk Sediment Organotins -ug/kg						*(ug/kg)*			*(ug/kg)*			*(ug/kg)*		
Monobutyl Tin	NV	NV	NV	NV	NV	<4.1		UJ	<4.1		UJ	<4.0		UJ
Dibutyl Tin	NV	NV	NV	NV	NV	<5.8		U	**14**			<5.7		U
Tributyl Tin	NV	NV	(73)*	NV	NV	**6.8**			**9.1**			<3.8		U
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	**0.019**	**0.64**	**J**	**0.033**	**0.47**		**0.066**	**2.7**	
Acenaphthylene	66	66	0.56	NV	1.3	<0.020	<0.67	U	**0.016**	**0.23**	**J**	<0.020	<0.82	U
Acenaphthene	16	57	0.5	NV	2.0	**0.010**	**0.34**	**J**	**0.017**	**0.24**	**J**	**0.015**	**0.61**	**J**
Fluorene	23	79	0.54	NV	3.6	**0.019**	**0.64**	**J**	**0.027**	**0.38**		**0.026**	**1.1**	
Phenanthrene	100	480	1.5	NV	21	**0.059**	**1.98**		**0.160**	**2.3**		**0.100**	**4.08**	
Anthracene	220	1200	0.96	NV	13	**0.026**	**0.87**		**0.055**	**0.78**		**0.032**	**1.3**	
2-Methylnaphthalene	38	64	0.67	NV	1.9	**0.020**	**0.67**		**0.033**	**0.47**		**0.067**	**2.7**	
Total LPAH	370	780	5.2	NV	29	**0.153**	**5.13**		**0.341**	**4.82**		**0.306**	**12.5**	
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	**0.120**	**4.03**		**0.310**	**4.38**		**0.150**	**6.12**	
Pyrene	1000	1400	2.6	11.98	16	**0.180**	**6.04**		**0.420**	**5.93**		**0.150**	**6.12**	
Benzo(a)anthracene	110	270	1.3	NV	5.1	**0.065**	**2.2**		**0.160**	**2.26**		**0.056**	**2.3**	
Chrysene	110	460	1.4	NV	21	**0.110**	**3.69**		**0.270**	**3.81**		**0.079**	**3.2**	
Benzofluoranthenes (b+k)	230	450	3.2	NV	9.9	**0.125**	**4.19**		**0.350**	**4.94**		**0.095**	**3.9**	
Benzo(a)pyrene	99	210	1.6	NV	3.6	**0.049**	**1.6**		**0.150**	**2.12**		**0.044**	**1.8**	
Indeno(1,2,3-cd)pyrene	34	88	0.6	NV	4.4	**0.030**	**1.0**		**0.095**	**1.3**		**0.026**	**1.1**	
Dibenzo(a,h)anthracene	12	33	0.23	NV	1.9	<0.020	<0.67	U	**0.021**	**0.30**		<0.020	<0.82	U
Benzo(g,h,i)perylene	31	78	0.67	NV	3.2	**0.033**	**1.1**		**0.097**	**1.4**		**0.030**	**1.2**	
Total HPAH	960	5300	12	NV	69	**0.712**	**23.9**		**1.873**	**26.45**		**0.630**	**25.7**	
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	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
1,4-Dichlorobenzene	3.1	9	0.11	NV	0.12	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
1,2-Dichlorobenzene	2.3	2.3	0.035	NV	0.11	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
1,2,4-Trichlorobenzene	0.81	1.8	0.031	NV	0.064	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Hexachlorobenzene	0.38	2.3	0.022	0.168	0.23	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	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	0.071	NV	1.4	<0.020	<0.67	U	**0.012**	**0.169**	**J**	<0.020	<0.82	U
Diethyl phthalate	61	110	0.2	NV	1.2	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Di-n-butyl phthalate	220	1700	1.4	NV	5.1	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Butyl benzyl phthalate	4.9	64	0.063	NV	0.97	<0.020	<0.67	U	**0.020**	**0.282**	**J**	**0.012**	**0.490**	**J**
Bis(2-ethylhexyl)phthalate	47	78	1.3	NV	8.3	**0.460**	**15.436**		**0.420**	**5.932**		**0.110**	**4.490**	
Di-n-octyl phthalate	58	4500	6.2	NV	6.2	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.049	U
Phenols - mg/kg						*(mg/kg)*			*(mg/kg)*			*(mg/kg)*		
Phenol	0.42	1	0.42	NV	1.2	<0.020		U	<0.020		U	**0.031**		
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	**0.021**			**0.032**			**0.045**		
2,4-Dimethylphenol	0.029	0.029	0.029	NV	0.21	<0.020		U	<0.020		U	**0.028**		
Pentachlorophenol	0.36	0.69	0.40	0.504	0.69	<0.099		U	<0.099		U	<0.099		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		U	<0.020		U
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	**0.019**	**0.638**	**J**	**0.030**	**0.424**		**0.048**	**1.959**	
Hexachloroethane	NV	NV	1.4	NV	14	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Hexachlorobutadiene	3.9	6.2	0.029	NV	0.27	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
N-Nitrosodiphenylamine	11	11	0.028	NV	0.13	<0.020	<0.67	U	<0.020	<0.28	U	<0.025	<1.0	Y
Volatile Organics -ug/kg			*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	(ug/kg)			*(ug/kg)*			*(ug/kg)*		
Trichloroethene	NV	NV	0.16	NV	1.6	<2.2		U	<1.6		U	<1.4		U
Tetrachlorethene	NV	NV	0.057	NV	0.21	<2.2		U	<1.6		U	<1.4		U
Ethylbenzene	NV	NV	0.01	NV	0.05	<2.2		U	<1.6		U	<1.4		U
Total xylenes (Sum of o-, m-, p-)	NV	NV	0.040	NV	0.16	<4.4		U	<3.2		U	<2.8		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	<0.002	<0.07	U	<0.002	<0.03	U	<0.002	<0.08	U
Aldrin	NV	NV	0.01	NV	NV	<0.001	<0.03	U	<0.001	<0.01	U	<0.001	<0.04	U
alpha-chlordane	NV	NV	0.01	0.037	NV	<0.001	<0.03	U	<0.001	<0.002	U	<0.001	<0.04	U
dieldrin	NV	NV	0.01	NV	NV	<0.002	<0.07	U	<0.002	<0.03	U	<0.002	<0.08	U
heptachlor	NV	NV	0.01	NV	NV	<0.001	<0.03	U	<0.001	<0.01	U	<0.001	<0.04	U
alpha-BHC	NV	NV	NV	0.01	NV	<0.001	<0.03		<0.001	<0.01		<0.001	<0.04	
gamma-BHC (Lindane)	NV	NV	0.01	NV	NV	<0.001	<0.03	U	<0.001	<0.01	U	<0.001	<0.04	U
PCBs	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Aroclor 1016	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Aroclor 1242	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Aroclor 1248	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Aroclor 1254	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Aroclor 1260	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Aroclor 1221	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Aroclor 1232	NV	NV	NV	NV	NV	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U
Total PCBs **	12	65	0.13	38***	3.1	<0.020	<0.67	U	<0.020	<0.28	U	<0.020	<0.82	U

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
Double underlined and italics exceeds the ML
* The 73 ug/kg criteria for bulk TBT derived from PSDDA screening level for sediments.
** Total PCBs are calculated by summing detected concentrations of Aroclors.
** This value is normalized to organic carbon, and is expressed in mg/kg TOC.
NV - No value currently established under PSDDA or SMS.
NA = Not analyzed
U = Undetected
D = Diluted sample
Y = Raised reporting limit due to background interference
B = Contamination observed in the method blank
J = Estimated concentration
UG = Undetected, reporting limit may be biased low
LPAH - Light molecular weight poly aromatic hydrocarbon
HPAH - Heavy molecular weight poly aromatic hydrocarbon
Data has been validated according to QA-2 protocols.

Table 3-1 Summary of Subsurface Sediment Chemical Concentrations

Parameter	SMS Criteria		DMMP Criteria			DMMU5			DMMU6		
	SQS	CSL	Screening Level (SL)	Bioaccum-mulation Trigger (BT)	Maximum Level (ML)	IJ-C5-S1			IJ-C6-S1		
Conventionals											
Total Solids (%)	NV	NV	NV	NV	NV	**47.7**			**51.30**		
Total Volatile Solids(%)	NV	NV	NV	NV	NV	**6.73**			**19.33**		
Total Organic Carbon (%)	NV	NV	NV	NV	NV	**3.22**			**7.03**		
Ammonia (mg-N/kg)	NV	NV	NV	NV	NV	**91.2**			**82.7**		
Total Sulfides (mg/kg)	NV	NV	NV	NV	NV	**3,400**		**J**	**680**		**J**
Metals - mg/kg						*(mg/kg)*			*(mg/kg)*		
Antimony	NV	NV	150	150	200	10		UR	10		UR
Arsenic	57	93	57	507.1	700	10		U	10		U
Cadmium	5.1	6.7	5.1	11.3	14	**0.7**			**0.9**		
Chromium	260	270	NV	267	NV	**68.0**			**55**		
Copper	390	390	390	1,027	1,300	**61.8**			**59.0**		
Lead	450	530	450	975	1,200	**27**			**66.0**		
Mercury	0.41	0.59	0.41	1.5	2.3	**0.74**			**1.0**		
Nickel	NV	NV	140	370	370	**106**			**94**		
Silver	6.1	6.1	6.1	6.1	8.4	0.7		U	0.6		U
Zinc	410	960	410	2,763	3,800	**131**		**J**	**134**		**J**
Porewater Organotins						*(ug/L)*			*(ug/L)*		
Monobutyl Tin	NV	NV	NV	NV	NV	**0.073**		**UB**	**0.086**		**UB**
Dibutyl Tin	NV	NV	NV	NV	NV	<0.029		U	<0.029		U
Tributyl Tin	NV	NV	0.15	NV	NV	**0.084**		**UB**	**0.022**		**J**
Bulk Sediment Organotins -ug/kg						*(ug/kg)*			*(ug/kg)*		
Monobutyl Tin	NV	NV	NV	NV	NV	<3.9		UJ	<4.0		UJ
Dibutyl Tin	NV	NV	NV	NV	NV	<5.6		U	<5.7		U
Tributyl Tin	NV	NV	(73)*	NV	NV	**6.4**			**14**		
LPAH	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Naphthalene	99	170	2.1	NV	2.4	**0.031**	**0.96**		**0.110**	**1.6**	
Acenaphthylene	66	66	0.56	NV	1.3	<0.020	<0.62	U	**0.014**	**0.20**	**J**
Acenaphthene	16	57	0.5	NV	2.0	**0.032**	**0.99**		**0.062**	**0.88**	
Fluorene	23	79	0.54	NV	3.6	**0.048**	**1.5**		**0.067**	**0.95**	
Phenanthrene	100	480	1.5	NV	21	**0.280**	**8.7**		**0.180**	**2.6**	
Anthracene	220	1200	0.96	NV	13	**0.069**	**2.1**		**0.083**	**1.2**	
2-Methylnaphthalene	38	64	0.67	NV	1.9	**0.033**	**1.0**		**0.069**	**0.98**	
Total LPAH	370	780	5.2	NV	29	**0.493**	**15.3**		**0.585**	**8.32**	
HPAH	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Fluoranthene	160	1200	1.7	4.6	30	**0.320**	**9.94**		**0.500**	**7.11**	
Pyrene	1000	1400	2.6	11.98	16	**0.400**	**12.4**		**0.560**	**7.97**	
Benzo(a)anthracene	110	270	1.3	NV	5.1	**0.160**	**4.97**		**0.170**	**2.42**	
Chrysene	110	460	1.4	NV	21	**0.200**	**6.21**		**0.250**	**3.56**	
Benzofluoranthenes (b+k)	230	450	3.2	NV	9.9	**0.220**	**6.83**		**0.249**	**3.54**	
Benzo(a)pyrene	99	210	1.6	NV	3.6	**0.110**	**3.42**		**0.110**	**1.56**	
Indeno(1,2,3-cd)pyrene	34	88	0.6	NV	4.4	**0.059**	**1.8**		**0.048**	**0.68**	
Dibenzo(a,h)anthracene	12	33	0.23	NV	1.9	**0.015**	**0.47**	**J**	**0.013**	**0.18**	**J**
Benzo(g,h,i)perylene	31	78	0.67	NV	3.2	**0.060**	**1.9**		**0.048**	**0.68**	
Total HPAH	960	5300	12	NV	69	**1.544**	**47.95**		**1.948**	**27.71**	
Chlorinated Hydrocarbons	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
1,3-Dichlorobenzene	NV	NV	0.17	NV	NV	<0.020	<0.62	U	<0.020	<0.28	U
1,4-Dichlorobenzene	3.1	9	0.11	NV	0.12	<0.020	<0.62	U	<0.020	<0.28	U
1,2-Dichlorobenzene	2.3	2.3	0.035	NV	0.11	<0.020	<0.62	U	<0.020	<0.28	U
1,2,4-Trichlorobenzene	0.81	1.8	0.031	NV	0.064	<0.020	<0.62	U	<0.020	<0.28	U
Hexachlorobenzene	0.38	2.3	0.022	0.168	0.23	<0.020	<0.62	U	<0.020	<0.28	U
Phthalates	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Dimethyl phthalate	53	53	0.071	NV	1.4	<0.020	<0.62	U	**0.079**	**1.124**	
Diethyl phthalate	61	110	0.2	NV	1.2	<0.020	<0.62	U	<0.020	<0.28	U
Di-n-butyl phthalate	220	1700	1.4	NV	5.1	<0.020	<0.62	U	<0.020	<0.28	U
Butyl benzyl phthalate	4.9	64	0.063	NV	0.97	<0.020	<0.62	U	<0.020	<0.28	U
Bis(2-ethylhexyl)phthalate	47	78	1.3	NV	8.3	**0.690**	**21.4**		***12.000***	**171**	**D**
Di-n-octyl phthalate	58	4500	6.2	NV	6.2	**0.210**	**6.522**		**0.040**	**0.569**	
Phenols - mg/kg						*(mg/kg)*			*(mg/kg)*		
Phenol	0.42	1	0.42	NV	1.2	<0.020		U	<0.020		U
2-Methylphenol	0.063	0.063	0.063	NV	0.077	<0.020		U	**0.011**		**J**
4-Methylphenol	0.67	0.67	0.67	NV	3.6	**0.055**			**0.097**		
2,4-Dimethylphenol	0.029	0.029	0.029	NV	0.21	**0.012**		**J**	**0.054**		
Pentachlorophenol	0.36	0.69	0.40	0.504	0.69	<0.100		U	<0.099		U
Miscellaneous Extractables	*(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		U
Benzoic acid	0.65	0.65	0.65	NV	0.76	<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)*	
Dibenzofuran	15	58	0.54	NV	1.7	**0.039**	**1.2**		**0.074**	**1.053**	
Hexachloroethane	NV	NV	1.4	NV	14	<0.020	<0.62	U	<0.020	<0.28	U
Hexachlorobutadiene	3.9	6.2	0.029	NV	0.27	<0.020	<0.62	U	<0.020	<0.28	U
N-Nitrosodiphenylamine	11	11	0.028	NV	0.13	<0.020	<0.62	U	<0.020	<0.28	U
Volatile Organics -ug/kg			*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ug/kg)*			*(ug/kg)*		
Trichloroethene	NV	NV	0.16	NV	1.6	<2.2		U	<1.6		U
Tetrachlorethene	NV	NV	0.057	NV	0.21	<2.2		U	<1.6		U
Ethylbenzene	NV	NV	0.01	NV	0.05	<2.2		U	<1.6		U
Total xylenes (Sum of o-, m-, p-)	NV	NV	0.040	NV	0.16	<4.4		U	<3.2		U
Pesticides	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
DDT	NV	NV	0.0069	0.05	0.069	<0.010	<0.31	Y	<0.012	<0.17	Y
Aldrin	NV	NV	0.01	NV	NV	<0.001	<0.03	U	<0.002	<0.03	U
alpha-chlordane	NV	NV	0.01	0.037	NV	<0.001	<0.03	U	<0.002	<0.03	U
dieldrin	NV	NV	0.01	NV	NV	<0.002	<0.062	U	<0.004	<0.06	U
heptachlor	NV	NV	0.01	NV	NV	<0.001	<0.03	U	<0.002	<0.03	U
alpha-BHC	NV	NV	NV	0.01	NV	<0.001	<0.03		<0.002	<0.03	U
gamma-BHC (Lindane)	NV	NV	0.01	NV	NV	<0.001	<0.03	U	<0.002	<0.03	U
PCBs	*(ppm TOC)*	*(ppm TOC)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ppm TOC)*		*(mg/kg)*	*(ppm TOC)*	
Aroclor 1016	NV	NV	NV	NV	NV	<0.020	<0.62	U	<0.004	<0.06	U
Aroclor 1242	NV	NV	NV	NV	NV	<0.020	<0.62	U	<0.004	<0.06	U
Aroclor 1248	NV	NV	NV	NV	NV	<0.047	<1.46	Y	<0.004	<0.06	U
Aroclor 1254	NV	NV	NV	NV	NV	**0.064**	**2.0**		**0.089**	**1.3**	
Aroclor 1260	NV	NV	NV	NV	NV	<0.020	<0.62	U	<0.004	<0.06	U
Aroclor 1221	NV	NV	NV	NV	NV	<0.020	<0.62	U	<0.004	<0.06	U
Aroclor 1232	NV	NV	NV	NV	NV	<0.020	<0.62	U	<0.004	<0.06	U
Total PCBs **	12	65	0.13	38***	3.1	**0.064**	**2.0**		**0.089**	**1.3**	

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
Double underlined and italics exceeds the ML
* The 73 ug/kg criteria for bulk TBT derived from PSDDA screening level for sediments.
** Total PCBs are calculated by summing detected concentrations of Aroclors.
** This value is normalized to organic carbon, and is expressed in mg/kg TOC.
NV - No value currently established under PSDDA or SMS.
NA = Not analyzed
U = Undetected
D = Diluted sample
Y = Raised reporting limit due to background interference
B = Contamination observed in the method blank
J = Estimated concentration
UG = Undetected, reporting limit may be biased low
LPAH - Light molecular weight poly aromatic hydrocarbon
HPAH - Heavy molecular weight poly aromatic hydrocarbon
Data has been validated according to QA-2 protocols.

Table 3-2 Subsurface Sediment Dioxin/Furan Results

Sample ID		IJ-C-S1 (sediment composite)		IJ-C3-S1 DMMU-3		IJ-C4-S1 DMMU-4A		IJ-C4-S2 DMMU-4B		IJ-C5-S1 DMMU-5		IJ-C6-S1 DMMU-6		IJ-B-S1 (clean sand blank)	
Analysis	**TEF**	**pg/g**	**TEC**	**pg/g**	**TEC**	**pg/g**	**TEC**	**pg/g**	**TEC**	**pg/g**	**TEC**	**pg/g**	**TEC**	**pg/g**	**TEC**
Dioxins-Furans (EPA 1613B) - pg/g															
2,3,7,8-TCDD	1.0	< 1.7	0.85	**1.0 J**	**1**	**1.1 J**	**1.1**	**1.4 J**	**1.4**	**1.4 J**	**1.4**	**1.4 J**	**1.4**	< 0.77	0.385
1,2,3,7,8-PeCDD	1.0	< 3.2	1.6	< 4.9	2.45	**5.7 J**	**5.7**	< 3.6	1.8	**5.8 J**	**5.8**	**5.4 J**	**5.4**	< 0.89	0.445
1,2,3,4,7,8-HxCDD	0.1	**7.5 J**	**0.75**	**9.6 J**	**0.96**	**10 J**	**1**	**5.9 J**	**0.59**	**10 J**	**1**	**7.1 J**	**0.71**	< 0.88	0.044
1,2,3,6,7,8-HxCDD	0.1	**28**	**2.8**	**32**	**3.2**	**35**	**3.5**	**27**	**2.7**	**41**	**4.1**	**39**	**3.9**	< 0.99	0.0495
1,2,3,7,8,9-HxCDD	0.1	**10**	**1**	**17**	**1.7**	**18**	**1.8**	**13**	**1.3**	**20**	**2**	**15**	**1.5**	< 0.87	0.0435
1,2,3,4,6,7,8-HpCDD	0.01	**670**	**6.7**	**830**	**8.3**	**820**	**8.2**	**880**	**8.8**	**950**	**9.5**	**1000**	**10**	< 0.61	0.00305
OCDD	0.0001	**5000**	**0.5**	**6000**	**0.6**	**6300**	**0.63**	**6200**	**0.62**	**6700**	**0.67**	**8300 E**	**0.83**	**6.6 J**	**0.00066**
2,3,7,8-TCDF	0.1	**9.3**	**0.93**	**12**	**1.2**	**15**	**1.5**	**9.3**	**0.93**	**13**	**1.3**	**8.2**	**0.82**	< 0.96	0.048
1,2,3,7,8-PeCDF	0.05	< 2.9	0.0725	< 3.1	0.0775	< 3.7	0.0925	< 2.8	0.07	< 4.3	0.1075	**4.8 J**	**0.24**	< 0.57	0.01425
2,3,4,7,8-PeCDF	0.5	< 2.6	0.65	< 3.5	0.875	< 3.9	0.975	< 3.2	0.8	< 4.5	1.125	**6.2 J**	**3.1**	< 0.52	0.13
1,2,3,4,7,8-HxCDF	0.1	**8.8 J**	**0.88**	**6.0 J**	**0.6**	**9.4 J**	**0.94**	**7.6 J**	**0.76**	**11**	**1.1**	**14**	**1.4**	< 1.4	0.07
1,2,3,6,7,8-HxCDF	0.1	< 3.5	0.175	< 4.2	0.21	< 4.6	0.23	< 3.8	0.19	< 5.1	0.255	**6.8 J**	**0.68**	< 1.2	0.06
2,3,4,6,7,8-HxCDF	0.1	< 2.8	0.14	< 3.7	0.185	< 3.6	0.18	< 3	0.15	< 4	0.2	**5.6 J**	**0.56**	< 0.88	0.044
1,2,3,7,8,9-HxCDF	0.1	< 2.3	0.115	< 0.49	0.0245	< 0.75	0.0375	< 0.53	0.0265	< 0.66	0.033	< 0.64	0.032	< 0.85	0.0425
1,2,3,4,6,7,8-HpCDF	0.01	**92**	**0.92**	**83**	**0.83**	**100**	**1**	**89**	**0.89**	**110**	**1.1**	**170**	**1.7**	< 0.49	0.00245
1,2,3,4,7,8,9-HpCDF	0.01	**6.0 J**	**0.06**	**5.9 J**	**0.059**	**6.50 J**	**0.065**	**5.5 J**	**0.055**	**7.6 J**	**0.076**	**8.90 J**	**0.089**	< 0.60	0.003
OCDF	0.0001	**260**	**0.026**	**230**	**0.023**	**270**	**0.027**	**240**	**0.024**	**310**	**0.031**	**390**	**0.039**	< 1.1	0.000055
Total HpCDF		**350**		**310**		**350**		**370**		**450**		**630**		< 0.60	
Total HpCDD		**2200**		**3300**		**2900**		**4100**		**4400**		**4800**		< 0.61	
Total HxCDF		**150**		**120**		**150**		**130**		**170**		**260**		< 1.4	
Total HxCDD		**410**		**600**		**620**		**530**		**870**		**610**		< 0.99	
Total PeCDF		**28**		**32**		**33.0**		**35**		**40**		**74**		< 1.0	
Total PeCDD		**150**		**210**		**250**		**83**		**280**		**120**		< 0.89	
Total TCDD		**120**		**150**		**160**		**46**		**160**		**76**		< 0.77	
Total TCDF		**47**		**50**		**55**		**44**		**56**		**61**		< 0.96	
Total TEC			**18.2**		**22.3**		**27.0**		**21.1**		**29.8**		**32.4**		**1.4**

Notes: All results in pg/g.
TEF = Toxic Equivalency Factor
TEC = Toxic Equivalency Concentration
Total TEC is summed using detected TEC concentrations and half of the TEC of the detection limit, per DMMP recommendations.
TEFs are from Van den Berg et al., 1998. Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife. Environmental Health Perspectives, 106:12 p 775-792, December.

Table 3-3 Summary of Subsurface Sediment Grain Size Data

Parameter / Sample ID	REF-01	REF-02	DMMU3	DMMU4A	DMMU4B	DMMU5	DMMU6
Sample Location			IJ-C3-S1	IJ-C4-S1	IJ-C4-S2	IJ-C5-S1	IJ-C6-S1
Sample Date	6/15/2006	6/15/2006	6/12/2006	6/14/2006		6/13/2006	6/13/2006
Conventionals - %							
Total Solids (%)	72.4	36.1	48.4	57.5	48.5	47.7	51.3
Total Volatile Solids (%)	1.86	7.16	7.75	23.76	10.11	6.73	19.33
Total Organic Carbon (%)	1.29	1.87	2.98	7.08	2.45	3.22	7.03
Ammonia (mg-N/kg)	15.3	13.8	62.2	50.9	41.6	91.2	82.7
Total Sulfide (mg/kg)	76 J	180 J	2,000	160	310	3,400	680
Grain Size - %							
Gravel	<0.0100	<0.0100	2.1	1.1	5.1	2.83	9.9
Sand	81.5	8.20	15.50	29.5	43.8	23.17	33.1
Silt	11.3	57.9	47.1	39.3	30.5	43.8	33
Clay	7.2	33.9	35.4	30	20.8	30.17	24.1
Total Fines	18.5	91.8	82.5	69.3	51.3	74	57.1

Notes:
No criteria has been established for SMS or DMMP for conventionals or grain size.

Table 3-4 Summary of Subsurface Sediment Bioassay 10- Day Amphipod Testing (*Eohaustorius estuarius*)

Sample Location	Replicate	Initial Count	Final Count	Percent Survival	Percent Mortality
Control-1	A	20	19	95	5
	B	20	20	100	0
	C	20	17	85	15
	D	20	18	90	10
	E	20	18	90	10
	Mean		18.4	92	**8**
IJW-RR-01	A	20	18	90	10
	B	20	20	100	0
	C	20	19	95	5
	D	20	19	95	5
	E	20	19	95	5
	Mean		19	95	**5**
IJW-RR-02	A	20	19	95	5
	B	20	19	95	5
	C	20	19	95	5
	D	20	18	90	10
	E	20	18	90	10
	Mean		18.6	93	**7**
DMMU-3	A	20	15	75	25
	B	20	16	80	20
	C	20	15	75	25
	D	20	18	90	10
	E	20	17	85	15
	Mean		16.2	81	**19**
DMMU-4A	A	20	18	90	10
	B	20	17	85	15
	C	20	17	85	15
	D	20	19	95	5
	E	20	18	90	10
	Mean		17.8	89	**11**
DMMU-4B	A	20	17	85	15
	B	20	17	85	15
	C	20	19	95	5
	D	20	16	80	20
	E	20	16	80	20
	Mean		17	85	**15**
DMMU-5	A	20	16	80	20
	B	20	14	70	30
	C	20	16	80	20
	D	20	17	85	15
	E	20	16	80	20
	Mean		15.8	79	**21**
DMMU-6	A	20	17	85	15
	B	20	18	90	10
	C	20	18	90	10
	D	20	17	85	15
	E	20	15	75	25
	Mean		17	85	**15**

Table 3-5 Summary of Subsurface Sediment Bioassay 20-Day Growth Juvenile Polychaete Testing (*Neanthes arenaceodentata*)

Sample Location	Replicate	Initial Count	Final Count	Percent Survival	Total Worm Weight (mg)	Average Weight Per Worm (mg)	Mean Individual Growth Rate (mg/ind/day)
Control-1	A	5	5	100	160.1	32.0	1.55
	B	5	5	100	55.3	11.1	0.50
	C	5	5	100	159.9	32.0	1.55
	D	5	5	100	134.8	27.0	1.29
	E	5	5	100	125.2	25.0	1.20
	Mean			**100**	**127.05**	**25.41**	**1.22**
IJW-RR-01	A	5	5	100	98.5	19.7	0.93
	B	5	5	100	117.7	23.5	1.12
	C	5	5	100	117.4	23.5	1.12
	D	5	5	100	100.9	20.2	0.96
	E	5	5	100	103.5	20.7	0.98
	Mean			**100**	**107.58**	**21.52**	**1.02**
IJW-RR-02	A	5	5	100	79.4	15.9	0.74
	B	5	5	100	113.1	22.6	1.08
	C	5	5	100	99.0	19.8	0.94
	D	5	5	100	104.5	20.9	0.99
	E	5	5	100	92.3	18.5	0.87
	Mean			**100**	**97.65**	**19.53**	**0.92**
DMMU-3	A	5	5	100	89.1	17.8	0.84
	B	5	5	100	58.3	11.7	0.53
	C	5	5	100	119.3	23.9	1.14
	D	5	5	100	105.5	21.1	1.00
	E	5	5	100	109.4	21.9	1.04
	Mean			**100**	**96.32**	**19.26**	**0.91**
DMMU-4A	A	5	5	100	93.3	18.7	0.88
	B	5	5	100	97.3	19.5	0.92
	C	5	5	100	133.9	26.8	1.29
	D	5	5	100	83.4	16.7	0.78
	E	5	5	100	102.4	20.5	0.97
	Mean			**100**	**102.08**	**20.42**	**0.97**
DMMU-4B	A	5	5	100	101.7	20.3	0.96
	B	5	5	100	87.6	17.5	0.82
	C	5	5	100	110.4	22.1	1.05
	D	5	5	100	112.8	22.6	1.07
	E	5	5	100	111.7	22.3	1.06
	Mean			**100**	**104.84**	**20.97**	**1.00**
DMMU-5	A	5	5	100	64.3	12.9	0.59
	B	5	5	100	82.3	16.5	0.77
	C	5	5	100	70.1	14.0	0.65
	D	5	5	100	63.6	12.7	0.58
	E	5	5	100	23.4	4.7	0.18
	Mean			**100**	**60.71**	**12.14**	**0.55**
DMMU-6	A	5	5	100	85.6	17.1	0.80
	B	5	5	100	54.3	10.9	0.49
	C	5	5	100	75.6	15.1	0.70
	D	5	5	100	65.3	13.1	0.60
	E	5	3	60	46.2	15.4	0.72
	Mean			**92**	**65.41**	**14.31**	**0.66**

Note:
Initial worm weight average 1.07 mg.

Table 3-6 Summary of Subsurface Sediment Bioassay Larval Normality Testing (*Dendraster excentricus*)

Site	Replicate	Initial Number of Embryos, T=0	Number Normal	Number Abnormal	Total Number	N_C/Mean Initial
Sea Water Control	A	213	201	4	205	0.94
	B	213	254	3	257	1.19
	C	213	201	3	204	0.94
	D	213	227	5	232	1.07
	E	213	200	5	205	0.94
	Mean	213	217	4	221	**1.02**

Site	Replicate	Number Normal	Number Abnormal	Total Number	N_{R1}/N_C
Reference (RR-01)	A	183	8	191	0.84
	B	165	6	171	0.76
	C	187	10	197	0.86
	D	182	9	191	0.84
	E	194	7	201	0.90
	Mean	182.2	8	190	**0.84**

Site	Replicate	Number Normal	Number Abnormal	Total Number	N_{R2}/N_C
Reference (RR-02)	A	196	8	204	0.90
	B	208	12	220	0.96
	C	132	8	140	0.61
	D	217	14	231	1.00
	E	168	6	174	0.78
	Mean	184	10	194	**0.85**

Site	Replicate	Number Normal	Number Abnormal	Total Number	Mean Normal Survival (N_T/N_{R1})	Mean Normal Survival (N_T/N_C)
DMMU-3	A	141	17	158	0.77	0.65
	B	107	12	119	0.59	0.49
	C	128	11	139	0.70	0.59
	D	83	12	95	0.46	0.38
	E	116	8	124	0.64	0.54
	Mean	115			**0.63**	**0.53**
DMMU-4A	A	146	11	157	0.80	0.67
	B	138	7	145	0.76	0.64
	C	156	8	164	0.86	0.72
	D	165	15	180	0.91	0.76
	E	97	5	102	0.53	0.45
	Mean	140			**0.77**	**0.65**
DMMU-4B	A	159	10	169	0.87	0.73
	B	125	8	133	0.69	0.58
	C	148	5	153	0.81	0.68
	D	181	6	187	0.99	0.84
	E	186	8	194	1.02	0.86
	Mean	160			**0.88**	**0.74**
DMMU-5	A	103	14	117	0.57	0.48
	B	101	16	117	0.55	0.47
	C	98	7	105	0.54	0.45
	D	163	9	172	0.89	0.75
	E	110	11	121	0.60	0.51
	Mean	115			**0.63**	**0.53**
DMMU-6	A	126	12	138	0.69	0.58
	B	176	7	183	0.97	0.81
	C	161	9	170	0.88	0.74
	D	138	6	144	0.76	0.64
	E	138	13	151	0.76	0.64
	Mean	148			**0.81**	**0.68**

Notes:
Replicates were run using standard method
N = normal counts
Subscripts: R = reference sediment, C = negative control

Table 3-7 DMMP Bioassay 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	$M_C \leq 10\%$	$M_R - M_C \leq 20\%$	$M_T - M_C > 20\%$ and M_T vs M_R SD ($p = 0.05$) and		$M_T - M_C > 20\%$ and M_T vs M_R SD ($p = 0.05$) and	
			$M_T - M_R > 10\%$	NOCN	$M_T - M_R > 30\%$	NOCN
Larval	$N_C \div I \geq 0.70$	$N_R \div N_C \geq 0.65$	$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD ($p = 0.10$) and		$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD ($p = 0.10$) and	
			$N_R/N_C - N_T/N_C > 0.15$	NOCN	$N_R/N_C - N_T/N_C > 0.30$	NOCN
Neanthes growth	$M_C \leq 10\%$ and MIGC ≥ 0.38	$M_R \leq 20\%$ and 'MIGR ÷ MIGC ≥ 0.80	$MIG_T \div MIG_C < 0.80$ and MIG_T vs MIG_R SD ($p = 0.05$) and		$MIG_T \div MIG_C < 0.80$ and MIG_T vs MIG_R SD ($p = 0.05$) and	
			$MIG_T/MIG_R < 0.70$	NOCN	$MIG_T/MIG_R < 0.50$	$MIG_T/MIG_R < 0.70$

Notes:
I - Initial count
M - Mortality
MIG - Mean individual growth rate
N - Normals
NOCN - No other conditions necessary
SD - Statistically different
Subscripts:
C - Negative control
R - Reference sediment
T - Test sediment

Table 3-8 Evaluation of Subsurface Sediment Bioassay Test Results

	DMMU-3	DMMU-4A	DMMU-4B	DMMU-5	DMMU-6
Amphipod Survival Test					
M_T-M_C	**11%**	**3%**	**7%**	**13%**	**7%**
M_T-M_C > 20%?	No	No	No	No	No
M_T-M_{R1}	**14%**	**6%**	**10%**	**16%**	**10%**
M_T-M_{R1} > 10%?	-	-	-	-	-
M_T-M_{R1} > 30%?	-	-	-	-	-
Statistically different from reference?	-	-	-	-	-
Dispersive Result	Pass	Pass	Pass	Pass	Pass
Nondispersive Result	Pass	Pass	Pass	Pass	Pass
Juvenile Polychaete Growth Test					
$MIG_T \div MIG_C$	**0.75**	**0.79**	**0.82**	**0.45**	**0.54**
$MIG_T \div MIG_C$ < 0.80?	Yes	Yes	No	Yes	Yes
$MIG_T \div MIG_{R1}$	**0.89**	**0.95**	**0.97**	**0.54**	**0.65**
$MIG_T \div MIG_{R1}$ < 0.70?	No	No	-	Yes	Yes
$MIG_T \div MIG_{R1}$ < 0.50?	No	No	-	No	No
Statistically different from reference?	No	No	-	Yes	Yes
Dispersive Result	Pass	Pass	Pass	1-hit Failure	1-hit Failure
Nondispersive Result	Pass	Pass	Pass	2-hit Failure	2-hit Failure
Larval Development Test					
$N_T \div N_C$	**0.53**	**0.65**	**0.74**	**0.53**	**0.68**
$N_T \div N_C$ < 0.80?	Yes	Yes	Yes	Yes	Yes
N_{R1}/N_C - N_T/N_C	**0.31**	**0.19**	**0.10**	**0.31**	**0.16**
N_{R1}/N_C - N_T/N_C > 0.15?	Yes	Yes	No	Yes	Yes
N_{R1}/N_C - N_T/N_C > 0.30?	Yes	No	No	Yes	No
Statistically different from reference?	Yes	Yes	No	Yes	Yes
Dispersive Result	1-hit Failure	1-hit Failure	Pass	1-hit Failure	1-hit Failure
Nondispersive Result	1-hit Failure	2-hit Failure	Pass	1-hit Failure	2-hit Failure

Notes:

All samples are compared to reference sample IJW-RR-02.
M = mortality
MIG = mean individual growth rate (mg/individual/day)
N = normals
Subscripts: R = reference sediment, C = negative control, T = test sediment

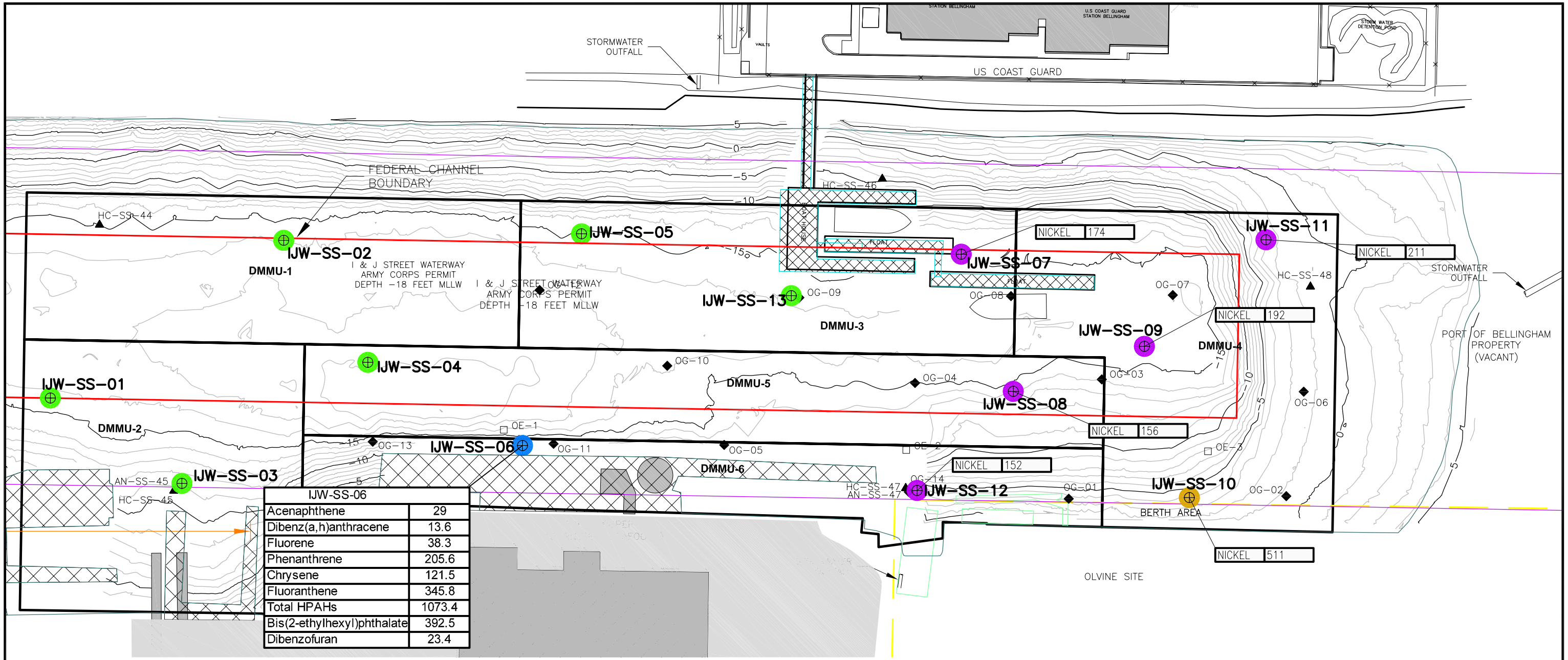
Table 3-9 I&J Waterway Subsurface Sediment Bioassay Test Interpretations

	Dispersive Site	Non-Dispersive Site
DMMU-3	Fail	Fail
DMMU-4A	Fail	Pass*
DMMU-4B	Pass*	Pass*
DMMU-5	Fail	Fail
DMMU-6	Fail	Fail

Notes:

* Addresses bioassay results, but does not address unresolved dioxin issue.

Figures



IJW-SS-06	
Acenaphthene	29
Dibenz(a,h)anthracene	13.6
Fluorene	38.3
Phenanthrene	205.6
Chrysene	121.5
Fluoranthene	345.8
Total HPAHs	1073.4
Bis(2-ethylhexyl)phthalate	392.5
Dibenzofuran	23.4

LEGEND

- DOCKS OR PIERS
- EXISTING STRUCTURES
- EXISTING SHORELINE
- BATHYMETRY (FEET BELOW MLLW, OCTOBER 2005)
- CURRENT OLIVINE UPLAND SITE BOUNDARY
- I & J WATERWAY BOUNDARY

- HC-SS-47 — WHATCOM WATERWAY STATION SEDIMENT GRAB SAMPLE (HART CROWSER, 1997)
- OG-10 — 2001 RETEC STATION SURFACE SEDIMENT GRAB SAMPLE
- OE-1 — PRE-REMEDIAL DESIGN TESTING STATION (COMPOSITE FOR LEACHING TESTS 2002)
- IJW-SS-02 — RI/FS SAMPLE LOCATION
- AN-SS-47 — ANCHOR BIOASSAY SAMPLE LOCATION
- NO EXCEEDANCES
- SQS EXCEEDANCE
- Ni > PSDDA SL (140 mg/kg)
- Ni > PSDDA BT (370 mg/kg)

Chemical Parameter	SQS	CSL
Acenaphthene (ppm-TOC)	220	1200
Dibenz(a,h)anthracene (ppm-TOC)	12	33
Fluorene (ppm-TOC)	23	79
Phenanthrene (ppm-TOC)	100	480
Chrysene (ppm-TOC)	110	460
Fluoranthene (ppm-TOC)	160	1200
Total HPAHs	960	5300
Bis(2-ethylhexyl)phthalate (ppm-TOC)	47	78
Dibenzofuran (ppm-TOC)	15	58
Nickel (mg/kg) - PSDDA	SL= 140	BT = 370

30 0 60
SCALE IN FEET

RETEC

I & J WATERWAY SEDIMENTS RI/FS

PORTB-18448-210

DATE: 10/19/06 | DRWN: E.M./SEA

SURFACE SEDIMENT CHEMICAL DATA ABOVE CRITERIA

FIGURE 2-1

STORMWATER OUTFALL

U.S COAST GUARD STATION BELLINGHAM

STORM WATER DETENTION POND

US COAST GUARD

FEDERAL CHANNEL BOUNDARY

HC-SS-44

BEP 2.6

IJW-SS-02

DMMU-1

I & J STREET WATERWAY ARMY CORPS PERMIT DEPTH -18 FEET MLLW

BEP 5.8

IJW-SS-05

HC-SS-46

SOUTH WAY

FLOAT

BEP 10.2

IJW-SS-07

IJW-SS-11

BEP 28.9

STORMWATER OUTFALL

I & J STREET WATERWAY ARMY CORPS PERMIT DEPTH -18 FEET MLLW

OG-12

IJW-SS-13

OG-09

BEP 11.8

DMMU-3

OG-08

OG-07

HC-SS-48

BEP 7.5

IJW-SS-09

DMMU-4

PORT OF BELLINGHAM PROPERTY (VACANT)

IJW-SS-01

BEP 10.3

DMMU-2

IJW-SS-04

BEP 9.4

OG-10

DMMU-5

OG-04

IJW-SS-08

OG-03

OG-06

OE-1

BEP 392.5

OG-13

IJW-SS-06

OG-11

OG-05

DMMU-6

OE-2

BEP 14

OG-14

HC-SS-47

AN-SS-47

IJW-SS-12

OG-01

BEP 10.2

OE-3

IJW-SS-10

OG-02

AN-SS-45

IJW-SS-03

HC-SS-45

BEP 16.3

BERTH AREA

BEP 21.9

OLVINE SITE

LEGEND

- DOCKS OR PIERS
- EXISTING STRUCTURES
- EXISTING SHORELINE
- BATHYMETRY (FEET BELOW MLLW, OCTOBER 2005)
- CURRENT OLIVINE UPLAND SITE BOUNDARY
- I & J WATERWAY BOUNDARY
- PREVIOUS bis(2-Ethylhexyl)phthalate CONCENTRATION CONTOURS FROM 2001 SAMPLING: SQS BOUNDARY
- PREVIOUS bis(2-Ethylhexyl)phthalate CONCENTRATION CONTOURS FROM 2001 SAMPLING: CSL BOUNDARY

- HC-SS-47 — WHATCOM WATERWAY STATION SEDIMENT GRAB SAMPLE (HART CROWSER, 1997)
- OG-10 — 2001 RETEC STATION SURFACE SEDIMENT GRAB SAMPLE
- OE-1 — PRE-REMEDIAL DESIGN TESTING STATION (COMPOSITE FOR LEACHING TESTS 2002)
- IJW-SS-02 — RI/FS SAMPLE LOCATION
- AN-SS-47 — ANCHOR BIOASSAY SAMPLE LOCATION
- BEP <SQS(47ppm-TOC)
- BEP >CSL(78ppm-TOC)

NOTE: BEP = BIS(2-ETHYLHEXYL)PHTHALATE

30 0 60

SCALE IN FEET

RETEC

I & J WATERWAY SEDIMENTS RI/FS PORTB-18448-210		SUMMARY OF BIS (2-ETHYLHEXYL) PHTHALATE CHEMICAL DATA
DATE: 10/19/06	DRWN: E.M./SEA	FIGURE 2-2

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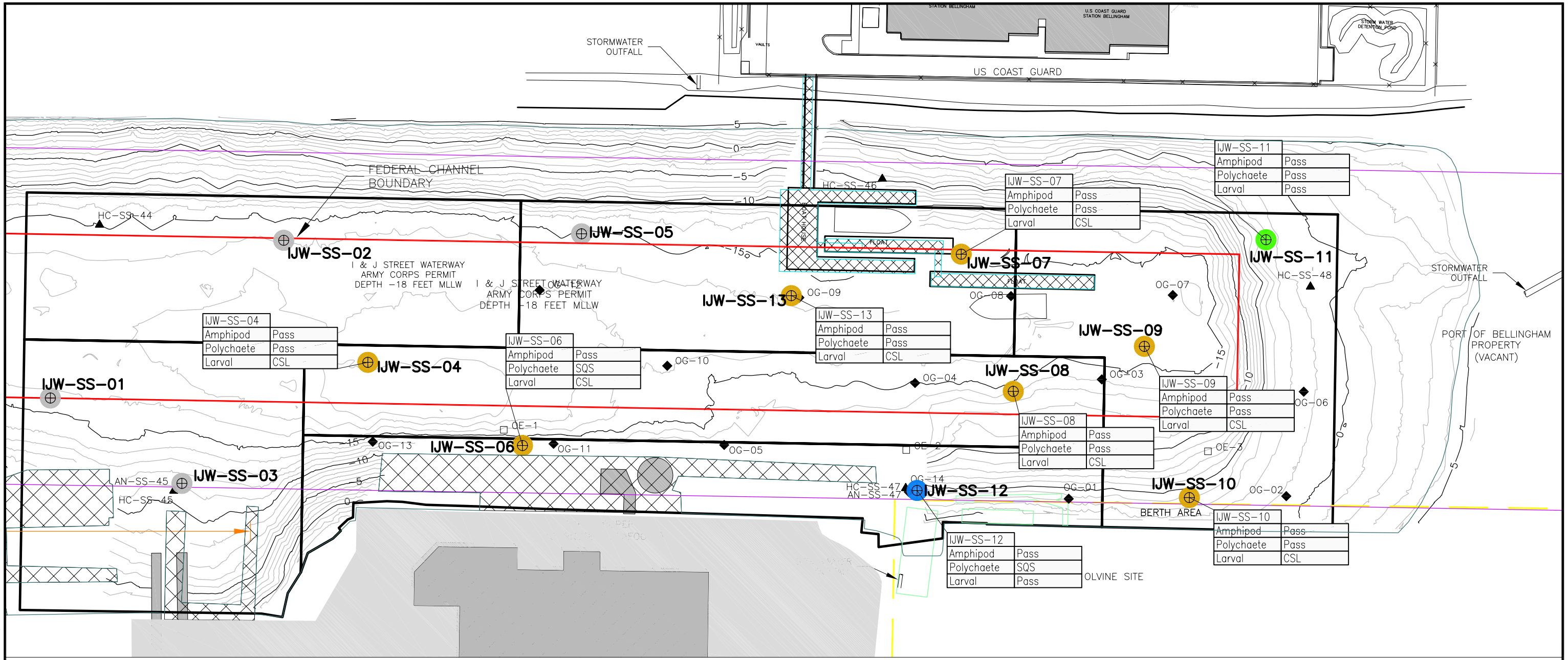


LEGEND

- DOCKS OR PIERS
- EXISTING STRUCTURES
- EXISTING SHORELINE
- 25 — BATHYMETRY (FEET BELOW MLLW, OCTOBER 2005)
- CURRENT OLIVINE UPLAND SITE BOUNDARY
- I & J WATERWAY BOUNDARY

- ▲ HC-SS-47 — WHATCOM WATERWAY STATION SEDIMENT GRAB SAMPLE (HART CROWSER, 1997)
- ◆ OG-10 — 2001 RETEC STATION SURFACE SEDIMENT GRAB SAMPLE
- □ OE-1 — PRE-REMEDIAL DESIGN TESTING STATION (COMPOSITE FOR LEACHING TESTS 2002)
- ⊕ IJW-SS-02 — RI/FS SAMPLE LOCATION
- ▲ AN-SS-47 — ANCHOR BIOASSAY SAMPLE LOCATION
- NO EXCEEDANCES
- SQS EXCEEDANCE
- CSL EXCEEDANCE
- NOT TESTED

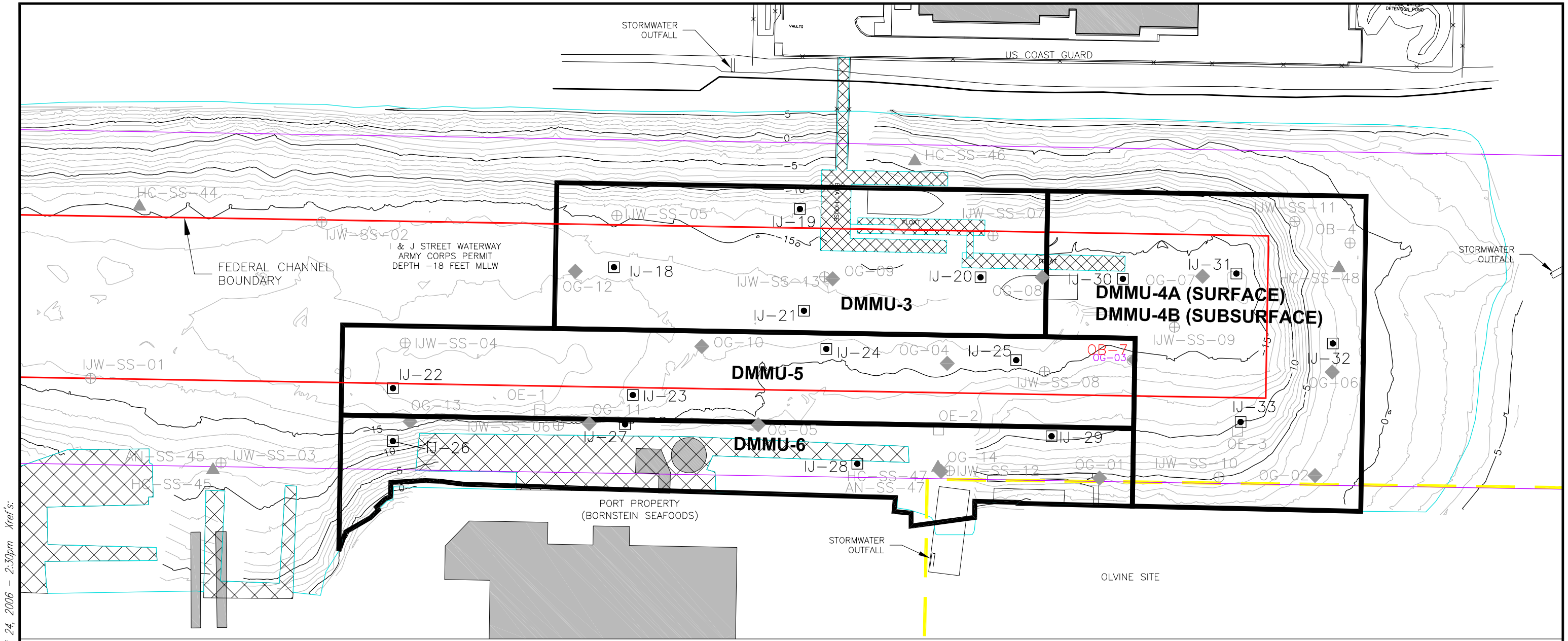
NOTES:
CSL = CLEANUP SCREENING LEVEL FAILURE
SQS = SEDIMENT QUALITY STANDARDS FAILURE
PASS = MEETS SEDIMENT MANAGEMENT STANDARD CRITERIA

30 0 60
SCALE IN FEET

RETEC

I & J WATERWAY SEDIMENTS RI/FS PORTB-18448-210			**SUMMARY OF SURFACE SEDIMENT BIOASSAY TEST RESULTS**
DATE: 10/19/06	DRWN: E.M./SEA		**FIGURE 2-3**

File: H:\18448\184485103.dwg Layout: Layout1 User: emarshall Plotted: Oct 20, 2006 - 11:35am Xref's:



LEGEND

DOCKS OR PIERS	IJ-27 — SUBSURFACE CORE LOCATIONS
EXISTING STRUCTURES	HC-SS-47 — WHATCOM WATERWAY STATION SEDIMENT GRAB SAMPLE (HART CROWSER, 1997)
EXISTING SHORELINE	OG-10 — 2001 RETEC STATION SURFACE SEDIMENT GRAB SAMPLE
BATHYMETRY (25)	OE-1 — PRE-REMEDIAL DESIGN TESTING STATION (COMPOSITE FOR LEACHING TESTS 2002)
CURRENT OLIVINE UPLAND SITE BOUNDARY	IJW-SS-02 — RI/FS SURFACE SEDIMENT LOCATION
I & J WATERWAY BOUNDARY	AN-SS-47 — ANCHOR BIOASSAY SAMPLE LOCATION

30 0 60

SCALE IN FEET

RETEC

I & J WATERWAY SEDIMENTS RI/FS PORTB-18448-210			**I & J WATERWAY SUBSURFACE SAMPLING LOCATIONS**
DATE: 10/24/06	DRWN: E.M./SEA		**FIGURE 3-1**

File: H:\18448\18448S105.dwg Layout: Layout1 User: emarshall Plotted: Oct 24, 2006 - 2:30pm Xref's:

Appendix A

Analytical Data Reports

Appendix B

Data Validation Reports

November 8, 2005

Organic and Inorganic Data Validation Report

I&J Waterway Port of Bellingham, Washington

Sediment Sampling August and September 2005

Prepared for:

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Prepared by:

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RETEC Project No.: PORTB-18448-210

Overview

The samples analyzed for the Port of Bellingham I&J Waterway sediment sampling from August and September 2005 are listed in the Table of Samples Analyzed (page 2). Data validation was performed on fifteen sediment samples and two rinsate blank samples.

Samples were analyzed by Analytical Resources, Incorporated (ARI) of Tukwila, WA. The validated analyses were Volatile Organic Compounds (VOCs) benzene, toluene, ethylbenzene, and xylenes (BTEX) by SW846 GC/MS method 8260B; Semivolatile Organic Compounds (SVOCs) by SW846 GC/MS method 8270D and PSDDA SW8270D; Polychlorinated Biphenyls (PCBs) by SW846 GC method 8082 and PSDDA SW8082; Total Metals (Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, and Zn) by SW846 methods 6010B, 7470A and 7471A; Total Organic Carbon (TOC) by method Plumb. 1981; Sulfide by method 376.2; Ammonia by method 350.1; Total Volatile Solids (TVS) by method 160.4; Total Solids and Preserved Total Solids by methods E160.3 and E160.3-PRES; pH by method 150.1; and Grain Size by method PSEP.

The RETEC Analytical Data Validation Checklist is presented as pages 4-10. Data were evaluated based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review*, document number EPA540/R-99/008, October 1999 with additional reference to document 540-R-04-009, January 2005, and *USEPA CLP National Functional Guidelines for Inorganic Data Review*, document number EPA540/R-04/004 of October 2004 as they applied to the reported methodology. Field duplicate RPD control limits were taken from the USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, February 1988, upheld in DRAFT 1993.

Submitted Deliverables
Case Narratives
Chain-of-Custody form(s) and sample integrity
Sample results, reporting limits, dilution factors
Holding times
Method blank results
Rinsate blank results
LCS/LCSD (blank spike) results
MS/MSD (matrix spike) results
Laboratory duplicate results
Organic surrogate recoveries
Electronic data deliverables (EDDs)

Data Validation Qualifiers Assigned During this Review

J	estimated concentration
UJ	undetected, reporting limit is estimated
U	evaluated to be undetected at the reported concentration; result is considered to be a false positive
R	rejected due to severe QC noncompliance

Assigned qualifiers are detailed in the RETEC Analytical Data Verification Checklist and are summarized in the Table of Qualified Analytical Results (pages 3-4).

Overall Data Assessment

Precision, accuracy, method compliance, and completeness of the data set have been determined to be acceptable. With the exception of some rejected antimony results, the data are suitable for their intended use with the qualifications noted.

Table of Samples Analyzed
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediments with Water QC Samples
Analytical Resources Inc. Laboratory Reports IM59 and IM72
August and September 2005 Sampling

Matrix	Sample Name	Sample Date and Time		Lab SDG	COC Reference
Sediment	IJW-SS-01	8/31/2005	10:56	IM59	ARI
Sediment	IJW-SS-02	8/31/2005	11:48	IM59	ARI
Sediment	IJW-SS-05	8/31/2005	13:42	IM59	ARI
Sediment	IJW-SS-06	8/31/2005	15:35	IM59	ARI
Sediment	IJW-SS-07	8/31/2005	14:44	IM59	ARI
Sediment	IJW-SS-09	8/31/2005	17:14	IM59	ARI
Sediment	IJW-SS-11	8/31/2005	16:27	IM59	ARI
Sediment	IJW-RR-01	9/2/2005	11:36	IM72	100870
Sediment	IJW-RR-02	9/2/2005	12:24	IM72	100870
Sediment	IJW-SS-03	9/1/2005	10:08	IM72	100870
Sediment	IJW-SS-04	9/1/2005	11:01	IM72	100870
Sediment	IJW-SS-08	9/1/2005	13:26	IM72	100870
Sediment	IJW-SS-10	9/1/2005	9:12	IM72	100870
Sediment	IJW-SS-12	9/1/2005	14:28	IM72	100870
Sediment	IJW-SS-13	9/1/2005	11:52	IM72	100870
Water QC	Rinsate Blank Bowl	9/2/2005		IM72	NA
Water QC	Rinsate Blank Grab	9/2/2005		IM72	NA

ANALYTICAL DATA VERIFICATION CHECKLIST

Table of Qualified Analytical Results
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediments with Water QC Samples
Analytical Resources Inc. Laboratory Reports IM59 and IM72
August and September 2005 Sampling

Lab SDG	Sample ID	Analysis	Dil.	Method	Analyte	Concentration	Qualifier	Reason Code
IM59	IJW-SS-01	initial	3	SW8270D	Di-n-Butylphthalate	830 ug/kg	U	MB
IM59	IJW-SS-01	initial	2	SW6010B	Antimony	< 20 mg/kg	R	MS
IM59	IJW-SS-02	initial	3	SW8270D	Di-n-Butylphthalate	820 ug/kg	U	MB
IM59	IJW-SS-02	initial	2	SW6010B	Antimony	< 10 mg/kg	R	MS
IM59	IJW-SS-05	initial	3	SW8270D	Di-n-Butylphthalate	800 ug/kg	U	MB
IM59	IJW-SS-05	initial	2	SW6010B	Antimony	< 10 mg/kg	R	MS
IM59	IJW-SS-06	initial	3	SW8270D	Acenaphthene	620 ug/kg	J	MS
IM59	IJW-SS-06	initial	3	SW8270D	Di-n-Butylphthalate	1000 ug/kg	U	MB
IM59	IJW-SS-06	reanalysis	10	SW8270D	Pyrene	6800 ug/kg	J	MS
IM59	IJW-SS-06	initial	5	SW6010B	Antimony	< 30 mg/kg	R	MS
IM59	IJW-SS-07	initial	3	SW8270D	Di-n-Butylphthalate	850 ug/kg	U	MB
IM59	IJW-SS-07	initial	2	SW6010B	Antimony	< 10 mg/kg	R	MS
IM59	IJW-SS-09	initial	1	SW8082	Aroclor 1260	31 ug/kg	J	LCS
IM59	IJW-SS-09	initial	3	SW8270D	Di-n-Butylphthalate	940 ug/kg	U	MB
IM59	IJW-SS-09	initial	2	SW6010B	Antimony	< 20 mg/kg	R	MS
IM59	IJW-SS-11	initial	3	SW8270D	Di-n-Butylphthalate	840 ug/kg	U	MB
IM59	IJW-SS-11	initial	2	SW6010B	Antimony	< 8 mg/kg	R	MS
IM72	IJW-RR-01	initial	1	SW8270D	Di-n-Butylphthalate	910 ug/kg	U	MB
IM72	IJW-RR-01	initial	2	SW6010B	Antimony	< 7 mg/kg	R	MS
IM72	IJW-RR-02	initial	1	SW8270D	Di-n-Butylphthalate	1000 ug/kg	U	MB
IM72	IJW-RR-02	initial	2	SW6010B	Antimony	< 10 mg/kg	R	MS
IM72	IJW-SS-03	initial	5	SW8270D	Di-n-Butylphthalate	640 ug/kg	U	MB
IM72	IJW-SS-03	initial	2	SW6010B	Antimony	< 10 mg/kg	R	MS
IM72	IJW-SS-04	initial	5	SW8270D	Di-N-Butylphthalate	1300 ug/kg	U	MB
IM72	IJW-SS-04	initial	2	SW6010B	Antimony	< 20 mg/kg	R	MS
IM72	IJW-SS-08	initial	3	SW8270D	Di-n-Butylphthalate	790 ug/kg	U	MB
IM72	IJW-SS-08	initial	2	SW6010B	Antimony	< 10 mg/kg	R	MS
IM72	IJW-SS-10	initial	5	SW8270D	Di-n-Butylphthalate	980 ug/kg	U	MB
IM72	IJW-SS-10	initial	2	SW6010B	Antimony	< 9 mg/kg	R	MS
IM72	IJW-SS-12	initial	3	SW8270D	Di-n-Butylphthalate	890 ug/kg	U	MB
IM72	IJW-SS-12	initial	2	SW6010B	Antimony	< 8 mg/kg	R	MS
IM72	IJW-SS-13	initial	3	SW8270D	Di-n-Butylphthalate	660 ug/kg	U	MB
IM72	IJW-SS-13	initial	2	SW6010B	Antimony	< 20 mg/kg	R	MS
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1016	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1221	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1232	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1242	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1248	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1254	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Bowl	initial	1	SW8082	Aroclor 1260	< 1 ug/L	UJ	HT

ANALYTICAL DATA VERIFICATION CHECKLIST

Table of Qualified Analytical Results
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediments with Water QC Samples
Analytical Resources Inc. Laboratory Reports IM59 and IM72
August and September 2005 Sampling

Lab SDG	Sample ID	Analysis	Dil.	Method	Analyte	Concentration	Qualifier	Reason Code
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1016	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1221	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1232	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1242	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1248	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1254	< 1 ug/L	UJ	HT
IM72	Rinsate Blank Grab	initial	1	SW8082	Aroclor 1260	< 1 ug/L	UJ	HT

Qualifier Definitions
J – Estimated concentration.
U – Evaluated to be undetected at the reported concentration; result is considered to be a false positive.
UJ – Undetected, reporting limit is estimated.
R – rejected due to severe QC noncompliance

Reason Code Definitions
HT – Holding time exceeded.
LCS – Laboratory control spike recovery is outside quality control limits.
MB – Method blank contamination.
MS – Matrix spike recovery is outside quality control limits.

ANALYTICAL DATA VERIFICATION CHECKLIST

Project Name: I&J Waterway Sediment Site	Laboratory: Analytical Resources, Incorporated (ARI), Tukwila, WA
Project Reference: Port of Bellingham, WA	Sample Matrix: Sediment with Water QC Samples
RETEC Project: PORTB-18448-210	Sample Start Date: 08/31/2005
Validated By/Date Validated: Ann Biegelsen / 11/08/2005	Sample End Date: 09/02/2005

Samples Analyzed: Refer to the Table of Samples Analyzed, I&J Waterway Sediment Site, Port of Bellingham, WA, Sediments with Water QC Samples, Analytical Resources Inc. Laboratory Reports IM59 and IM72, August and September 2005 Sampling (page 2).

Parameters Validated: Volatile Organic Compounds (VOCs) benzene, toluene, ethylbenzene, and xylenes (BTEX) by SW846 GC/MS method 8260B; Semivolatile Organic Compounds (SVOCs) by SW846 GC/MS method 8270D and PSDDA SW8270D; Polychlorinated Biphenyls (PCBs) by SW846 GC method 8082 and PSDDA SW8082; Total Metals (Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, and Zn) by SW846 methods 6010B, 7470A and 7471A; Total Organic Carbon (TOC) by method Plumb. 1981; Sulfide by method 376.2; Ammonia by method 350.1; Total Volatile Solids (TVS) by method 160.4; Total Solids and Preserved Total Solids by methods E160.3 and E160.3-PRES; pH by method 150.1; and Grain Size by method PSEP.

Not all samples were analyzed for every parameter. Refer to Chain of Custody records for the exact analyses requested.

Laboratory Project IDs: IM59 and IM72.

PRECISION, ACCURACY, METHOD COMPLIANCE, AND COMPLETENESS ASSESSMENT

Precision:	X	Acceptable		Unacceptable	AB	Initials

Comments: Precision is the measure of variability of individual sample measurements. Field precision could not be determined, as there were no field duplicate samples included in this data set. Laboratory precision was determined by examination of laboratory duplicate results. Evaluation of both field and laboratory duplicates for precision was done using the Relative Percent Difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. No data require qualification based on laboratory duplicate precision measurements, and overall laboratory precision is acceptable. Precision measurements are reviewed in items 17, 20, and 21.

Accuracy:	X	Acceptable		Unacceptable	AB	Initials

Comments: Field accuracy, a measure of the sampling bias, was determined by reviewing rinsate blank bowl and rinsate blank grab results for evidence of sample contamination stemming from field activities. Laboratory accuracy is a measure of the system bias, and was measured by evaluating laboratory control sample/laboratory control sample duplicate (LCS/LCSD), matrix spike/matrix spike duplicate (MS/MSD), and organic system monitoring compounds (surrogate) percent recoveries (%Rs). LCS/LCSD %Rs, which demonstrated the overall performance of the analysis, were compared to EPA published QC limits. MS/MSD %Rs, which provided information on sample matrix interferences, were compared to EPA published QC limits or laboratory control charted limits. System monitoring compound or surrogate recoveries, which measured system performance and efficiency during organic analysis, were compared to EPA published QC limits or laboratory control charted limits. Although some data require qualification based on LCS %Rs (see item 15) or qualification or rejection based or MS %Rs (see item 16), overall field and laboratory accuracy is acceptable. Accuracy measurements are reviewed in items 12, 14, 15 and 16.

Method Compliance:	X	Acceptable		Unacceptable	AB	Initials

Comments: Method compliance was determined by evaluating sample integrity, holding time, system and laboratory blanks against method specified requirements, while applying EPA data validation guidelines. Although some data require qualification based on missed holding times (see item 8) or based on laboratory blank contamination (see item 11), overall method compliance is acceptable based on the supplied data. Method compliance measurements are reviewed in items 4, 6, 8, 11, 13, 18, 19, 20 and 22.

ANALYTICAL DATA VERIFICATION CHECKLIST

Completeness:	X	Acceptable		Unacceptable	AB	Initials

Comments: Completeness is the overall ratio of the number of samples planned versus the number of samples with valid analyses. Completeness goals are set at 90-100%. Determination of completeness included a review of chain of custody records, laboratory analytical methods and detection limits, laboratory case narratives, and project requirements. Completeness also included 100% review of the laboratory sample data results, QC summary reports, and electronic data deliverables (EDDs). As some total metals results were rejected due to MS %Rs, not all of the data received from the laboratory are useable with qualification. Out of 1421 possible data results, 15 were rejected. Completeness of the data is calculated to be 98.5% and is acceptable.

VALIDATION CRITERIA CHECK

Data validation qualifiers used in this review:

J – estimated concentration

UJ – undetected, reporting limit is estimated

U – evaluated to be undetected at the reported concentration; result is considered to be a false positive

R – rejected due to severe QC noncompliance

The following comments identifying sample results requiring qualification are in bold type. The other comments are of interest, but qualification of the sample results is not necessary.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 3-4).

1. Did the laboratory identify any non-conformances related to the analytical results?	X	Yes		No	AB	Initials

Explanation by laboratory:

Method 8260B: Low internal standard recoveries were confirmed due to matrix by re-analysis. Both sets of data were submitted for the affected samples.

Method 8082: Due to laboratory error, the water samples were not extracted within holding time. The samples were extracted as soon as the error was discovered.

Conventionals Analysis: Method blank contamination was noted

Additionally, assigned laboratory flags were noted and considered within this report. Data qualification, if any, related to the laboratory observations are discussed in the following sections.

2. Were sample Chain-of-Custody forms complete?		Yes	X	No	AB	Initials

Comments: COC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt, with the following exceptions.

SDG IM72: The Rinsate Blank Bowl and Rinsate Blank Grab samples were not listed on the accompanying COC. These samples were logged in and analyzed for total metals, SVOCs, and PCBs. They were not analyzed for VOAs or general chemistry parameters TOC, sulfide, ammonia, TVS, total solids, preserved total solids, or pH. Field accuracy for the VOAs or the general chemistry parameters could not be determined.

3. Were all the analyses requested for the samples on the COCs completed by the laboratory?	X	Yes		No	AB	Initials

Comments: All requested analyses were completed.

4. Were samples received in good condition and at the appropriate temperature?	X	Yes		No	AB	Initials

Comments: Samples were received on ice, intact, and in good condition with cooler temperatures outside the 4°C ± 2°C acceptance range at 4.6°C, 7.0°C and 8.0°C as noted on the COCs. Cooler temperatures that were greater than 6°C are judged acceptable as samples were received within 24 hours of collection, sample containers were intact and sample temperatures were still well below ambient (~25 °C).

ANALYTICAL DATA VERIFICATION CHECKLIST

5. Were the requested analytical methods in compliance with WP/QAPP, permit, or COC?	X	Yes		No	AB	Initials
Comments: Reported methods were comparable to those requested on the COC records and with *table 2-3 Sediment Analysis Methods, Target Detection Limits and Criteria* provided to the data validator with the following exceptions. Method 8082: Pesticides DDT, aldrin, alpha-chlordane, dieldrin, heptachlor, alpha-BHC and gamma-BHC are listed on table 2-3 but were not requested on the COCs or reported for these samples. As COC requests were met, no action is required except to note this discrepancy.						
6. Were detection limits in accordance with WP/QAPP, permit, or method?	X	Yes		No	AB	Initials
Comments: Reported detection limits are achievable by the quoted methods. Some samples required dilution due to high concentrations of target analytes or interference. The reporting limits for diluted results were raised appropriately. Detection limits for sediment results reported on a dry weight basis were increased to reflect the percent moisture content. Detection limits could not be compared to those specified in table 2-3 noted in item 5 as the table did not include reporting units.						
7. Do the laboratory reports include only those constituents requested to be reported for a specific analytical method?	X	Yes		No	AB	Initials
Comments: Only the requested target analytes were reported.						
8. Were sample holding times met?		Yes	X	No	AB	Initials
Comments: Extraction and analytical holding times were met for all samples and analyses except as noted below. **Method 8082: Samples Rinsate Blank Bowl and Rinsate Blank Grab were extracted 4 days after the 14 day holding time had passed. All analytes associated with these analyses have been qualified as UJ to indicate the undetected results are at estimated reporting limits.** Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 3-4).						
9. Were correct concentration units reported?	X	Yes		No	AB	Initials
Comments: Correct concentration units were reported. Organic method 8082, 8260B and 8270D results are reported in units of µg/Kg or µg/L (ppb). All inorganic results are reported in units of mg/L or mg/Kg except for the TOC, total solid, TVS, and preserved total solids results which are reported in units of percent (%), and pH are reported in standard units.						
10. Were the reporting requirements for flagged data met?	X	Yes		No	AB	Initials
Comments: Data validation qualifiers override any assigned laboratory flags.						
11. Were laboratory blank samples free of target analyte contamination?		Yes	X	No	AB	Initials
Comments: All laboratory blanks were free of target analyte contamination with the following exceptions. **Method 8270D: The laboratory method blank sample associated with the laboratory batch of 09/12/2005 reported di-n-butylphthalate at 800 µg/Kg. This common laboratory contaminant was also detected in samples IJW-SS-06, IJW-RR-02, IJW-SS-06, IJW-SS-04, IJW-SS-03, IJW-SS-13, IJW-SS-08, IJW-SS-05, IJW-SS-02, IJW-SS-01, IJW-SS-11, IJW-SS-07, IJW-SS-12, IJW-RR-01, IJW-SS-09 and IJW-SS-10 at less than ten times the amount found in the blank and has been qualified as U in these samples to indicate the analyte has been determined to be undetected at the reported concentration and is a false positive due to laboratory contamination.** Continued on following page						

ANALYTICAL DATA VERIFICATION CHECKLIST

Comments (continued):

Method 6010B: The laboratory method blank from the sediment batch of 09/07/2005 reported zinc at 1.2 mg/Kg. As this analyte was not detected in any of the associated samples at less than ten times the amount found in the blank, no action is required based on this discrepancy.

General Chemistry: The laboratory method blank from the sediment batch of 09/06/2005 reported ammonia at 0.13 mg/Kg. As this analyte was not detected in any of the associated samples at less than ten times the amount found in the blank, no action is required based on this discrepancy.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 3-4).

12. Were trip blank, field blank, and/or equipment rinse blank samples free of target analyte contamination?		Yes	**X**	No	AB	Initials

Comments: Target analytes were not detected in the trip blank samples with the following exception.

Method 6010B: The Rinsate Blank Bowl sample, reported zinc at 0.008 mg/L and the Rinsate Blank Grab sample reported zinc at 0.012 mg/L. As this analyte was not detected at less than ten times the blank amounts in any of the associated samples, no data requires qualification based on this discrepancy.

13. Were instrument calibrations within method or data validation control limits?	NA	Yes	NA	No	AB	Initials

Comments: Not applicable for this level of data verification – Instrument calibration data was supplied in the analytical laboratory report but as the QAPP allowed for a level II verification, it was not considered as part of this data review.

14. Were surrogate recoveries within control limits?		Yes	**X**	No	AB	Initials

Comments: Surrogate percent recoveries (%Rs) for organic analyses were within data validation QC criteria for all samples, with the following exceptions.

Method 8270D: In the analyses of sample IJW-SS-01, surrogate 1,2-dichloroethane-D_4 was recovered outside the data validation QC limits of 30-84% at 29%. The National Functional Guidelines for the validation of SVOC data allows for one surrogate of each fraction outside QC limits as long as the recovery is greater than 10%. As these criteria are met, no data requires qualification based on this discrepancy.

15. Were laboratory control sample recoveries within control limits?		Yes	**X**	No	AB	Initials

Comments: LCS and LCSD (blank spike) recoveries were within data validation or laboratory control-charted QC limits for all target analytes.

Method 8082: In the analysis of the LCS sample extracted 09/09/2005, spike analyte aroclor 1016 was recovered outside the data validation QC limits of 75-125% at 150% and spike analyte aroclor 1260 was recovered outside the data validation QC limits of 75-125% at 145%. As the elevated recoveries indicate high bias undetected results do not require qualification. Aroclor 1260 was detected in sample IJW-SS-09 and has been qualified as J to indicate the concentration is estimated.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 3-4).

ANALYTICAL DATA VERIFICATION CHECKLIST

16. Were matrix spike recoveries within control limits?		Yes	X	No	AB	Initials
Comments: Project specific MS and MSD recoveries for target analytes were within data validation QC limits or were not applicable due to required sample dilution, or to sample concentrations which exceeded four times the amount spiked. MS and MSD spike recoveries for non-project samples were not considered since matrix similarity to project samples could not be guaranteed. **Method 8270D: In the analysis of samples IJW-SS-06 MS and MSD, spike analyte acenaphthene was recovered outside the laboratory QC limits of 41-116% at -48% and -43%, respectively, and spike analyte pyrene was recovered outside the laboratory QC limits of 14-147% at -4% and -5%, respectively. These analytes were detected in this sample and have been qualified as J to indicate the concentrations are estimated.** **Method 6010B: In the analysis of sample IJW-SS-01 MS, spike analyte antimony was recovered outside the laboratory QC limits of 75-125% at 13.3%. This analyte was not detected in any of the associated samples of the same matrix and has been qualified as R in these samples to indicate the results are rejected due to severe QC non-compliance. The National Functional Guidelines for the validation of ICP metals data require the rejection of all results associated with a matrix spike recovery that is less than 30%.** Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 3-4).						
17. Were duplicate RPDs and/or serial dilution %Ds within control limits?	X	Yes		No	AB	Initials
Comments: Laboratory RPDs for target analytes in LCS/LCSD and project-specific MS/MSD samples were within data validation control limits.						
18. Were organic system performance criteria met?	NA	Yes	NA	No	AB	Initials
Comments: Not applicable for this level of data verification – Organic system performance data was supplied in the analytical laboratory report but as the QAPP allowed for a level II verification, it was not considered as part of this data review.						
19. Were internal standards within method criteria for GC/MS sample analyses?	NA	Yes	NA	No	AB	Initials
Comments: Not applicable for this level of data verification – GC/MS internal standard data was supplied in the analytical laboratory report but as the QAPP allowed for a level II verification, it was not considered as part of this data review.						
20. Were inorganic system performance criteria met?	NA	Yes	NA	No	AB	Initials
Comments: Not applicable for this level of data verification – Inorganic system performance data was supplied in the analytical laboratory report but as the QAPP allowed for a level II verification, it was not considered as part of this data review.						
21. Were blind field duplicates collected? If so, discuss the precision (RPD) of the results.		Yes	X	No		Initials
Comments: There were no field duplicate samples associated with this sample set. Field precision could not be determined.						
22. Were qualitative criteria for organic target analyte identification met?	X	Yes		No	AB	Initials
Comments: Retention times and chromatography were reviewed by trained laboratory personnel in accordance with the laboratory's internal QA/QC program.						

ANALYTICAL DATA VERIFICATION CHECKLIST

23. Were 100% of the EDD concentrations and reporting limits compared to the hardcopy data reports?	X	Yes		No	AB	Initials

Comments: The EDD entries were resolved with the hardcopy data results and corrected as necessary. According to validation protocol, the hardcopy data report was accepted as the correct reference. The data validator provided corrected EDDs as part of this verification report. The EDD file, with data validation qualifiers and reason codes added, was returned to the RETEC database manager in Seattle, WA 11/09/2005.

The 'sample matrix code' column entries were changed from W to WQ for the rinsate blank samples.

SVOC analysis: The 'lab anl method' column displayed SW8270D. In some cases the laboratory hard copy reports showed SW8270C as the method reference. As the laboratory confirmed that the SVOCs were analyzed following method SW8270D protocols, the SW8270D method references remain in the EDD file.

Methods 8260B and 8270D: In some cases the compound name as it appeared on the hard copy report and as it appeared in the EDD were different. All compound names were synonyms and there is no CAS No. disagreement. Please see the cross referencing table below for a list of compound names as they appear in the hard copy reports compared to the synonyms used in the EDD files.

Method ID	CAS No.	Chemical Name (Hard Copy Reports)	Chemical Name (EDD file)
SW8260B	75-35-4	1,1-Dichloroethene	1,1-DICHLOROETHYLENE
SW8260B	135-98-8	sec-butylbenzene	2-PHENYLBUTANE
SW8260B	75-69-4	trichlorofluoromethane	CFC-11
SW8260B	76-13-1	1,1,2-trichloro-1,2,2-trifluoroethane	CHLORINATED FLUOROCARBON (FREON 113)
SW8260B	74-97-5	Bromochloromethane	CHLOROBROMOMETHANE
SW8260B	99-87-6	4-isopropyltoluene	CYMENE
SW8260B	75-09-2	Methylene Chloride	DICHLOROMETHANE
SW8260B	74-96-4	Bromoethane	ETHYL BROMIDE
SW8260B	87-68-3	Hexachlorobutadiene	HEXACHLORO-1,3-BUTADIENE
SW8260B	541-73-1	1,3-Dichlorobenzene	M-DICHLOROBENZENE
SW8260B	591-78-6	2-Hexanone	METHYL N-BUTYL KETONE
SW8260B	108-88-3	Toluene	METHYLBENZENE
SW8260B	110-57-6	trans-1,4-dichloro-2-butene	TRANS-1,4-DICHLOROBUTENE
SW8260B	75-25-2	Bromoform	TRIBOMOMETHANE
SW8260B	79-01-6	Trichloroethene	TRICHLOROETHYLENE
SW8270D	218-01-9	Chrysene	1,2-BENZPHENANTHRACENE
SW8270D	78-59-1	Isophorone	3,5,5-TRIMETHYL-2-CYCLOHEXENE-1-ONE
SW8270D	85-68-7	Butylbenzylphthalate	BENZYL BUTYL PHTHALATE
SW8270D	87-68-3	Hexachlorobutadiene	HEXACHLORO-1,3-BUTADIENE
SW8270D	541-73-1	1,3-Dichlorobenzene	M-DICHLOROBENZENE
SW8270D	106-47-8	4-Chloroaniline	P-CHLOROANILINE
SW8270D	100-01-6	4-Nitroaniline	P-NITROANILINE

24. Additional Comments:

25. General Comments: Data were evaluated based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review*, document number EPA540/R-99/008, October 1999 with additional reference to document 540-R-04-009, January 2005, and *USEPA CLP National Functional Guidelines for Inorganic Data Review*, document number EPA540/R-04/004 of October 2004 as they applied to the reported methodology. Field duplicate RPD control limits were taken from the USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, February 1988, upheld in DRAFT 1993.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 3-4).

August 16, 2006

Organic and Inorganic Data Validation Report

I&J Waterway Port of Bellingham, Washington

Sediment and Porewater Sampling June 2006

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Overview

The samples analyzed for the Port of Bellingham I&J Waterway sediment and porewater sampling from June 2006 are listed in the Table of Samples Analyzed (page 3). Data validation was performed on seven sediment samples and five porewater samples.

Samples were analyzed by Analytical Resources, Incorporated (ARI) of Tukwila, WA. The validated analyses were Volatile Organic Compounds (VOCs) (Ethylbenzene, Xylenes, Tetrachloroethene and Trichloroethene) by SW846 GC/MS method 8260B; Semivolatile Organic Compounds (SVOCs) by SW846 GC/MS method PSDDA SW8270D; Pesticides and Polychlorinated Biphenyls (PCBs) by SW846 GC method 8081; Butyl Tin, Dibutyl Tin and Tributyl Tin by SW846 method 8270 TBT; Total Metals (Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, and Zn) by SW846 methods 6010B and 7471A; Total Organic Carbon (TOC) by method Plumb. 1981; Sulfide by method 376.2; Ammonia by method 350.1; Total Volatile Solids (TVS) by method 160.4; Total Solids and Preserved Total Solids by methods E160.3 and E160.3-PRES; pH by method 150.1; and Grain Size by method PSEP.

The RETEC Analytical Data Validation Checklist is presented as pages 8-15. Data were evaluated based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review*, document number EPA540/R-99/008, October 1999 with additional reference to document 540-R-04-009, January 2005, and *USEPA CLP National Functional Guidelines for Inorganic Data Review*, document number EPA540/R-04/004 of October 2004 as they applied to the reported methodology.

The following data components were reviewed during the data validation procedure:

Submitted Deliverables
Case Narratives
Chain-of-Custody form(s) and sample integrity
Sample results, reporting limits, dilution factors
Holding times
Method blank results
LCS/LCSD (blank spike) results
MS/MSD (matrix spike) results
Instrument tunes (system performance checks)
Instrument calibrations
Laboratory duplicate results
Organic surrogate recoveries
GC/MS Internal standards
Electronic data deliverables (EDDs)

Data Validation Qualifiers Assigned During this Review

J	estimated concentration
J+	estimated concentration, biased high
J-	estimated concentration, biased low
UJ	undetected, reporting limit is estimated
U	evaluated to be undetected at the reporting limit or at the reported concentration due to evidence of contamination
R	rejected due to severe QC noncompliance

Assigned qualifiers are detailed in the RETEC Analytical Data Verification Checklist and are summarized in the Table of Qualified Analytical Results (pages 4-7).

Other Qualifiers Assigned During this Review

DNR – Do not report, used to identify duplicate results from dilutions or reanalysis that are not reportable because an alternate, acceptable result for that sample and analyte is available.

Overall Data Assessment

Precision, accuracy, method compliance, and completeness of the data set have been determined to be acceptable. The data are suitable for their intended use with the qualifications noted.

Table of Samples Analyzed
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediment and Pore Water Samples
Analytical Resources Inc. Laboratory Reports JM04, JM05, JM26, JM27, & JM28
June 2006 Sampling

Matrix	Sample Name	Sample/Porewater Centrifuge Date and Time		Lab SDG
Sediment	IJ-C4-S1	6/15/2006	16:25	JM04
Sediment	IJ-C4-S1	6/15/2006	16:25	JM04
Sediment	IJ-C4-S2	6/15/2006	16:30	JM04
Sediment	IJ-C3-S1	6/13/2006	14:50	JM05
Sediment	IJ-C3-S1	6/13/2006	14:50	JM05
Sediment	IJ-C5-S1	6/15/2006	11:50	JM05
Sediment	IJ-C5-S1	6/15/2006	11:50	JM05
Sediment	IJ-C6-S1	6/14/2006	11:00	JM05
Sediment	IJ-C6-S1	6/14/2006	11:00	JM05
Pore Water	IJ-C4-S1 PW	6/16/2006		JM26
Pore Water	IJ-C4-S2 PW	6/16/2006		JM26
Pore Water	IJ-C3-S1 PW	6/16/2006		JM27
Pore Water	IJ-C5-S1 PW	6/16/2006		JM27
Pore Water	IJ-C6-S1 PW	6/16/2006		JM27
Sediment	SS-REF01-0606	6/15/2006	12:02	JM28
Sediment	SS-REF02-0606	6/15/2006	13:06	JM28

Table of Qualified Analytical Results
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediment and Pore Water Samples
Analytical Resources Inc. Laboratory Reports JM04, JM05, JM26, JM27, & JM28
June 2006 Sampling

Lab SDG	Sample ID	Analysis	Dil.	Method	Analyte	Concentration		Qualifier	Reason Code	Reportable Result?
JM04	IJ-C4-S1	initial	10	E376.2	Sulfide	160	mg/kg	J	RPD	Yes
JM04	IJ-C4-S1	initial	2	SW6010B	Antimony	< 10	mg/kg	R	MS	Yes
JM04	IJ-C4-S1	initial	2	SW6010B	Zinc	113	mg/kg	J+	CRDL	Yes
JM04	IJ-C4-S1	initial	1	SW8270 TBT	Butyl Tin Ion	< 4.1	ug/kg	UJ	CCV	Yes
JM04	IJ-C4-S1	initial	1	SW8270D	Acenaphthene	17	ug/kg	J	<PQL	Yes
JM04	IJ-C4-S1	initial	1	SW8270D	Acenaphthylene	16	ug/kg	J	<PQL	Yes
JM04	IJ-C4-S1	initial	1	SW8270D	Benzyl Butyl Phthalate	20	ug/kg	J	<PQL	Yes
JM04	IJ-C4-S1	initial	1	SW8270D	Dimethyl Phthalate	12	ug/kg	J	<PQL	Yes
JM04	IJ-C4-S2	initial	10	E376.2	Sulfide	310	mg/kg	J	RPD	Yes
JM04	IJ-C4-S2	initial	2	SW6010B	Antimony	< 8	mg/kg	R	MS	Yes
JM04	IJ-C4-S2	initial	2	SW6010B	Zinc	80.1	mg/kg	J+	CRDL	Yes
JM04	IJ-C4-S2	initial	1	SW8270 TBT	Butyl Tin Ion	< 4.0	ug/kg	UJ	CCV	Yes
JM04	IJ-C4-S2	initial	1	SW8270D	Acenaphthene	15	ug/kg	J	<PQL	Yes
JM04	IJ-C4-S2	initial	1	SW8270D	Benzyl Butyl Phthalate	12	ug/kg	J	<PQL	Yes
JM05	IJ-C3-S1	initial	100	E376.2	Sulfide	2000	mg/kg	J	RPD	Yes
JM05	IJ-C3-S1	initial	2	SW6010B	Antimony	< 9	mg/kg	R	MS	Yes
JM05	IJ-C3-S1	initial	2	SW6010B	Zinc	128	mg/kg	J+	CRDL	Yes
JM05	IJ-C3-S1	initial	1	SW8270 TBT	Butyl Tin Ion	< 4.1	ug/kg	UJ	CCV	Yes
JM05	IJ-C3-S1	initial	1	SW8270D	Acenaphthene	10	ug/kg	J	<PQL	Yes
JM05	IJ-C3-S1	initial	1	SW8270D	Dibenzofuran	19	ug/kg	J	<PQL	Yes
JM05	IJ-C3-S1	initial	1	SW8270D	Fluorene	19	ug/kg	J	<PQL	Yes
JM05	IJ-C3-S1	initial	1	SW8270D	Naphthalene	19	ug/kg	J	<PQL	Yes
JM05	IJ-C5-S1	initial	100	E376.2	Sulfide	3400	mg/kg	J	RPD	Yes
JM05	IJ-C5-S1	initial	2	SW6010B	Antimony	< 10	mg/kg	R	MS	Yes
JM05	IJ-C5-S1	initial	2	SW6010B	Zinc	131	mg/kg	J+	CRDL	Yes
JM05	IJ-C5-S1	initial	1	SW8270 TBT	Butyl Tin Ion	< 3.9	ug/kg	UJ	CCV	Yes
JM05	IJ-C5-S1	initial	1	SW8270D	2,4-Dimethylphenol	12	ug/kg	J	<PQL	Yes
JM05	IJ-C5-S1	initial	1	SW8270D	Dibenz(a,h)Anthracene	15	ug/kg	J	<PQL	Yes

Table of Qualified Analytical Results (continued)
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediment and Pore Water Samples
Analytical Resources Inc. Laboratory Reports JM04, JM05, JM26, JM27, & JM28
June 2006 Sampling

Lab SDG	Sample ID	Analysis	Dil.	Method	Analyte	Concentration		Qualifier	Reason Code	Reportable Result?
JM05	IJ-C6-S1	initial	50	E376.2	Sulfide	680	mg/kg	J	RPD	Yes
JM05	IJ-C6-S1	initial	2	SW6010B	Antimony	< 10	mg/kg	R	MS	Yes
JM05	IJ-C6-S1	initial	2	SW6010B	Zinc	134	mg/kg	J+	CRDL	Yes
JM05	IJ-C6-S1	initial	1	SW8270 TBT	Butyl Tin Ion	< 4.0	ug/kg	UJ	CCV	Yes
JM05	IJ-C6-S1	initial	1	SW8270D	2-Methylphenol	11	ug/kg	J	<PQL	Yes
JM05	IJ-C6-S1	initial	1	SW8270D	Acenaphthylene	14	ug/kg	J	<PQL	Yes
JM05	IJ-C6-S1	initial	1	SW8270D	Dibenz(a,h)thracene	13	ug/kg	J	<PQL	Yes
JM26	IJ-C4-S1 PW	reextract	1	SW8270 TBT	Butyl Tin Ion	0.065	ug/l	U	MB, HT	Yes
JM26	IJ-C4-S1 PW	reextract	1	SW8270 TBT	Tributyl Tin Ion	0.028	ug/l	J	HT	Yes
JM26	IJ-C4-S2 PW	reextract	1	SW8270 TBT	Butyl Tin Ion	0.13	ug/l	U	MB, HT	Yes
JM26	IJ-C4-S2 PW	initial	1	SW8270 TBT	Tributyl Tin Ion	0.12	ug/l	U	MB	Yes
JM27	IJ-C3-S1 PW	reextract	1	SW8270 TBT	Butyl Tin Ion	0.075	ug/l	U	MB, HT	Yes
JM27	IJ-C3-S1 PW	initial	1	SW8270 TBT	Tributyl Tin Ion	0.13	ug/l	U	MB	Yes
JM27	IJ-C5-S1 PW	reextract	1	SW8270 TBT	Butyl Tin Ion	0.073	ug/l	U	MB, HT	Yes
JM27	IJ-C5-S1 PW	initial	1	SW8270 TBT	Tributyl Tin Ion	0.084	ug/l	U	MB	Yes
JM27	IJ-C6-S1 PW	reextract	1	SW8270 TBT	Butyl Tin Ion	0.086	ug/l	U	MB, HT	Yes
JM27	IJ-C6-S1 PW	reextract	1	SW8270 TBT	Tributyl Tin Ion	0.022	ug/l	J	HT	Yes
JM28	SS-REF01-0606	initial	5	E376.2	Sulfide	76	mg/kg	J-	MS, RPD	Yes
JM28	SS-REF02-0606	initial	10	E376.2	Sulfide	180	mg/kg	J-	MS, RPD	Yes
JM05	IJ-C6-S1	initial	1	SW8260B	Ethylbenzene	< 1.7	ug/kg	UJ	DNR, IS	No
JM05	IJ-C6-S1	initial	1	SW8260B	m,p-Xylene	< 1.7	ug/kg	UJ	DNR, IS	No
JM05	IJ-C6-S1	initial	1	SW8260B	o-Xylene	< 1.7	ug/kg	UJ	DNR, IS	No
JM05	IJ-C6-S1	reanalysis	10	SW8270D	Anthracene	100	ug/kg	J	DNR, <PQL	No
JM05	IJ-C6-S1	reanalysis	10	SW8270D	Benzo(a)Anthracene	190	ug/kg	J	DNR, <PQL	No
JM05	IJ-C6-S1	reanalysis	10	SW8270D	Benzo(a)Pyrene	120	ug/kg	J	DNR, <PQL	No
JM05	IJ-C6-S1	reanalysis	10	SW8270D	Benzo(b)Fluoranthene	160	ug/kg	J	DNR, <PQL	No
JM05	IJ-C6-S1	reanalysis	10	SW8270D	Benzo(k)Fluoranthene	120	ug/kg	J	DNR, <PQL	No
JM05	IJ-C6-S1	initial	1	SW8270D	Bis(2-ethylhexyl)Phthalate	7600	ug/kg	J	DNR, ECR	No
JM05	IJ-C6-S1	reanalysis	10	SW8270D	Naphthalene	120	ug/kg	J	DNR, <PQL	No

Table of Qualified Analytical Results (continued)
I&J Waterway Sediment Site, Port of Bellingham, WA
Sediment and Pore Water Samples
Analytical Resources Inc. Laboratory Reports JM04, JM05, JM26, JM27, & JM28
June 2006 Sampling

Lab SDG	Sample ID	Analysis	Dil.	Method	Analyte	Concentration		Qualifier	Reason Code	Reportable Result?
JM26	IJ-C4-S1 PW	initial	1	SW8270 TBT	Butyl Tin Ion	< 0.02	ug/l	UJ	DNR, CCV	No
JM26	IJ-C4-S1 PW	reextract	1	SW8270 TBT	Dibutyl Tin Ion	< 0.029	ug/l	R	DNR, HT	No
JM26	IJ-C4-S1 PW	initial	1	SW8270 TBT	Tributyl Tin Ion	0.12	ug/l	U	DNR, MB	No
JM26	IJ-C4-S2 PW	initial	1	SW8270 TBT	Butyl Tin Ion	< 0.02	ug/l	UJ	DNR, CCV	No
JM26	IJ-C4-S2 PW	reextract	1	SW8270 TBT	Dibutyl Tin Ion	< 0.029	ug/l	R	DNR, HT	No
JM26	IJ-C4-S2 PW	reextract	1	SW8270 TBT	Tributyl Tin Ion	< 0.019	ug/l	R	DNR, HT	No
JM27	IJ-C3-S1 PW	initial	1	SW8270 TBT	Butyl Tin Ion	< 0.02	ug/l	UJ	DNR, CCV	No
JM27	IJ-C3-S1 PW	reextract	1	SW8270 TBT	Dibutyl Tin Ion	< 0.029	ug/l	R	DNR, HT	No
JM27	IJ-C3-S1 PW	reextract	1	SW8270 TBT	Tributyl Tin Ion	< 0.019	ug/l	R	DNR, HT	No
JM27	IJ-C5-S1 PW	reextract	1	SW8270 TBT	Dibutyl Tin Ion	< 0.029	ug/l	R	DNR, HT	No
JM27	IJ-C5-S1 PW	reextract	1	SW8270 TBT	Tributyl Tin Ion	< 0.019	ug/l	R	DNR, HT	No
JM27	IJ-C6-S1 PW	initial	1	SW8270 TBT	Butyl Tin Ion	< 0.02	ug/l	UJ	DNR, CCV	No
JM27	IJ-C6-S1 PW	reextract	1	SW8270 TBT	Dibutyl Tin Ion	< 0.029	ug/l	R	DNR, HT	No
JM27	IJ-C6-S1 PW	initial	1	SW8270 TBT	Tributyl Tin Ion	0.084	ug/l	U	DNR, MB	No

Qualifier Definitions
J – Estimated concentration.
J- – Estimated concentration, biased low
J+ – Estimated concentration, biased high
N – Tentative identification
UJ – Undetected, reporting limit is estimated.
R – Rejected due to severe QC noncompliance

Reason Code Definitions
< PQL – Reported concentration is greater than the MDL but less than the PQL.
CCV – Continuing calibration verification outside limits.
CRDL – Contract required detection limit standard recovery is outside quality control limits.

Continued on following page

Reason Code Definitions (continued)

DNR – Do not report, an alternate, acceptable result is available.
ECR – Reported concentration exceeds instrument calibration range.
HT – Holding time exceeded.
IS – Internal standard recovery outside limits.
MB – Method blank contamination.
MS – Matrix spike recovery is outside quality control limits.
RPD – Duplicate sample relative percent difference outside quality control limits.

ANALYTICAL DATA VALIDATION CHECKLIST

Project Name: I&J Waterway Sediment Site	Laboratory: Analytical Resources, Incorporated (ARI), Tukwila, WA
Project Reference: Port of Bellingham, WA	Sample Matrix: Sediment and Porewater Samples
RETEC Project: PORTB-18448-210	Sample Start Date: 06/13/2006
Validated By/Date Validated: Ann Biegelsen / 08/16/2006	Sample End Date: 06/15/2006 Porewater Centrifuge Date: 06/16/2006
Samples Analyzed: Refer to the Table of Samples Analyzed (page 3).	
Parameters Validated: Volatile Organic Compounds (VOCs) (Ethylbenzene, Xylenes, Tetrachloroethene and Trichloroethene) by SW846 GC/MS method 8260B; Semivolatile Organic Compounds (SVOCs) by SW846 GC/MS method PSDDA SW8270D; Pesticides and Polychlorinated Biphenyls (PCBs) by SW846 GC method 8081; Butyl Tin, Dibutyl Tin and Tributyl Tin by SW846 method 8270 TBT; Total Metals (Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, and Zn) by SW846 methods 6010B and 7471A; Total Organic Carbon (TOC) by method Plumb. 1981; Sulfide by method 376.2; Ammonia by method 350.1; Total Volatile Solids (TVS) by method 160.4; Total Solids and Preserved Total Solids by methods E160.3 and E160.3-PRES; pH by method 150.1; and Grain Size by method PSEP. Not all samples were analyzed for every parameter. Refer to Chain of Custody records for the exact analyses requested.	
Laboratory Project IDs: JM04, JM05, JM26, JM27 and JM28	

PRECISION, ACCURACY, METHOD COMPLIANCE, AND COMPLETENESS ASSESSMENT

Precision:	X	Acceptable		Unacceptable	AB	Initials
Comments: Precision is the measure of variability of individual sample measurements. Field precision could not be determined as there were no field duplicate samples collected with this data set. Laboratory precision was determined by examination of laboratory duplicate results. Evaluation of laboratory duplicates for precision was done using the Relative Percent Difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. Laboratory RPD limits referenced EPA published QC limits. Although some data require qualification based on laboratory duplicate RPDs, overall laboratory precision is acceptable. Precision measurements are reviewed in items 17, 20, and 21.						
Accuracy:	X	Acceptable		Unacceptable	AB	Initials
Comments: Field accuracy, a measure of the sampling bias, could not be determined as there were no trip blank, field blank, or equipment rinse blank samples included in this data set. Laboratory accuracy is a measure of the system bias, and was measured by evaluating laboratory control sample/laboratory control sample duplicate (LCS/LCSD), matrix spike/matrix spike duplicate (MS/MSD), and organic system monitoring compounds (surrogate) percent recoveries (%Rs). LCS/LCSD %Rs, which demonstrated the overall performance of the analysis, were compared to EPA published QC limits. MS/MSD %Rs, which provided information on sample matrix interferences, were compared to EPA published QC limits or laboratory control charted limits. System monitoring compound or surrogate recoveries, which measured system performance and efficiency during organic analysis, were compared to EPA published QC limits or laboratory control charted limits. Although some data require qualification or rejection based on MS %Rs (see item 16), laboratory accuracy measurements, and overall field and laboratory accuracy is acceptable. Accuracy measurements are reviewed in items 12, 14, 15 and 16.						

ANALYTICAL DATA VALIDATION CHECKLIST

Method Compliance:	X	Acceptable		Unacceptable	AB	Initials

Comments: Method compliance was determined by evaluating sample integrity, holding time, system performance checks, initial and continuing instrument calibrations, laboratory blanks, internal standards, and target analyte identification against method specified requirements, while applying EPA data validation guidelines. Although some data require qualification based on analytes detected below the practical quantitation limits (PQL) but above the method detection limits (MDL) (see item 6), analytes detected above the calibration range of the instrument (see item 6), laboratory blank contamination (see item 11), instrument calibration outliers (see item 13),or internal standard recovery outliers (see item 19) and some data require qualification or rejection based on missed holding times (see item 8), overall method compliance is acceptable based on the supplied data. Method compliance measurements are reviewed in items 4, 6, 8, 11, 13, 18, 19, 20 and 22.

Completeness:	X	Acceptable		Unacceptable	AB	Initials

Comments: Completeness is the overall ratio of the number of samples planned versus the number of samples with valid analyses. Completeness goals are set at 90-100%. Determination of completeness included a review of chain of custody records, laboratory analytical methods and detection limits, laboratory case narratives, and project requirements. Completeness also included 100% review of the laboratory sample data results, QC summary reports, and electronic data deliverables (EDDs). Not all of the data received from the laboratory are useable with qualification. Of a total of 525 possible data points, five were rejected based on instrument MS %R outliers and one result was not reported due to laboratory oversight (see item 3). Completeness of the data is calculated to be 98.8% and is acceptable.

VALIDATION CRITERIA CHECK

Data validation qualifiers used in this review:

J – estimated concentration

J+ – estimated concentration, biased high

J- – estimated concentration, biased low

UJ – undetected, reporting limit is estimated

U – evaluated to be undetected at the reported concentration; result is considered to be a false positive

R – rejected due to severe QC noncompliance

The following comments identifying sample results requiring qualification are in bold type. The other comments are of interest, but qualification of the sample results is not necessary.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

1. Did the laboratory identify any non-conformances related to the analytical results?	X	Yes		No	AB	Initials

Explanation by laboratory:

Method 8270 TBT: SDG JM04 and JM05 – resubmitted: The results for MBT and DBT have been added as requested.

SDGs JM26 and JM27: All samples were initially extracted on 06/20/2006 and they were analyzed on 06/22-23/06. Tributyl tin was detected in the method blank associated with these samples. All samples were re-extracted on 07/06/06 and they were re-analyzed on 07/07/06. Butyl tin was detected in the method blank associated with the re-extraction of these samples. The contamination is from a reagent used in the extraction process. Since insufficient sample remained, no further corrective actions could be taken. The results for both analyses have been submitted for all samples.

Continued on following page

ANALYTICAL DATA VALIDATION CHECKLIST

Explanation by laboratory (continued):

Method 8260B: SDG JM04: The areas for the 4th internal standard (IS) were low following the initial analyses of samples IJ-C4-S1 and IJ-C4-S2. These samples were re-analyzed. The area for the 4th IS was low following the re-analysis of sample IJ-C4-S1. The area for the 4th IS was within acceptable QC limits (though still somewhat low) for the re-analysis of sample IJ-C4-S2. It was concluded that the sample matrices were the cause of the low IS recoveries. No further actions were taken. The results for both analyses of each sample have been submitted for comparison.

SDG JM05: The areas for the 3rd and 4th ISs were low following the initial analyses of these samples. All samples were re-analyzed. The areas for the 4th and/or the 5th ISs were not within control limits for the re-analyses of all samples. It was concluded that the sample matrices were the cause of the poor IS recoveries. No further corrective actions were taken. The results for both analyses of each sample have been submitted for comparison. *Validator's Note: There was no 5th internal standard reported. The 4th IS was not in QC limits for any of the initial or re-analyses of these samples.*

Method 8081: SDG JM04 and JM05: All samples were initially analyzed on 06/23/2006. The %D were high following the analysis of the closing CCAL that was analyzed on that day. All samples were re-analyzed on 06/26/2006. The %D for one surrogate was high for the closing CCAL on one column for the re-analyses. It was suspected that the sample matrices were the cause of the high %D. No further corrective action were taken. The results for the re-analyses only have been submitted for all samples. *Validator's Note: The %Ds were within data validation QC limits for all reported CCALs..*

Method 6010B: SDG JM04 and JM05: A small amount of zinc was detected in the MB associated with the total metals analyses of these samples. Zinc was detected in the samples at concentrations significantly greater than the amount found in the blank. No corrective actions were taken.

General Chemistry: SDG JM04: A matrix duplicate (MD) was prepared for total sulfides in conjunction with sample IJ-C4-S1. The RPD was high following the initial analysis of the MD. Since the %R for this analyte was within control limits in the LCS, it was concluded that a lack of sample homogeneity was the cause of the high RPD.

SDG JM28: A matrix spike (MS) was prepared and analyzed for total sulfides in conjunction with sample SS-REF01-0606. The %R was low following the initial analysis of the MS. Since the %R for total sulfides was within acceptable QC limits for the corresponding LCS, it was concluded that the sample matrix was the cause of the low MS recovery. No corrective actions were taken.

Additionally, assigned laboratory flags were noted and considered within this report. Data qualification, if any, related to the laboratory observations are discussed in the following sections.

2. Were sample Chain-of-Custody forms complete?		Yes	**X**	No	AB	Initials

Comments: COC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt, with the following exception.

SDG JM04: Sample IJ-C4-S2 is incorrectly listed as IJ-C4-C2 on page 2 of 2 of the COCs associated with this laboratory project.

No further action is required other than to note this discrepancy.

3. Were all the analyses requested for the samples on the COCs completed by the laboratory?		Yes	**X**	No	AB	Initials

Comments: All requested analyses were completed with the following exception.

Method 7471A: Analysis of mercury was requested for sample IJ-C3-S1 but was not reported. This missing analyte has been included in the completeness calculation, above.

4. Were samples received in good condition and at the appropriate temperature?	**X**	Yes		No	AB	Initials

Comments: The laboratory did not note the temperature of the samples upon receipt. No discrepancies or problems were identified on the chains of custody, Sample Receiving Checklist forms or in the case narratives.

ANALYTICAL DATA VALIDATION CHECKLIST

5. Were the requested analytical methods in compliance with WP/QAPP, permit, or COC?	X	Yes		No	AB	Initials
Comments: Reported methods were comparable to those requested on the COC records and are acceptable for the requested target analytes and sample matrix.						
6. Were detection limits in accordance with WP/QAPP, permit, or method?	X	Yes		No	AB	Initials
Comments: Reported detection limits are achievable by the quoted methods. Some samples required dilution due to high concentrations of target analytes or interference. The reporting limits for diluted results were raised appropriately. Detection limits for soil results reported on a dry weight basis were increased to reflect the percent moisture content. **Analytes reported below the laboratory reporting limits, but above the laboratory MDLs, were qualified as J to indicate that the concentrations are estimated.** **Analytes detected at concentrations greater than the calibration range of the instrument were qualified as J to indicate the concentrations are estimated.** Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).						
7. Do the laboratory reports include only those constituents requested to be reported for a specific analytical method?	X	Yes		No	AB	Initials
Comments: Only the requested target analytes were reported.						
8. Were sample holding times met?		Yes	X	No	AB	Initials
Comments: Extraction and analytical holding times were met for all samples and analyses, except as noted. **Method 8270 TBT: SDGs JM26 and JM27: Samples IJ-C3-S1 PW, IJ-C4-S1 PW, IJ-C4-S2 PW, IJ-C5-S1 PW and IJ-C6-S1 PW were re-extracted 13 days after the 7 day aqueous extraction holding time had passed. As more than twice the total holding time had passed from the date of porewater centrifuge, the results have been qualified as J or R to indicate estimated concentrations or undetected and rejected results due to severe QC non-compliance.** Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).						
9. Were correct concentration units reported?	X	Yes		No	AB	Initials
Comments: Correct concentration units were reported.						
10. Were the reporting requirements for flagged data met?	X	Yes		No	AB	Initials
Comments: Data validation qualifiers override any assigned laboratory flags.						
11. Were laboratory blank samples free of target analyte contamination?		Yes	X	No	AB	Initials
Comments: All laboratory blanks were free of target analyte contamination. Method 6010B: SDGs JM04 and JM05: Target analyte zinc was detected at 0.7 mg/Kg in the method blank prepared 06/22/2006. As this analyte was detected at more than ten times the amount found in the blank in the associated samples, no data requires qualification based on this discrepancy. Continued on following page						

Comments (continued):

Method 8270C TBT: SDGs JM26 and JM27: The method blank associated with initial extraction of pore water samples IJ-C3-S1 PW, IJ-C4-S1 PW, IJ-C4-S2 PW, IJ-C5-S1 PW and IJ-C6-S1 PW reported target analyte tributyl tin ion at 0.083 µg/L. The laboratory case narrative attributes the detection of this analyte in the blank to a contaminated reagent. This analyte was also detected in all of the associated samples at less than five times the amount found in the blank and has been qualified as U in these samples to indicate the results are undetected at the reported concentrations and are considered to be false positives due to laboratory contamination.

The method blank associated with re-extraction of pore water samples IJ-C3-S1 PW, IJ-C4-S1 PW, IJ-C4-S2 PW, IJ-C5-S1 PW and IJ-C6-S1 PW reported target analyte butyl tin ion at 0.12 µg/L. The laboratory case narrative attributes the detection of this analyte in the blank to a contaminated reagent. This analyte was also detected in all of the associated samples at less than five times the amount found in the blank and has been qualified as U in these samples to indicate the results are undetected at the reported concentrations and are considered to be false positives due to laboratory contamination.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

12. Were trip blank, field blank, and/or equipment rinse blank samples free of target analyte contamination?	NA	Yes	NA	No	AB	Initials
Comments: Not applicable – There were no trip blank, field blank or equipment rinse blank samples included in this data set.						
13. Were instrument calibrations within method or data validation control limits?		Yes	**X**	No	AB	Initials

Comments: Calibration criteria were met for all samples and analyses with the following exceptions.

Method 8270 TBT: SDGs JM04 and JM05: In the continuing calibration verification (CCV) analyzed 06/23/2006, the %D for butyl tin exceeded the 0-25% QC limits at 26.9%. This analyte has been qualified as J or UJ in associated samples IJ-C3-S1, IJ-C4-S1, IJ-C4-S2, IJ-C5-S1, and IJ-C6-S1 to indicate estimated concentrations or reporting limits.

SDGs JM26 and JM27: In the continuing calibration verification (CCV) analyzed 06/22/2006, the %D for butyl tin exceeded the 0-25% QC limits at 60.9%. This analyte has been qualified as J or UJ in associated samples IJ-C3-S1 PW, IJ-C4-S1 PW, IJ-C4-S2 PW and IJ-C6-S1 PW to indicate estimated concentrations or reporting limits.

Method 6010B: SDGs JM04 and JM05: The CRDL standard analyzed 06/26/2006 recovered zinc outside the 70-130% QC limits at 150.8%. This analyte was detected in all of the associated samples IJ-C3-S1, IJ-C4-S1, IJ-C4-S2, IJ-C5-S1 and IJ-C6-S1 at more than two times the reporting limit and has been qualified as J+ in these samples to indicate the concentrations are estimated and biased high.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

14. Were surrogate recoveries within control limits?	**X**	Yes		No	AB	Initials
Comments: Surrogate percent recoveries (%Rs) for organic analyses were within data validation QC criteria for all samples.						
15. Were laboratory control sample recoveries within control limits?	**X**	Yes		No	AB	Initials
Comments: LCS and LCSD (blank spike) recoveries were within data validation or laboratory control-charted QC limits for all target analytes.						

ANALYTICAL DATA VALIDATION CHECKLIST

16. Were matrix spike recoveries within control limits?		Yes	X	No	AB	Initials

Comments: Project specific MS and MSD recoveries for target analytes were within data validation QC limits, except as noted below. MS and MSD spike recoveries for non-project samples were not considered since matrix similarity to project samples could not be guaranteed.

Method 6010B: SDGs JM04 and JM05: In the analysis of the matrix spike of sample IJ-C4-S1, spike analyte antimony was recovered outside the laboratory QC limits of 75-125% at 12.4%. This analyte was not detected in any of the associated samples of the same matrix and has been qualified as R in these samples to indicate the results are rejected due to severe QC non-compliance. The National Functional Guidelines for the validation of ICP metals data require the rejection of all results associated with a matrix spike recovery that is less than 30%.

General Chemistry: SDG JM28: In the analysis of the matrix spike of sample SS-REF01-0606, spike analyte sulfide was recovered outside the data validation QC limits of 75-125% at 32.4%. This analyte was detected in both associated samples of the same matrix and has been qualified as J- to indicate the concentrations are estimated and biased low.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

17. Were duplicate RPDs and/or serial dilution %Ds within control limits?		Yes	X	No	AB	Initials

Comments: Laboratory RPDs for target analytes in LCS/LCSD and project-specific MS/MSD samples were within data validation control limits. All laboratory duplicate samples met data validation RPD criteria, except as noted below. Laboratory duplicates for non-project samples were not considered since matrix similarity to project samples could not be guaranteed.

Method 8270 TBT: SDG JM26: In the analysis of the sample IJ-C4-S1 PW MS and MSD the RPDs for target analyte butyl tin ion exceeded the 0-30% data validation QC limits at 48%. As this analyte was not detected in this sample, no data requires qualification based on this discrepancy.

General Chemistry: SDGs JM04 and JM05: In the duplicate sample analysis of sample IJ-C4-S1 the RPD for sulfide exceeded the 0-20% QC limit at 28.6%. All detected sulfide results in samples of the same matrix have been qualified as J to indicate the concentrations are estimated.

SDG JM28: In the duplicate sample analysis of sample SS-REF02-060 the RPD for sulfide exceeded the 0-20% QC limit at 27.3%. All detected sulfide results in samples of the same matrix have been qualified as J to indicate the concentrations are estimated.

Metals Serial Dilution %D data was not performed by the laboratory and therefore could not be included in this data review.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

18. Were organic system performance criteria met?	X	Yes		No	AB	Initials

Comments: GC/MS methods 8260B BFB and 8270C DFTPP tunes were within ion abundance and 12-hour clock method criteria for all analytical sequences.

GC system performance as demonstrated by the degradation of endrin aldehyde and DDT and tracking of target analyte retention time windows, was monitored by the laboratory personnel following method requirements and the laboratory quality assurance procedures. No data outliers were noted, therefore; further review of the instrument raw data was not required to assure organic system performance.

ANALYTICAL DATA VALIDATION CHECKLIST

19. Were internal standards within method criteria for GC/MS sample analyses?		Yes	X	No	AB	Initials

Comments: Internal standards were within method criteria for all GC/MS samples and analyses with the following exceptions.

Method 8260B: SDG JM04: The areas of Internal standard 1,4-dichlorobenzene-D_4 were outside the 50-200% QC limits at 39% and 46% in the initial analyses of samples IJ-C4-S1 and IJ-C4-S2 and at 48% in the re-analysis of sample IJ-C4-S1. As this internal standard is not associated with any of the analytes of interest, no data requires qualification based on these discrepancies.

SDG JM05: The areas of internal standard 1,4-dichlorobenzene-D_4 were outside the 50-200% QC limits at 43%, 44% and 26%, respectively in the initial analyses of samples IJ-C3-S1, IJ-C5-S1 and IJ-C6-S1 and at 43%, 48% and 29%, respectively in the re-analyses of these samples. As this internal standard is not associated with any of the analytes of interest, no data requires qualification based on these discrepancies.

The area of internal standard 1,4-difluorobenzene was outside the 50-200% QC limits at 46% in the initial analysis of sample IJ-C6-S1. As this IS was within QC limits in the re-analysis of this sample, the re-analysis has been selected as the better of the two analyses for the affected analytes ethylbenzene, m,p-xylene and o-xylene, and these analytes have been qualified as J or UJ in the initial analysis to indicate estimated concentrations or reporting limits.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

20. Were inorganic system performance criteria met?	X	Yes		No	AB	Initials

Comments: System performance checks were within method criteria for all analyses.

21. Were blind field duplicates collected? If so, discuss the precision (RPD) of the results.		Yes	X	No		Initials

Comments: There were no field duplicate samples associated with this sample set. Field precision for this data set could not be determined.

22. Were qualitative criteria for organic target analyte identification met?	X	Yes		No	AB	Initials

Comments: Retention times and chromatography were reviewed by trained laboratory personnel in accordance with the laboratory's internal QA/QC program. No data outliers were noted, therefore, further review of sample chromatograms during data validation was not required.

23. Were 100% of the EDD concentrations and reporting limits compared to the hardcopy data reports?	X	Yes		No	AB	Initials

Comments: The EDD entries were resolved with the hardcopy data results and corrected as necessary. According to validation protocol, the hardcopy data report was accepted as the correct reference. The EDD file, with data validation qualifiers and reason codes added, was returned to the Seattle database manager with this data validation report. Duplicate results from re-extractions/reanalyses were evaluated as part of this data review. The data validator determined the most reliable results based on data validation rules, method knowledge, and professional judgment. Duplicate results, determined to be less reliable, were designated as not reportable in the data base, and DNR was added to the Result_Comment field of the EDD to indicate these duplicate results should not be reported.

The following additional observations and changes were made to the EDD query.

A column for the sample times was added to the EDD query and populated with the sample times as they appear on the COCs.

A column for the lab_sample_ids was added to the EDD query and populated with the laboratory sample IDs as they appear in the hard copy reports.

Continued on following page

Comments (continued):

A column titled Sample_Name was added to the EDD. All of the sample names are the same as they appear in the sys_sample_codes except for the porewater samples which have had PW added to the end of the sample ID.

The collection dates for the porewater samples are 06/16/2006 which is the date the porewaters were centrifuged and poured off of the associated sediments. The collection dates of the sediment samples as they appeared in the EDD query were incorrect and have been changed as follows. The sampled date for sample IJ-C3-S1 was changed from 06/16/2006 to 06/13/2006. The sampled date for sample IJ-C4-S1 was changed from 06/16/2006 to 06/15/2006. The sampled date for sample IJ-C4-S2 was changed from 06/16/2006 to 06/15/2006. The sampled date for sample IJ-C5-S1 was changed from 06/16/2006 to 06/15/2006. The sampled date for sample IJ-C6-S1 was changed from 06/16/2006 to 06/14/2006.

For the sediment samples, the sample_matrix_codes were changed from GW or SO to SED. For the porewater samples, the sample_matrix_codes were changed from GW to PW.

Method 8270 TBT: SDGs JM04 and JM05: Results for target analytes butyl tin ion and dibutyl tin ion were added to the EDD query for samples IJ-C3-S1, IJ-C4-S1, IJ-C4-S2, IJ-C5-S1 and IJ-C6-S1.

24. Additional Comments: Where multiple dilutions of a sample were reported, the analyses selected for a specific analyte was chosen based on considerations of required qualification or rejection of results and which analyses would provide the lowest possible reporting limit or more conservative (higher) value while detecting the target analyte within the linear calibration range of the instrument.

25. General Comments: Data were evaluated based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review*, document number EPA540/R-99/008, October 1999 with additional reference to document 540-R-04-009, January 2005, and *USEPA CLP National Functional Guidelines for Inorganic Data Review*, document number EPA540/R-04/004 of October 2004 as they applied to the reported methodology. Field duplicate RPD control limits were taken from the USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, February 1988, upheld in DRAFT 1993.

Refer to the Table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 4-7).

Appendix C

Bioassay Data Reports

Appendix D

Core Processing Logs

Sediment Core Log

IJ-18

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-0.3**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **16.7**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-17.0**	Recovery in ft (%): **6.4 (91)**
Contractor: **MSS**	N./LAT: **48 45.2970** E./LONG: **122 29.6136**	Process Date: **06/13/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C3) Bioassay (IJ-C3)	ML: wet, very soft, dark gray (GLEY 1, 4/N) SILT, trace clay. Scattered rootlets and wood fragments. Clay texture is gummy.	Homogenized for sample IJ-C3	S1
1				ML: wet, soft, dark gray (GLEY 1, 4/N) CLAYEY SILT, trace sand and gravel. Clay competancy increases towards basal contact. @ 1.3' subangular gravel up to 1/2" diameter		
2				ML: moist, soft, dark gray (GLEY 1, 4/N) SILT, little sand.		
3	Z1		Archive	SM: moist, medium dense, very dark gray (GLEY 1, 3/N) SAND, little silt. Sand grains are medium, multicolored (red, white, black), and coarsen towards basal contact. Trace shell fragments. Moderate hydrogen sulfide odor.		Z
4				GP: moist, dense, very dark gray (GLEY 1, 3/N) GRAVEL, little sand. Gravel is subrounded to subangular and up to 3" L.		
5				SM: moist, medium dense, very dark gray (7.5YR, 3/1) SAND, few silt. Sand grains are multicolored (red, white, black). Trace wood layers up to 2" thick with wood fragments up to 1" L.		
6				CL: damp, stiff, greenish gray (GLEY 1, 5/GY) CLAY. Clay is of high plasticity, rolls well, and is highly competant.		
				End of core at 5.7'. Driven to refusal. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		

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Remarks: **Drive notes: freefall (3.0'), easy (4.8'), very hard (6.6'). refusal (6.4'). Core shoe was 25% full of green-gray clay, trace hydrogen sulfide odor. Core tube scratched.**

Calculated Recovery
Sample Length/Penetration Length:
6.4 / 7.0 = 91 %

Sediment Core Log

IJ-19

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-1.7**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **13.6**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-15.2**	Recovery in ft (%): **5.2 (74)**
Contractor: **MSS**	N./LAT: **48 45.2963** E./LONG: **122 29.6137**	Process Date: **06/13/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater VOCs Sulfides Archive Dioxins (IJ-C3) Bioassays (IJ-C3)	ML: wet, soft, dark gray (GLEY 1, 4/N) SILT, trace sand. Scattered worms, trace rootlets.	Homogenized for sample IJ-C3	
1				ML: moist, medium stiff, dark gray (GLEY 1, 4/N) SILT, trace fine sand. Sand percentage increases to few and coarsens toward basal contact. Slight hydrogen sulfide odor. Trace fish matter (scales) up to 1/2" diameter.		
2				GP: moist, dense, dark gray (GLEY 1, 4/N) SANDY GRAVEL. Gravel is subrounded to subangular and up to 2" L.		
3	Z1			SM: moist, dense, very dark gray (GLEY 1, 3/N) SAND, trace gravel. Sand grains are coarse and multicolored. Trace shell fragments.		
			Archive	SM: moist, dense, very dark gray (GLEY 1, 3/N) SAND, few silt, trace gravel. Trace shell fragments. Trace hydrogen sulfide odor.		
4				CL: damp, stiff to very stiff, greenish gray (GLEY 1, 5/GY) CLAY. Clay has high plasticity and rolls well. @ 3.8-3.9': substantial subrounded gravel up to 3" L and shell fragments. Scattered sand and smaller gravels.		Z
5				End of core at 4.5'. Driven to refusal (see remarks). In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		
6						

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Remarks: **Drive notes: freefall (3.5'), easy (6.1'), refusal (6.1').**

Core shoe 100% full of damp, greenish gray clay.

Refusal likely caused by mechanical rather than lithological refusal.

Calculated Recovery
Sample Length/Penetration Length:
5.2 / 7.0 = 74 %

Sediment Core Log

IJ-20

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **+1.3**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **18.4**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-17.1**	Recovery in ft (%): **6.3 (96)**
Contractor: **MSS**	N./LAT: **48 45.3057** E./LONG: **122 29.5848**	Process Date: **06/13/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0				ML: wet, very soft, dark gray (GLEY 1, 4/N) SILT, trace fine sand.		0
	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C3) Bioassays (IJ-C3)	ML: moist, soft, very dark gray (GLEY 1, 3/N) SILT. Silt competancy increases toward basal contact. Trace fish matter. Trace to moderate hydrogen sulfide odor.	Homogenized for sample IJ-C3	
1						1
				ML: moist, soft, very dark gray (GLEY 1, 3/N) SILT, little clay. Silt competancy increases toward basal contact. No hydrogen sulfide odor below 2.0'.		
2				@ 2.1' 3" L metal piece (drill bit - like)	Bag @ 2.1' (metal).	2
				ML: moist, medium stiff, very dark gray (GLEY 1, 3/N) SILT, few sand. Sand grains are medium to coarse. Trace wood and gravel. @ 3.3'-4.5': scattered wood fragments up to 1" L @ 3.5': subrounded gravel up to 2.5" L @ 4.0': subangular gravel up to 2.5" L		
3						3
4	Z1		Archive	ML: moist, medium stiff, very dark gray (GLEY 1, 3/N) CLAYEY SILT, trace gravel. Trace shell fragments and organic matter (wood).		4
5						5
6				End of core at 6.1. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.	Clay tagged in core shoe.	6

S1 Z

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Remarks: **Drive notes: freefall (3.7'), easy (7.0'), no refusal.**

Core shoe was 100% full of damp, black clayey silt.

Calculated Recovery
Sample Length/Penetration Length:
6.7 / 7.0 = 96 %

Sediment Core Log

IJ-21

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-3.0**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **14.1**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-17.1**	Recovery in ft (%): **6.8 (97)**
Contractor: **MSS**	N./LAT: **48 45.2904** E./LONG: **122 29.6016**	Process Date: **06/13/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0				ML: wet, very soft, black (GLEY 1, 2.5/N) SILT.		0
			Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C3) Bioassays (IJ-C3)	ML: moist, soft, black (GLEY 1, 2.5/N) CLAYEY SILT. Trace fish matter (scales and flakes)l and wood fragments. Trace hydrogen sulfide odor. @ 1.1': 1" thick layer of wood fragments GP: moist, dense, black (GLEY 1, 2.5/N) GRAVEL, little silt and sand. Gravel is subrounded to subangular and up to 2" in diameter. @ 1.7': 1/2" thick lens of very coarse sand	Homogenized for sample IJ-C3	
1						1
2	S1			CL: moist, medium stiff, very dark gray (GLEY 1, 3/N) CLAY, trace silt. Clay texture is gummy, rolls easily, and has low plasticity. Trace layers of fish matter (scales and flakes) and wood fragments.		2
3						3
4	Z1		Archive	@ 3.6': wood fragments up to 1" L. Plastic piece 1.5" L. @ 4.0': Trace flakes of organic matter (fish scales) in a layer of decomposing material.	Bag @ 3.6' (plastic).	4
5				SM: moist, medium dense, black (GLEY 1, 2.5/N) SAND, little silt. Moderate to substational wood, trace fish bones. @ 4.7': 1" thick layer of moderate to substantial wood fragments @ 4.9': fish bones up to 3" L @ 5.4': CLAYEY SILT with seams of sand		5
6				End of core at 6.3'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		6

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Remarks: Drive notes: freefall (1.0'), easy (7.0'), no refusal.

Core shoe was empty.

Calculated Recovery
Sample Length/Penetration Length:
6.8 / 7.0 = 97 %

Sediment Core Log

IJ-22

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-2.6**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **16.7**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-19.3**	Recovery in ft (%): **6.6 (93)**
Contractor: **MSS**	N./LAT: **48 45.3023** E./LONG: **122 29.5739**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	SI		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C5) Bioassays (IJ-C5)	ML: moist, soft, greenish black (GLEY 1, 2.5/10Y) SILT trace very fine sand. Trace shell fragments up to 3" L. Moderate hydrogen sulfide odor.	Homogenized for sample IJ-C5	SI
1				ML: moist, medium stiff, greenish black (GLEY 1, 2.5/10Y) SILT, few medium-coarse sand. Scattered small shell fragments. Strong hydrogen sulfide odor.		
2				CL: moist, stiff, greenish gray (GLEY 1, 5/GY) CLAY, trace subrounded gravel.		
3						
4						
5						
6				End of core at 6.6'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		
7						

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Remarks: Drive notes: freefall (2.0'), moderate (7.0'), no refusal.
Core shoe was 100% full of green-gray clay.

Calculated Recovery
Sample Length/Penetration Length:
6.6 / 7.0 = 93 %

Sediment Core Log

IJ-23

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-1.8**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **15.7**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-17.5**	Recovery in ft (%): **6.7 (96)**
Contractor: **MSS**	N./LAT: **48 45.2721** E./LONG: **122 29.6107**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals VOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C5) Bioassays (IJ-C5)	ML: moist, very soft, greenish black (GLEY 1, 2.5/10Y) SILT, few sand. Abundant intact mussel shells up to 1.5" L. Trace wood fragments up to 2.5" L. Moderate hydrogen sulfide odor. Grades to substantial shells and fish scales up to 3" L and fish bones up to 1" L. Trace subrounded 2" L gravel and trace wood fragments up to 2" L. Very strong hydrogen sulfide odor.	Homogenized for sample IJ-C5 Bag @ 1.6' (plastic).	S1
1				@ 1.6': piece of 3" L filmy, thin, plastic		
2				ML: moist, medium stiff, greenish black (GLEY 1, 2.5/10Y) SILT, few fine sand. Scattered decomposed fish matter (scales and flakes).		
3				ML: moist, medium stiff, greenish black (GLEY 1, 2.5/10Y) VERY SANDY SILT. Scattered 1/2" to 1" thick layers of decomposed, broken fish matter (scales, bones, flakes).		
4				CL: moist, stiff, greenish gray (GLEY 1, 5/GY) CLAY, trace subrounded gravel up to 1/2" diameter.		
5				End of core at 6.3'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		
6						

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Remarks: Drive notes: freefall (1.0'), easy (4.0'), moderate-hard (7.0'), no refusal. Core shoe was 100% full of green-gray clay. Piece of 3/8" polypropylene line in bottom of core shoe.

Calculated Recovery
Sample Length/Penetration Length:
6.7 / 7.0 = 96 %

Sediment Core Log

IJ-24

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-0.9**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **16.3**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-17.2**	Recovery in ft (%): **6.6 (96)**
Contractor: **MSS**	N./LAT: **48 45.2894** E./LONG: **122 29.5948**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description (Classification Scheme: USCS; Contacts are recovered depth)	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C5) Bioassays (IJ-C5)	ML: moist, soft, greenish black (GLEY 1, 2.5/10Y) SILT, trace very fine sand. Color is mottled gray-green and black. @ 0.5': 2" L worm	Homogenized for sample IJ-C5	0
1				ML: moist, soft, black (GLEY 1, 2.5/N) CLAYEY SILT. Silt competancy increases toward basal contact. Few fish matter (fish scales and bones), trace intact mussle shells up to 1" L, and trace shell fragments up to 2 cm.		1
2				ML: moist, soft, black (GLEY 1, 2.5/N) CLAYEY SILT, trace fine sand. Silt decreases in competancy toward basal contact. Trace fish matter (scales, bones) increasing to substantial below 2.2' in 2" thick layers. Trace hydrogen sulfide odor.		2
3				ML: moist, medium-stiff, black (GLEY 1, 2.5/N) SILT, few sand and trace gravel. Sand grains are medium to coarse and multicolored (gray, white, black). Gravel is subangular, up to 3" diameter, and increases to few below 4.2 feet. Trace rootlets. Trace hydrogen sulfide odor.		3
4	Z1		Archive	SM: moist, medium dense, black (GLEY 1, 2.5/N) COARSE SAND, few silt. Moderate to substantial shredded wood fragments.		4
5				CL: moist, medium stiff, greenish gray (GLEY 1, 5/GY) CLAY.		5
6				End of core at 6.3'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		6

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Remarks: Drive notes: freefall (1.0'), easy (4.0'), moderate-hard (7.0'), no refusal. Core shoe was 100% full of gray-green clay and some woody material.

Calculated Recovery
Sample Length/Penetration Length:
6.7 / 7.0 = 96 %

Sediment Core Log

IJ-25

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **0.01**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **16.9**	Sample Quality: **Good**
Collection Date: **06/12/06**	Mudline Elevation (ft): **-16.9**	Recovery in ft (%): **6.8 (97)**
Contractor: **MSS**	N./LAT: **48 45.3027** E./LONG: **122 29.5741**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description (Classification Scheme: USCS; Contacts are recovered depth)	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater VOCs Sulfides Archive Dioxins (IJ-C5) Bioassays (IJ-C5)	ML: wet, very soft, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT.	Homogenized for sample IJ-C5	0
1				ML: moist, soft, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT. Silt competancy increases toward basal contact. Trace rootlets. Trace hydrogen sulfide odor.		1
2				ML: moist, soft, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT, trace very fine sand. Trace fish matter (scales) below 2.2 feet and trace layers of fish matter. @ 2.0': 2" thick layer of substantial fish matter (scales, bones, shells). Slight hydrogen sulfide odor.		2
3				ML: moist, medium-stiff, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT, trace medium to coarse sand.		3
4	Z1		Archive	ML: moist, medium-stiff, greenish black (GLEY 1, 2.5/10Y) SILT, little medium to coarse sand. Moderate decomposed wood chips and shreds up to 1" L.		4
5				CL: damp, stiff, greenish gray (GLEY 1, 5/GY) CLAY, trace subrounded gravel up to 1" diameter. Clay is of high plasticity, rolls well, and is highly competant.		5
6				End of core at 6.1'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		6

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Remarks: Drive notes: freefall (4.0'), easy (5.0'), moderate-hard (7.0'), no refusal. Core shoe was 100% full of gray-green clay.

Calculated Recovery
Sample Length/Penetration Length:
6.8 / 7.0 = 97 %

Sediment Core Log

IJ-26

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-3.0**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **17.2**	Sample Quality: **Good**
Collection Date: **06/13/06**	Mudline Elevation (ft): **-14.2**	Recovery in ft (%): **5.2 (75)**
Contractor: **MSS**	N./LAT: **48 45.2519** E./LONG: **122 29.6311**	Process Date: **06/14/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov. Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description (Classification Scheme: USCS; Contacts are recovered depth)	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater VOCs Sulfides Archive	ML: wet, soft, greenish black (GLEY 1, 2.5/10Y) FISHY SILT. Abundant decomposed fish bones and scales up to 4" L, wood splinters and fragments up to 2.5" L, and shells up to 2.5" L. Very strong hydrogen sulfide odor.	Homogenized for sample IJ-C6	
1						
2			Dioxins (IJ-C6) Bioassays (IJ-C6)	CL: moist, medium stiff, very dark greenish gray (GLEY 1, 5/GY) CLAY, little silt. Clay texture is gummy.		
				ML: moist, medium stiff, greenish gray (GLEY 1, 3/10Y) SILT, little fine to medium sand. Very strong hydrogen sulfide odor.		
3	Z1		Archive	ML: moist, medium-stiff, greenish gray (GLEY 1, 3/10Y) SILT, little, sand and clay. Silt texture increases in competancy toward basal contact. Scattered fish matter (bones) up to 2" L, shells both intact and fragments up to 2" L, and wood fragments up to 3"L. Hydrogen sulfide odor decreases toward basal contact from strong to trace.		
4				CL: moist, stiff, greenish gray (GLEY 1, 5/GY) CLAY. Clay rolls well and is of high plasticity.	No sample collected below 3.75' due to clay layer.	
				End of core at 4.8'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		
5					Strongest hydrogen sulfide odor of all the cores logged.	
6						

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Remarks: **Drive notes: freefall (3.5'), easy (6.0'), moderate-hard (7.0'), no refusal. Core shoe was 100% full of gray-green clay.**

Calculated Recovery
Sample Length/Penetration Length:
5.2 / 7.0 = 75 %

Sediment Core Log

IJ-27

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-3.0**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **13.4**	Sample Quality: **Good**
Collection Date: **06/13/06**	Mudline Elevation (ft): **-16.4**	Recovery in ft (%): **6.7 (96)**
Contractor: **MSS**	N./LAT: **48 45.2702** E./LONG: **122 29.6068**	Process Date: **06/14/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive	ML: wet, soft, greenish black (GLEY 1, 2.5/10Y) FISHY SILT, trace subrounded gravel. Abundant decomposed fish scales and wood splinters up to 3.0" L, trace intact mussel shells up to 0.5" L and worms. Moderate hydrogen sulfide odor.	Homogenized for sample IJ-C6	
2			Dioxins (IJ-C6) Bioassays (IJ-C6)	CL: moist, medium stiff, very dark greenish gray (GLEY 1, 5/GY) CLAY, few fine sand and clay. Scattered wood fragments and fish matter (bones). Trace to moderate hydrogen sulfide odor. @ 2.0': angular anthropogenic fragment		
3				ML: moist, soft, very dark greenish gray (GLEY 1, 3/10Y) FISHY SILT, little fine sand. Abundant fish matter (bones and scales). Very strong hydrogen sulfide odor.		
4	Z1		Archive	ML: moist, soft, very dark greenish gray (GLEY 1, 3/10Y) SILT, little fine sand. Scattered fish matter (bones, scales, vertebrae). Moderate hydrogen sulfide odor.		
5				ML: moist, medium-stiff, very dark greenish gray (GLEY 1, 3/10Y) SILT, few sand and clay. Scattered layer of fish matter (scales).		
6				CL: damp, stiff, greenish gray (GLEY 1, 5/GY) CLAY, trace subrounded gravel. Clay is highly competant, of high plasticity, and rolls well.		
				End of core at 6.5'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		

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Remarks: **Drive notes: freefall (5.0'), moderate-hard (7.0'), no refusal. Proposed location was under the dock, actual is 6.0' from proposed.**

Calculated Recovery
Sample Length/Penetration Length:
6.7 / 7.0 = 96 %

Sediment Core Log

IJ-28

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **+3.0**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **17.0**	Sample Quality: **Good**
Collection Date: **06/13/06**	Mudline Elevation (ft): **-14.0**	Recovery in ft (%): **5.8 (92)**
Contractor: **MSS**	N./LAT: **48 45.2865** E./LONG: **122 29.5820**	Process Date: **06/14/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C6) Bioassays (IJ-C6)	ML: wet, very soft, greenish black (GLEY 1, 2.5/10Y) FISHY SILT, trace sand. Abundant decomposed fish matter (bones) and mussel shells.		0
1				ML: moist, soft, very dark greenish gray (GLEY 1, 5/GY) SILT, few sand and trace subrounded gravel up to 3" L. Silt competancy increases with depth. Moderate fish matter (scales).	Homogenized for sample IJ-C6	1
				ML: moist, soft, very dark greenish gray (GLEY 1, 3/10Y) SILT, few fine to medium sand. Trace to scattered fish matter (scales), shells, and seams of decomposed wood.		
2	Z1		Archive	ML: moist, soft, very dark greenish gray (GLEY 1, 3/10Y) SILT, few sand and clay, trace subangular gravel up to 0.25" diameter. Moderate shell fragments. Trace hydrogen sulfide odor.		2
3				ML: moist, soft, dark greenish gray (GLEY 1, 4/10Y) SILT, little medium to coarse sand. Trace rootlets. Grades to more sand towards basal contact.		3
4						4
5				End of core at 5.3'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		5

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Remarks: Drive notes: freefall (2.6'), moderate-hard (7.0'), no refusal.

Calculated Recovery
Sample Length/Penetration Length:
5.8 / 7.0 = 92 %

Sediment Core Log

IJ-29

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-2.1**	Penetration Depth (ft): **6.8**
Client: **Port of Bellingham**	Water Depth (ft): **8.4**	Sample Quality: **Good**
Collection Date: **06/13/06**	Mudline Elevation (ft): **-10.3**	Recovery in ft (%): **6.8 (100)**
Contractor: **MSS**	N./LAT: **48 45.3000** E./LONG: **122 29.5616**	Process Date: **06/14/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C6) Bioassays (IJ-C6)	ML: wet, soft, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT, trace fine sand. Silt competancy and sand content increase towards basal contact . Trace shell and wood fragments up to 2" L and scattered worms. Trace hydrogen sulfide odor.	Homogenized for sample IJ-C6	S1
2	Z1		Archive	ML: wet, soft, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT, few fine sand. Trace rootlets and wood fragments.		Z1
4				@ 3.8': seam of wood fragments (lumbered)		
6				ML: moist, medium-stiff, very dark greenish gray (GLEY 1, 3/10Y) CLAYEY SILT, little sand. Color is mottled black and greenish gray.		

End of core at 6.8'.
In-situ depth = Recovered Interval / % Recovery
Method assumes compaction is the same throughout the core.

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Remarks: Drive notes: easy (6.8'), no refusal.

Calculated Recovery
Sample Length/Penetration Length:
6.8 / 6.8 = 100 %

Sediment Core Log

IJ-30

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **-0.5**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **15.3**	Sample Quality: **Good**
Collection Date: **06/14/06**	Mudline Elevation (ft): **-15.8**	Recovery in ft (%): **6.5 (93)**
Contractor: **MSS**	N./LAT: **48 45.3170** E./LONG: **122 29.5745**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C4-S1) Bioassays (IJ-C4-S1)	ML: wet, very soft, black (GLEY 1, 2.5/N) SILT, few fine sand. Trace eel grass blades and mussel shell fragments up to 1" L.	Homogenized for sample IJ-C4-S1	0
1				ML: wet, soft, black (GLEY 1, 2.5/N) SILT, few fine sand. Trace shell fragments up to 0.5" L and rootlets. Silt has increased competancy.		1
				ML: moist, soft, very dark gray (GLEY 1, 3/N) CLAYEY SILT, few fine sand. Trace wood fragments.		
2				ML: moist, soft, very dark gray (GLEY 1, 3/N) CLAYEY SILT, few medium sand. Trace rootlets. Trace hydrogen sulfide odor.		2
3	S2		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C4-S2) Bioassays (IJ-C4-S2) Archive	ML: moist, medium stiff, dark reddish brown (5YR, 2.5/Z) WOODY SILT, little sand. Wood fragments and chips are up to 3" L. Sand grains are medium to coarse, angular, poorly sorted, multicolored (black, white, brownish-green), and non-native looking. Moderate hydrogen sulfide odor.	Homogenized for sample IJ-C4-S2 Bag @ 4.0' (sand, non-native looking).	3
4				@ 3.8': Strong hydrogen sulfide odor.		4
5	Z1			ML: moist, medium stiff, very dark gray (GLEY 1, 3/N) SILT, few medium sand. Trace hydrodgen sulfide odor.		5
				ML: moist, soft, very dark gray (GLEY 1, 3/N) CLAYEY SILT, few medium sand. Trace rootlets.		
6				End of core at 6.1'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		6

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Remarks: **Drive notes: freefall (0-3'), easy (7.0'), no refusal.**

Core shoe was 50 % full of black sandy silt with wood.

Calculated Recovery
Sample Length/Penetration Length:
6.5 / 7.0 = 93 %

Sediment Core Log

IJ-31

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **+1.0**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **16.8**	Sample Quality: **Good**
Collection Date: **06/14/06**	Mudline Elevation (ft): **-15.8**	Recovery in ft (%): **6.9 (99)**
Contractor: **MSS**	N./LAT: **48 45.3238** E./LONG: **122 29.5602**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C4-S1) Bioassays (IJ-C4-S1)	ML: wet, soft, black (GLEY 1, 2.5/N) SILT. Trace leaf and wood fragments up to 3" L.	Homogenized for sample IJ-C4-S1	0
1				ML: moist, soft, black (GLEY 1, 2.5/N) SILT with 2" diameter pockets of clay. Silt has increased competancy. Trace rootlets. Trace hydrogen sulfide odor. @ 1.2': 2" thick layer of moist, soft, black (GLEY 1, 2.5/N) SILT, few medium sand. Trace wood fragments up to 0.25" L. Moderate hydrogen sulfide odor.		1
2				@ 2.2': layer of fish scales up to 0.5" L.		2
3	S2		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C4-S2) Bioassays (IJ-C4-S2)	ML: moist, medium stiff, black (GLEY 1, 2.5/N) SILT, few coarse sand and clay, trace sub-angular gravel. Sand is similar to that found in IJ-30. Gravel is up to 1" diameter. Trace dark red (5YR, 2.5/2) wood fragments up to 3" L.	Homogenized for sample IJ-C4-S2	3
4				CL: damp, stiff, greenish gray (GLEY 1, 5/GY) CLAY. Clay is of high plasticity, rolls well, and is highly competant.		4
5						5
6				End of core at 6.5'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		6

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Remarks: **Drive notes: freefall (4.5'), moderate (5.0'), hard (7.0'), no refusal. Core shoe was full of stiff, gray, clay.**

Calculated Recovery
Sample Length/Penetration Length:
6.9 / 7.0 = 99 %

Sediment Core Log

IJ-32

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **+2.6**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **3.7**	Sample Quality: **Good**
Collection Date: **06/14/06**	Mudline Elevation (ft): **-1.1**	Recovery in ft (%): **4.2 (60)**
Contractor: **MSS**	N./LAT: **48 45.3292** E./LONG: **122 29.5429**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Sulfides VOCs Archive Dioxins (IJ-C4-S1) Bioassays (IJ-C4-S1)	SP: moist, medium dense, dark gray (GLEY 1, 4/N) FINE SAND, few silt. Jumbled texture. Trace intact clam shells up to 2" L and rootlets. Scattered wood fragments up to 3" L. Moderate to strong hydrogen sulfide odor. @ 0.0-0.8': Shell fragments with trace intact shells up to 2" L.	Homogenized for sample IJ-C4-S1	
1						
2	S2		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Sulfides VOCs Archive Dioxins (IJ-C4-S2) Bioassays (IJ-C4-S2)	SP: moist, medium dense, dark gray (GLEY 1, 4/N) MEDIUM SAND, trace subrounded gravel up to 2" diameter. Scattered shell fragments.	Homogenized for sample IJ-C4-S2	
3	Z		Archive	End of core at 3.6'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		
4						
5						
6						

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Remarks: **Drive notes: moderate (7.0'), no refusal. Core shoe was full of dark gray sand with moderate sulfide odor.**

Calculated Recovery
Sample Length/Penetration Length:
4.2 / 7.0 = 60 %

Sediment Core Log

IJ-33

Sheet 1 of 1

Project: **POB I&J Waterway**	Water Body Type: **Marine**	Tube Length (ft): **8.0**
Project #: **PORTB-18448-310**	Water Elevation (ft)/Tide: **+1.2**	Penetration Depth (ft): **7.0**
Client: **Port of Bellingham**	Water Depth (ft): **11.2**	Sample Quality: **Good**
Collection Date: **06/14/06**	Mudline Elevation (ft): **-10.0**	Recovery in ft (%): **6.8 (97)**
Contractor: **MSS**	N./LAT: **48 45.3149** E./LONG: **122 29.5432**	Process Date: **06/15/06**
Vessel: **R/V Nancy Anne**	Horiz. Datum: **NAD 83** Vert. Datum: **MLLW**	Process Method: **Cut tube**
Operator: **Bill Jaworski**	Method/Tube ID: **Vibracorer/3" round Al**	Logged By: **L.McKee, C.Brackett**

Recovered Depth (ft)	Recov.Interval & Sample #	% Recovery (depth in ft)	Analysis	Sediment Description Classification Scheme: USCS Contacts are recovered depth	Comments for Recovered Depths	*In-situ* Depths (ft) & Graphic Log
0	S1			ML: wet, very soft, greenish black (GLEY 1, 2.5/10Y) SILT.		0
			Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C4-S1) Bioassays (IJ-C4-S1)	ML: moist, soft, greenish black (GLEY 1, 2.5/10Y) CLAYEY SILT, few fine sand. Trace rootlets and leaf stems. Grades to medium sand below 1.5'. Trace hydrogen sulfide odor.	Homogenized for sample IJ-C4-S1	
1						1
2						2
3						3
	S2		Metals SVOCs PCB TBT bulk Pesticides Conventionals Grain Size TBT porewater Archive Dioxins (IJ-C4-S2) Bioassays (IJ-C4-S2)	ML: moist, medium stiff, very dark gray (GLEY 1, 3/N) SILT, few fine to medium sand. Sand grains are poorly sorted and angular. Scattered shredded wood up to 2" L. Grades to no wood below 4.2". Sand content increases to little (25%) toward basal contact.	Homogenized for sample IJ-C4-S2	
4						4
5				CL: damp, medium stiff, greenish gray (GLEY 1, 5/GY) CLAY, few sand. Jumbled texture.		5
6				CL: damp, firm, greenish gray (GLEY 1, 5/GY) CLAY.		6
				End of core at 6.4'. In-situ depth = Recovered Interval / % Recovery Method assumes compaction is the same throughout the core.		

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Remarks: **Drive notes: easy (7.0'), no refusal.**

Core shoe was full of gray-green clay.

Calculated Recovery
Sample Length/Penetration Length:
6.8 / 7.0 = 97 %