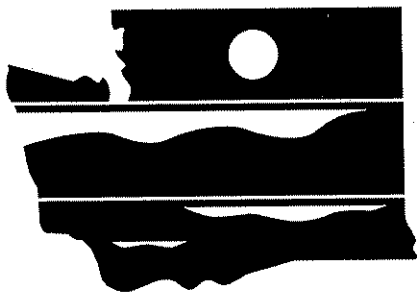

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Lower Budd Inlet Sediment Characterization Study

Midwest Site Evaluation and Chemical Screening of Selected Point Sources

February 1999
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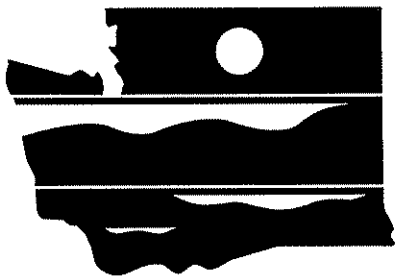

Lower Budd Inlet Sediment Characterization Study

Midwest Site Evaluation and Chemical Screening of Selected Point Sources

by
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Abstract

Chemical and biological testing of sediments from the Midwest Site in lower Budd Inlet was performed in June 1998, to determine if this area should still be listed on the Washington State Department of Ecology Contaminated Sediment Site List (CSSL). Chemical screening (metals and organics) was also conducted near several other potential sources to determine if further sediment investigation was warranted at these locations. For comparison, a reference site in Totten Inlet was also sampled.

Concentrations of both metals and organics were low in most of the areas sampled in lower Budd Inlet. The majority of chemical contamination noted seems to be associated with specific discharges. Four chemicals were present above the Sediment Management Standards (SMS). Of the six individual violations of the SMS measured, only two were above the Cleanup Screening Levels: bis(2-ethyl hexyl)phthalate near the Fiddlehead Outfall and in East Bay at the mouth of Indian/Moxlie Creek. No immediate action is recommended at these sites, however,activities with the potential to disturb sediments in these areas should include prior sediment monitoring to evaluate the potential to transport contaminated sediments. Tributyltin concentrations inside the West Bay Marina and near the Fiddlehead Outfall exceeded the interim screening level recommended by the Puget Sound Dredge Disposal Analysis (PSDDA)/SMS programs, which requires biological testing to be performed.

Concerning the Midwest Site, no chemicals were measured above the SMS. Toxicity evaluation using the amphipod and juvenile polychaete bioassays indicated that sediments from the Midwest Site should not have adverse effects on biological communities. Based on a preponderance of evidence,the Midwest Site should be re-scored by Ecology's Sediment Management Unit and be considered for removal from the CSSL.

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A number of Ecology made significant contributions to this project. The author would like to extend thanks to the following:

- Dave Rogowski and Dave Serdar assisted in collection of the samples
- Debbie Lacroix, Pam Covey, Randy Knox, Greg Perez, Karin Fedderson, and Dickey Huntamer coordinated analytical services and reviewed data for the project
- Stuart Magoon managed the bioassay contract
- Russ McMillan, Michelle Wilcox, Art Johnson, and Will Kendra reviewed the report and provided valuable comments
- Shirley Rollins and Joan LeTourneau edited and formatted the document for publication

Introduction

Project Description

In 1988, the National Marine Fisheries Service (NMFS) under contract to the Army Corps of Engineers (ACOE) conducted a sediment characterization study in lower Budd Inlet (NOAA, 1988). The purpose of this study was to evaluate sediment quality in and around the main navigation channel as part of a proposed widening/deepening project to improve deep water access to the Port of Olympia terminal. Analyses included both chemistry and a suite of bioassays. The results of this study indicated that sediments in the proposed project area were unsuitable for open water disposal under the Puget Sound Dredge Disposal (PSDDA) guidelines. The project was subsequently stopped.

Subsequent analysis of the bioassay hits obtained during the preliminary investigation indicated that a portion of the turning basin should be included as a contaminated sediment site (Midwest Site) on the Washington State Department of Ecology Contaminated Sediment Site List (CSSL) (Ecology, 1996). Since the 1988 characterization study was designed to evaluate disposal options for dredge material, bioassays were run on composite samples collected to a depth of 4'. Due to the sampling scheme employed it is unclear what the significance of these results is to the biologically active zone (upper 0-10 cm). In addition, approximately 10 years have passed since the earlier data were generated.

To evaluate the current status of the Midwest Site, Russ McMillan of the Ecology Southwest Regional Office (SWRO) requested that chemical and biological testing of sediments be conducted. Chemical screening of sediments from several other suspected problem areas in lower Budd Inlet was also requested. The Budd Inlet study area is shown in Figure 1.

The Ecology Environmental Assessment Program (EAP), Watershed Ecology Section, was contracted to conduct this survey. The primary objectives of the study were as follows:

- Conduct chemical and biological testing of sediments from the Midwest Site located in lower Budd Inlet to determine if the site should still be listed on the CSSL using the criteria described in Ecology's Sediment Management Standards (173-204 WAC).

- Perform chemical screening of sediments near potential sources in lower Budd Inlet to determine if further investigation is warranted.

Results from this investigation will be used to evaluate the current status of the Midwest Site listing. In addition, the chemical screening data will be used to evaluate the need for further sediment characterization work at the other locations in Budd Inlet. The data generated from this study will be entered into Ecology's Environmental Information Management (EIM) database and SEDQUAL (sediments database) for future reference.

Methods

Site Selection

Sediment samples were collected on June 9-10, 1998 from 14 locations (Table 1 and Figure 2). Station locations were selected to provide spatial coverage of the Midwest Site, screen for impacts from other potential sources, and evaluate current conditions at known problem areas. For chemical screening sites, known and suspected problem areas were identified based on information obtained from Ecology's SWRO and Sediment Management Unit (SMU).

Table 1. Sampling Locations for the Lower Budd Inlet Sediment Characterization Study

Site Characterization

No. Sites	Station Name	Description	Target Analytes	Purpose of Site
6	MW1-6	Midwest Portion of Turning Basin	%S, TOC, GS, Metals (8), Semiv., PCBs, Bioassay	Evaluate listing as a contaminated sediment site

Site Screening

No. Sites	Station Name	Description	Target Analytes	Purpose of Site
2	Hard1-2	Former Hardel Plywood Mill Site Drains	%S, TOC, GS, Metals (8), Semiv., Phenolics	Evaluate suspected contamination in sediments adjacent to historical drains
1	Fido1	Fiddlehead Outfall	%S, TOC, GS, Metals (8), Semiv., Butyltins, Phenolics, PCBs	Evaluate current contaminant levels near outfall
2	WB1-2	West Bay Marina	%S, TOC, GS, Metals (8), Semiv., Butyltins	Screen for impacts from boatyard runoff
1	PD1	Berth B Log Terminal	%S, TOC, GS, Metals, Semiv., Phenolics, PCBs	Evaluate current contaminant levels adjacent to port dock
1	IM1	Indian/Moxlie Creek Mouth	%S, TOC, GS, Metals (8), Semiv. Phenolics, PCBs	Screen for impacts from discharge to East Bay
1	Ref	Reference- Totten Inlet	%S, TOC, GS, Metals (8), Semiv. Phenolics, Butyltins, PCBs, Bioassay	Reference area for comparison

%S = Percent Solids; TOC = Total Organic Carbon; GS = Grain Size
Metals (8) = SMS metals (As, Cd, Cu, Cr, Hg, Ni, Pb, and Zn)
Semiv. = Semivolatile Organics
Phenolics = Low-level analysis
PCBs = Polychlorinated Biphenyls
Butyltins = Mono, di, and tri-butyltin
Bioassay = Amphipod, Larval Echinoderm, and Juvenile Polychaete

Station positions were located with the use of a differentially corrected Northstar 941XD global positioning system in conjunction with depth readings. Station positions and location descriptions are listed in Appendix A, Table A1.

Sample Collection

Where applicable, sampling methods followed Puget Sound Estuary Protocols (PSEP) and requirements of Ecology's Sediment Management Standards (SMS) (PSEP, 1996; Ecology, 1995a,b).

Each sample, at a minimum, consisted of a composite of two individual grabs. For each grab, the top 10-cm layer (biologically active zone - Ecology, 1995b) was retained for analysis. In most instances, samples were collected from Ecology's 20' skiff using a 0.1 m^2 stainless steel van Veen grab. A grab was considered acceptable if it was not over-filled with sediment, overlying water was present and not excessively turbid, the sediment surface was relatively flat, and the desired depth of penetration had been achieved. At sites where it was not possible to navigate the vessel (IM-1), samples were obtained at low tide by hand using stainless steel spoons. A field log was maintained throughout the sampling. Descriptions of each sample are listed in Appendix A, Table A2.

Processing of samples in the field consisted of first siphoning off overlying water in the grab. The top 10-cm of sediment, not in contact with the sidewalls of the grab, was then removed with stainless steel scoops, placed in a stainless steel bucket, and homogenized by stirring.

Sub-samples of the homogenized sediment were placed in glass jars (Teflon lid liners) cleaned to EPA QA/QC specifications (EPA, 1990), or Whirl-Pak bags for grain size. Separate 4-oz jars were used for semivolatile organics, phenolics, metals, butyltins, PCBs, and excess sample; 2-oz jars were used for TOC. For the bioassays, ½ gallon jars were used for the amphipod and juvenile polychaete samples, while aliquots for echinoderm testing were placed in 8-oz jars.

All utensils used to manipulate the samples (stainless steel scoops and buckets) were pre-cleaned by washing with Liquinox® detergent, followed by sequential rinses with tap water, dilute (10%) nitric acid, deionized water, and pesticide-grade acetone. The equipment was then air-dried and wrapped in aluminum foil. The same procedure was used to pre-clean the grab before going into the field. Between stations cleaning of the grab consisted of thoroughly brushing with on-site water. If oil or visible contamination was encountered the grab was cleaned between samples with a Liquinox® detergent wash followed by a rinse with onsite water.

All samples were wrapped in plastic bags and placed on ice in coolers immediately after collection. All samples were transported to the Ecology Manchester Environmental Laboratory (MEL) within 48 hours of collection. Chain-of-custody was maintained throughout the sampling.

Analysis and Data Quality

MEL, or a certified contract laboratory selected by MEL, conducted all chemical and biological analyses for the project. A summary of the analytical methods and laboratories used for this project are shown in Table 2.

Table 2: Analytical Methods and Laboratories Used for the Budd Inlet Sediment Characterization Study

Analyte	Method	Reference	Laboratory
Conventionals			
Percent Solids	Gravimetric (160.3)	PSEP, 1996	MEL
Total Organic Carbon	Combustion/CO2 Measurement @ 70°C and 104°C (9060)	PSEP, 1996	MEL
Grain Size	Sieve and Pipet	PSEP, 1996	Rosa Environmental
Metals			
Arsenic	GFAA (206.2)	PSEP, 1996	MEL
Cadmium, Copper, Chromium, Nickel, Lead, and Zinc	ICP (200.7)	PSEP, 1996	MEL
Mercury	CVAA (245.5)	PSEP, 1996	MEL
Organics			
Semivolatiles	GC/MS (8270)	PSEP, 1996	MEL
Butyltins	GC/MS-SIM	PSEP, 1996	MEL
PCBs	GC/ECD (8080)	PSEP, 1996	MEL
Chlorinated Phenols	GC/MS-SIM (8270)	EPA, 1995	MEL
Biological			
Amphipod *(Ampelisca abdita)*	10-Day Mortality	PSEP, 1996	Parametrix, Inc.
Larval Echinoderm *(Dendraster excentricus)*	96-hour Effective Mortality	PSEP, 1996	Parametix, Inc.
Juvenile Polychaete *(Neanthes arenaceodentata)*	20-Day Mortality and Growth Rate	PSEP, 1996	Parametrix, Inc.

Quality of the data generated was assessed by analysis of the following samples and quality control checks: field and laboratory duplicates, matrix spikes, internal standards, surrogate spikes, method blanks, and laboratory control samples. Staff at MEL performed a detailed quality assurance review of the data package produced. Quality control limits recommended by PSEP were considered in this evaluation. Copies of the case narratives for these reviews are included in Appendix B, which includes a detailed discussion of data quality.

Overall precision (sampling + laboratory analysis) of the data set was evaluated by calculating the relative percent difference (range in concentrations/mean concentration expressed in percent) between detected values in blind field duplicates (a single sample homogenized and split in the field). These data indicate that overall precision of the data set was good, variability being < 5 % for conventionals, <10% for metals, and <20% in most instances for organics. Tributyltin results were somewhat more variable having a RPD of 38%.

In general, no major analytical problems were encountered in the physical and chemical analysis of samples for the project, with the exceptions noted below. Consequently, the data generated are considered acceptable for use as reported with the qualifiers listed in the data tables.

Benzoic acid results were rejected due to a poor response on the initial and continuing calibration curve. Several organic compounds (phenol, 4-methyl phenol, tri-butyltin, and di-butyltin) were qualified as estimates, because matrix spike recoveries could not be calculated due to high native sample concentrations which masked the spikes. Mono-butyltins were qualified as estimates due to blank contamination. Detection limits were higher than expected for several samples because of a low solids content. This resulted in detection limits for butyl benzyl phthalate, 2-methylphenol, 1,2-dichlorophenol, and 2,4-dimethylphenol being higher then the associated Sediment Quality Standard (SQS) in several instances. Unless otherwise noted, all concentrations in this document are reported on a *dry weight basis*. Copies of the laboratory sample reports are included in Appendix C.

Toxicity of sediments from the Midwest Site were evaluated with the use of two acute (amphipod and larval echinoderm) and one chronic bioassay (juvenile polychaete). Results from the amphipod test met all performance standards.

For the larval echinoderm test, effective mortality of the reference sediment ($N_r \div N_c =$ 50%) exceeded the allowable interim performance standard of ≤35% (Fox and Littleton, 1994). Consequently, use of the reference sediment was rejected. In addition, although acceptable performance was observed in the seawater control, both the test and reference sediment displayed similar mortality. Based on these results and the fact that acceptable performance of the reference sediment was seen in the other two bioassays, the larval echinoderm results were not used in evaluating the toxicity of the test sediments from the Midwest Site.

In the juvenile polychaete test, the mean control growth rate (0.51mg/day) fell below the performance standard of 0.72mg/day. Per interim guidelines adopted in 1995, growth rates in the negative control do not invalidate the test until they fall below 0.38mg/day (Littleton and Kendall, 1996). The growth rates observed in the juvenile polychaete test are not expected to significantly impact performance of the test. A copy of the bioassay testing report is also included in Appendix C.

Results

Contaminant Distribution

Visually, subtidal sediments from the turning basin (Midwest Site) were fairly homogenous, black-to-gray fine silt which had a strong hydrogen sulfide odor. In contrast, sediments from most of the intertidal areas were brown-to-black sandy silty which contained shell and wood fragments. A strong hydrogen sulfide odor was noted in most of the intertidal samples.

The results of physical and chemical analyses of sediments from Budd Inlet are summarized in Appendix D, Table D1. Percent solids ranged from 23% at MW-5 located in the turning basin, to 61% at IM-1 near the outlet of Indian/Moxlie Creek in East Bay. Total organic carbon (TOC) concentrations were somewhat variable, ranging from 1.8% to 7.6%. The mean TOC content was 4.2%. The highest TOC concentration was measured near the north end drain (Hard-1) at the former Hardel plywood site. Relatively high TOC values were also present inside the West Bay Marina (6.2 and 6.3%).

Grain size distributions are displayed in Figure 3. These data indicated that the majority of samples collected were >80% fines (i.e., silt and clay size particles). Exceptions were seen at stations Hard-1, Fido-1, and IM-1, which were primarily sandy.

Metal analyses included all eight metals listed in Ecology's SMS (Ecology, 1995a). Metal concentrations at all stations in Budd Inlet were quite low and similar to concentrations measured at the reference site.

As was the case for metals, concentrations of most organic compounds were low in sediments from the areas sampled in Budd Inlet. The distribution of low molecular weight polynuclear aromatic hydrocarbons (LPAH) and high molecular weight PAH (HPAH) is displayed in Figure 4. These data are shown on an organic carbon normalized basis to reduce the variability associated with differences in TOC content of the samples. Only two sites had appreciable concentrations of HPAH. These stations were located near the Fiddlehead Outfall (HPAH= 410mg/kg, OC) and in East Bay at the outlet of Indian/Moxlie Creek (HPAH= 670 mg/kg, OC). At all sites, the sum of HPAH exceeded the sum of LPAH. This enrichment of HPAH relative to LPAH is commonly observed in environmental samples since weathering processes – such as evaporation, photochemical oxidation, dissolution, and microbial degradation – can preferentially remove PAHs with molecular weights less than that of fluoranthene (Merrill and Wade, 1985). The distribution of PAHs observed indicates that the sediments sampled have undergone some weathering, which implies that historical PAH sources are primarily responsible for the PAH contamination observed.

Other than PAHs, concentrations of all target semivolatile organics were generally below 1 mg/kg. A summary of semivolatile compounds (other than PAHs) exceeding 1 mg/kg are shown in Table 3.

Table 3. Summary of Semivolatile Organics, Other than PAHs, Exceeding 1 mg/kg in Budd Inlet Sediments (mg/kg, dry weight)

Chemical	Median	Maximum	Location of Maximum
Coprostanol (n= 15)	100	3100	Fido-1
Di-n-butyl phthalate (n= 15)	210u	3200	MW-6
Bis(2EH) phthalate (n= 8)	470j	6700	Fido-1

u= Not detected at detection limit shown
j= Estimated concentration

Peak concentrations of two of the three compounds (coprostanol and bis(2-ethyl hexyl)phthalate) were present near the Fiddlehead Outfall. Coprostanol is produced in the intestine of mammals by the microbial reduction of cholesterol which is the main sterol in the tissue of vertebrates (Verschueren, 1983). Historically, the Fiddlehead Outfall was used as a sewage bypass for the LOTT treatment plant during high flow events. In 1997, construction was completed to practically eliminate sewage bypass events. Stormwater is still discharged through the outfall.

Based on the potential for sources, butyltin levels were only measured at two locations (West Bay Marina and near the Fiddlehead Outfall) in Budd Inlet. The results of butyltin analysis are shown below in Table 4.

Table 4. Results of Butyltin Analysis of Sediments from Lower Budd Inlet (ug/kg, dry)

Analyte	Fiddlehead Outfall Fido-1	West Bay Marina near haulout WB-1	West Bay Marina South end WB-2	Reference Totten Inlet Ref-1
Monobutyltin Chloride	220j	510j	850j	55j
Dibutyltin Chloride	96j	490j	920j	3.9j
Tributyltin Chloride	280j	1500j	1200j	5.1j
Tetrabutyltin Chloride	R	12j	8j	R

j= Estimated concentration
R= No analytical results (see quality assurance section)

The highest butyltin levels were present inside the West Bay Marina. Mean concentrations of mono-, di-, and tri-butyltin chloride inside the marina were as follows: monobutyltin chloride= 680 ug/kg, dibutyltin chloride= 710 ug/kg, and tributyltin chloride= 1.400 ug/kg. Compared to concentrations at the reference station, tributyltin levels inside the West Bay Marina were elevated by over two orders of magnitude. Mono- and di-butyltin are released into the environment through multiple sources. Most of the time, their occurrence is related to degradation pathways of TBT. However, there is increasing evidence that MBT and DBT may be released directly into the environment via discharge pipes and sewage treatment discharges (Quevauviller et al., 1991). It is thought that the butyltins leach to the water in pipes (such as PVC) and are later

discharged to the environment. In addition MBT and DBT are used as a catalyst in the manufacture of polyurethane foams (EPA, 1996).

Bioassay Results

Toxicity testing results for Midwest Site sediments using the amphipod (*Ampelisca abdita*) and juvenile polychaete (*Neanthes arenaceodentata*) are summarized in Table 5. As previously mentioned, larval echinoderm data were not used in evaluating sediment toxicity at the site, because effective mortality of the reference sediment ($N_r \div N_c = 50\%$) exceeded allowable performance standards (≤35%) for this test (see Quality Assurance section).

Table 5. Summary of Bioassay Results for Amphipod and Juvenile Polychaete Testing of Budd Inlet Sediments

Station Sample No. 24-	MW-1 8080	MW-2 8081	MW-3 8082	MW-4 8083	MW-5 8085	MW-6 8086	Reference 8087	Negative Control
Ampelisca abdita								
Mortality Untransformed (%)	27	29	15	22	20	25	18	8
Mortality Arc Sine SQRT Transformed (%)	0.54	0.57	0.39	0.47	0.46	0.52	0.42	0.25
p-Value Compared to Reference	0.0924	0.0558	0.3435	0.3151	0.3389	0.1401	N/A	0.0562
Neanthes arenaceodentata								
Mortability (%)	0	0	0	0	0	0	4	0
Mean Growth Rate (mg ind/day)	0.53	0.68	0.72	0.67	0.49	0.49	0.47	0.51
p-Value Compared to Reference	0.211	0.031*	0.074	0.016*	0.417	0.402	N/A	0.308

N/A= All reference and test sediments normalized to control response
p-value= $p < 0.05$ using 1-tail test
*= Higher growth rate observed in test than reference

No acute (amphipod) or chronic (juvenile polychaete) toxicity was observed in sediments from the Midwest Site. Based on the bioassay results, sediments from the site should not have adverse impacts on biological communities.

Discussion

Comparison with Sediment Standards and Other Data on Budd Inlet

In 1991, Ecology adopted the Sediment Management Standards (SMS), WAC 173-204 (Ecology, 1995a). The standards include chemical concentrations criteria, biological effects criteria, and human health criteria which are used to identify sediments that have no adverse affect on biological resources and pose no significant risks to human health. The Sediment Quality standards (SQS) represent the level below which no adverse effects would be observed in benthic communities. The standards also establish Cleanup Screening Levels (CSL) which represent the upper limit of allowable minor adverse effects on biological resources. Contaminant concentrations above the CSL are a high priority for remediation activities. Chemical concentrations in Budd Inlet sediments are compared to the SMS in Table 6.

Midwest Site Cluster Analysis

To determine if a station cluster of potential concern exists at a site, a minimum of three sediment stations are selected that 1) are spatially and chemically similar, and 2) have the highest concentration of each chemical or the highest degree of biological effects. The average concentration for the contaminant or biological effect at the three stations is then determined. If the average contaminant concentration or biological effect for any three stations identified exceeds the applicable CSL, then the station cluster is defined as a station cluster of potential concern (Ecology, 1995a). Sediment clusters of potential concern are scored by Ecology's Sediment Management Unit (SMU) to determine if they should be included on the CSSL.

In the present study, no chemicals were detected above the SMS in bottom sediments from the Midwest Site. The original basis for listing the Midwest Site on the CSSL was toxicity in the larval echinoderm test (McMillan, 1992). Unfortunately, we were not able to make direct comparisons with this earlier work using larval echinoderm test results from the present study (see Quality Assurance section). However, based on the results from the other two bioassays performed in the study (amphipod and juvenile polychaete), it seems unlikely that these sediments pose a significant hazard to biological communities.

Using procedures outlined in the SMS, data from the present study indicate that sediments from the Midwest Site would be classified as a "sediment station cluster of low concern". This classification indicates that the Midwest Site should be re-scored and considered for removal from the CSSL.

Table 6: Comparison of Analytical Results to Ecology Sediment Management Standards (WAC 173-204).

Location	Midwest Site						Mean of	Reference	SMS	
Station	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	Three	Station		
Sample No. 24-	8080	8081	8082	8083	8085	8086	Highest	8087	SQS	CSL
Conventionals (%)										
TOC @ 70°C	3.4	4.4	3.5	3.5	3.8	3.6	3.9	2.5	-	-
									-	-
Metals (mg/kg,dry)										
Arsenic	8.3	9.4	8.6	9.3	7.5	8.6	9.1	8.2	57	93
Cadmium	0.75	1.4	1.8	1.6	1.6	1.2	1.7	0.65	5.1	6.7
Chromium	36	37	35	37	32	35	37	42	260	270
Copper	70	71	70	72	63	72	72	40	390	390
Lead	15	19	18	20	17	17	19	14	450	530
Mercury	0.18	0.17	0.16	0.18	0.16	0.17	0.18	0.11	0.41	0.59
Zinc	80	92	86	90	81	87	90	77	410	960
Organics (mg/kg, organic carbon)										
Acenaphthene	0.24 j	0.44 j	0.29 j	2.9 u	3.2 u	0.31 j	0.35 j	3.7 u	16	57
Acenaphthylene	3.2 u	0.5 j	0.4 j	0.5 j	3.2 u	0.42 j	0.47 j	0.3 j	66	66
Naphthalene	0.74 j	1.9 j	1.3 j	1.2 j	0.63 j	1.0 j	1.5 j	0.92 j	99	170
Fluorene	0.44 j	0.54 j	0.6 j	0.48 j	0.29 j	0.53 j	0.56 j	0.15 j	23	79
Anthracene	1.0 j	1.0 j	1.5 j	1.7 j	0.97 j	1.6 j	1.6 j	0.44 j	220	1200
Phenanthrene	1.6 j	2.5	2.5 j	2.8 j	1.7 j	2.8 j	2.7 j	1.5 j	100	480
Sum LPAH	4.1 j	7.0 j	6.6 j	6.7 j	3.7 j	6.7 j	6.8 j	3.3 j	370	780
Fluoranthene	5.0	5.9	5.7	8.7	4.5	6.1	6.9	3.2 j	160	1200
Benzo(a)anthracene	2.1 j	2.1 j	2.9 u	4.1 j	2.1 j	3.3 u	2.6 j	3.7 u	110	270
Chrysene	2.5 j	2.3	3.1	2.3	2.5 j	4.7	3.4 j	1.7 j	110	460
Pyrene	5.3	6.6	8.0	10	5.5	8.6	8.9	2.8 j	1000	1400
Benzofluoranthenes	5.3 j	5.0 j	7.7 j	8.7 j	5.3 j	8.3 j	8.2 j	4.0 j	230	450
Benzo(a)pyrene	2.1 j	1.6 j	2.3 j	3 j	1.8 j	3.3	2.9 j	1.0 j	99	210
Dibenzo(a,h)anthracene	5.9 j	4.3 j	6 u	5.7 j	5.8 j	6.1 j	5.9	7.2 u	12	33
Indeno(1,2,3-cd)pyrene	6.2 j	5.0 j	6.6 j	6.9 j	6.3 j	6.9 j	6.8 j	7.2 j	34	88
Benzo(g,h,i)perylene	2.9 j	2.7	3.1	3.8	2.9 j	3.6	3.5	3.4 j	31	78
Sum HPAH	38 j	36 j	37 j	53 j	37 j	47 j	45 j	24 j	960	5300
2-Methylnaphthalene	0.35 j	0.5 j	0.54 j	0.5 j	0.32 j	0.44 j	0.51 j	0.36 j	38	64
Dibenzofuran	0.38 j	0.54 j	0.49 j	0.48 j	0.26 j	0.5 j	0.51 j	0.29 j	15	58
Di-n-butyl phthalate	41	2.3 uj	2.9 uj	31 j	42	89	57	8.4 u	220	1700
Butylbenzyl phthalate	2.9 u	12 u	15 u	0.77 j	16 u	1.1 J	-	18 u	4.9	64
Organics (ug/kg, dry)										
2-Methylphenol	110 u	100 u	100 u	2.7 j	120 u	120 u	-	92 u	63	63
4-Methylphenol	64 j	160	63 j	53 j	76 j	210	150 j	92 u	670	670
Polychlorinated Biphenyls (mg/kg, organic carbon)										
Total PCBs	0.44	0.59	2.9 u	0.67	0.5	3.1 u	0.59	3.5 u	12	65

j=Estimated concentration
uj=Estimated detection limit
u=Not detected at detection limit shown
SMS- SQS= Sediment Quality Standard; CSL= Cleanup Screening Level
Underlined values= Detection limit exceeded associated SQS

Table 6 (cont): Comparison of Analytical Results to Ecology Sediment Management Standards and Other Applicable Screening Levels.

Location	Hardel Plywood		Fiddlehead	Port Dock	West Bay Marina		Indian Moxlie	Reference		
Station	Hard1	Hard2	Fido1	PD-1	WB-1	WB-2	IM-1	Station	SMS	
Sample No. 24-	8088	8090	8091	8092	8093	8095	8096	8087	SQS	CSL
Conventionals (%)										
TOC @ 70°C	7.6	5.5	4.1	4.3	6.2	6.3	1.8	2.5	-	-
Metals (mg/kg,dry)										
Arsenic	9.2	8.8	5.2	7.8	10	10	5	8.2	57	93
Cadmium	0.86	2.2	1.5	1.7	2.5	2.1	0.5 u	0.65	5.1	6.7
Chromium	34	33	31	34	34	32	30	42	260	270
Copper	81	62	89	75	170	130	25	40	390	390
Lead	63	33	72	17	24	26	37	14	450	530
Mercury	0.19	0.26	0.24	0.2	0.25	0.27	0.067	0.11	0.41	0.59
Zinc	120	130	260	100	130	110	88	77	410	960
Organics (mg/kg, organic carbon)										
Acenaphthene	0.55 j	1.1	1.1 j	2.1 j	0.5 j	0.62 j	4.2	3.7 u	16	57
Acenaphthylene	0.34 j	0.51 j	2.7	0.72 j	0.77 j	0.79 j	2.2 j	0.3 j	66	66
Naphthalene	2.5	2.5	1.0 j	1.2 j	1.0	1.7	2.2 j	0.92 j	99	170
Fluorene	0.7	1.2	2.1	2.6 j	0.77 j	0.74 j	6.1	0.15 j	23	79
Anthracene	0.86	2.5	9.5	4.9	2.4	2.2	16	0.44 j	220	1200
Phenanthrene	3.8	7.3	13	9.3	3.9	3.8	**110**	1.5 j	100	480
Sum LPAH	8.8 j	15 j	29 j	21 j	9.4 j	10 j	140 j	3.3 j	370	780
Fluoranthene	5.3	14	130	22	13	12	**190**	3.2 j	160	1200
Benzo(a)anthracene	0.58 u	5.8	27	12	5.3	4.6	44	3.7 u	110	270
Chrysene	2.0	6.9	54	13	9.5	8.9	67	1.7 j	110	460
Pyrene	5.1	15	100	28	16	19	140	2.8 j	1000	1400
Benzofluoranthenes	2.8	12	51	20	13	13	89	4.0 j	230	450
Benzo(a)pyrene	1.2	6.2	15	7.4	4.5	4.4	43	1.0 j	99	210
Dibenzo(a,h)anthracene	1.2	2.4	3.4 u	6	2.1	2.2	**12**	7.2 u	12	33
Indeno(1,2,3-cd)pyrene	1.7 j	4.9	11	8.1	3.9 j	3.8 j	32	7.2 j	34	88
Benzo(g,h,i)perylene	1.2	3.8	8.8	4.4	2.7	2.9	26	3.4 j	31	78
Sum HPAH	21 j	71	410	120	71 j	71 j	670	24 j	960	5300
2-Methylnaphthalene	0.95	0.98	0.9 j	0.74 j	0.5 j	0.59 j	1.4 j	0.36 j	38	64
Dibenzofuran	0.99	0.75 j	1.0 j	2.0 j	0.69 j	0.83	3.3	0.29 j	15	58
1,2-Dichlorobenzene	0.33 j	0.78 u	1.7 u	3.0 u	0.82 u	0.81 u	2.9 u	3.7 u	2.3	2.3
1,4-Dichlorobenzene	0.58 u	0.78 u	1.2 j	3.0 u	0.82 u	0.81 u	2.9 u	3.7 u	3.1	9.0
Dimethyl phthalate	0.58 u	0.78 u	5.6	3 u	0.87	2.5	1.0 j	3.7 u	53	53
Di-n-butyl phthalate	13	2.4 uj	16 uj	70	1.9 uj	3.3 uj	3.3 uj	8.4 u	220	1700
Di-n-octyl phthalate	1.2	1.4 j	6.1	6.0 u	1.6 u	1.6 u	9.4	7.2 u	58	4500
Butylbenzyl phthalate	0.74 j	1.4 j	**8.5 j**	3.0 u	4.2 u	12 u	**14**	18 u	4.9	64
Bis(2EH)phthalate	6.4	25	**160 j**	10 uj	5.5 uj	5.7 uj	**83**	4.0 uj	47	78
Organics (ug/kg, dry)										
Phenol	60 uj	41 uj	39 uj	52 uj	150 uj	120 uj	27 uj	13 uj	420	1200
2-Methylphenol	14	4.5	1.8 j	7.8 u	51 u	51 u	2.0 j	4.9 uj	63	63
4-Methylphenol	250	120 j	110	65	120	140	22	11 uj	670	670
2,4-Dimethylphenol	8.2	4.8	4.2	7.8 u	51 u	51 u	2.4 u	4.0	29	29
Pentachlorophenol	87 j	86 j	95 j	110 j	130 j	260 uj	57 j	69 j	360	690
Polychlorinated Biphenyls (mg/kg, organic carbon)										
Total PCBs			3.8	4.2 u	-	-	3.4 u	5.3 u	12	65
Tributyltin (ugTBT/kg)										
Tributyltin	-	-	**250 j**	-	**1300 j**	**1100 j**	-	4.5 j	73*	-

-= Not analyzed

j=Estimated concentration

uj=Estimated detection limit

u=Not detected at detection limit shown

Bold values exceeded SMS= SQS- Sediment Quality Standards; CSL- Cleanup Screening Level

Underlined values= Detection limits exceeded associated SQS

*= Recommended PSDDA and SMS Screening Level that triggers biological testing (reported as TBT ion)

Site Screening

As was the case for the Midwest Site, few chemicals were present above the SMS at sites which were subjected to chemical screening. A summary of chemicals exceeding the SMS is presented in Table 7.

Table 7. Summary of Compounds Exceeding Sediment Management Standards at Budd Inlet Screening Sites

Station	Chemical	Concentration	Criteria Exceeded	Exceedence Factor
Fido-1	Butylbenzyl Phthalate	8.5 mg/kg, OC	SQS (4.9 mg/kg, OC)	1.7
	Bis(2EH) Phthalate	160 mg/kg, OC	CSL (78 mg/kg, OC)	2.1
IM-1	Phenanthrene	110 mg/kg, OC	SQS (100 mg/kg, OC)	1.1
	Fluoranthene	190 mg/kg, OC	SQS (160 mg/kg, OC)	1.2
	Butylbenzyl Phthalate	14 mg/kg, OC	SQS (4.9 mg/kg, OC)	2.6
	Bis(2EH) Phthalate	83 mg/kg, OC	CSL (78 mg/kg, OC)	1.1

SQS= Sediment Quality Standard- Marine Criteria
CSL= Cleanup Screening Level

Phthalate results from the present study at Fido-1 (near the Fiddlehead Outfall), while slightly lower for bis(2-ethyl hexyl)phthalate, are consistent with data collected in 1996 by the LOTT partnership at this location. Butylbenzyl phthalate and bis(2EH)phthalate concentrations during the LOTT sampling were 3.3 and 330 mg/kg OC, respectively. Four compounds (two PAHs and two phthalates) were also above the SMS in East Bay sediments near the mouth of Indian/Moxlie Creek. Of the four compounds, bis(2-ethyl hexyl) phthalate was the only compound which exceeded the CSL.

To put the results from the present investigation into perspective, selected data from other sediment investigations in Budd Inlet are summarized in Table 8.

Table 8. Concentrations of Selected Chemicals in Lower Budd Inlet Bottom Sediments from Three Surveys (Metals= mg/kg; Organics= ug/kg)

Chemical	Present Study N=15	OlyHarFC N= 25-27	LOTT 96 N= 20
TOC (%)	4.3 (1.8-7.6)	1.4 (0.09-3.8)	3.1 (0.98-9.3)
Copper	77 (25-170)	25 (0.05u-100)	69 (19-130)
Mercury	0.19 (0.067-0.27)	0.11 (0.016u-0.37)	0.16 (0.08-0.3)
Zinc	110 (77-260)	59 (35-130)	97 (50-210)
4-Methylphenol	110 (11u-250)	45 (1.0-560)	810u (19u-16000)
Bis(2EH) Phthalate	860 (100uj-6700j)	87 (13-490)	1700 (30-31000)
Butyl Benzyl Phthalate	310 (27j-750u)	21 (0.3-200)	35j (19u-290)
Benzoic Acid	610 (320-940)	3.7 (0.1u-31)	200u (190u-310)

Values shown are mean (range) of all values
u= Not detected at detection limit shown
j= Estimated concentration

References - Listed in SEDQUAL

OlyHarFC (NOAA, 1988)=Olympia Harbor Planning- Full Characterization Study

LOTT 96 (LOTT, 1996)=NPDES Sediment Monitoring Report

All three surveys appear to confirm the fact that concentrations of the contaminants shown are relatively low in sediments from the lower Budd Inlet study area. Most of the problems detected appear to be associated with specific sources.

The toxicity and bioaccumulation of tributyltin (TBT) is a complex process that is affected by a number of factors, including organic carbon levels in sediment and water, pH, salinity, clay content, and the presence of inorganic constituents such as iron oxides (EPA, 1996). Due to its complex behavior in the aquatic environment, no sediment quality criteria have been adopted for TBT in marine sediments. In 1988, the PSDDA agencies developed an interim screening level (SL) for use in the PSDDA program, based on best available knowledge of the chemical and its properties (Michelsen et al, 1996). The interim screen level was set at 30 ug/kg (as Sn). This corresponds to a concentration of 73 ug/kg (reported as TBT-ion). Exceedence of the interim SL requires biological testing to be performed. All sites sampled in Budd Inlet exceeded the interim SL, with concentrations ranging from 250 to 1,300 ugTBT/kg with a mean of 880 ugTBT/kg. At the reference site TBT levels were 4.5 ug/kg. The data collected indicates that sediments near the Fiddlehead Outfall and the West Bay Marina should undergo biological toxicity testing. For perspective, TBT concentrations at 13 Lower Budd Inlet locations sampled by the Thurston County Health Department in 1991, ranged from 6 to 170 ugTBT/kg with a mean of 44 ugTBT/kg (TCHD, 1991).

In 1996, an interagency work group was formed to review the available information on TBT, with the goal of developing a site-specific cleanup level for Hylebos Waterway in Tacoma and Harbor Island in Elliott Bay in support of sediment cleanup activities. The cleanup level determined for Hylebos Waterway is based on a interstitial water concentration of 0.7ug TBT/L, which is believed to be protective of many organisms from most acute effects from TBT (EPA, 1996). Applying EPA's equilibrium partitioning approach to this interstitial water level yields a bulk sediment cleanup concentration of 17500 ugTBT(ion)/kg, OC.

Converted to comparable units (ugTBT/kg, OC) TBT levels measured in Budd Inlet sediments ranged from 180 to 21,000 ugTBT/kg, OC. Sediment from the West Bay Marina at station WB-1 (21 mgTBT/kg, OC) was the only location exceeding the Hylebos Waterway specific cleanup level. The Hylebos Waterway criteria is only being provided here for informational purposes. Sediments outside Hylebos Waterway should be evaluated using the PSDDA/SMS interim screening level of 73 ugTBT/kg. The use of interstitial water concentrations for evaluating TBT contamination is under consideration for adoption in both the PSDDA and SMS programs. However, this change has not been implemented in either program.

Conclusions

Cconcentrations of both metals and organics were low in samples analyzed from lower Budd Inlet. Most of the chemical contamination problems seem to be associated with specific discharges. Four chemicals were present above the SMS. Of the six individual violations of the SMS only two were above Cleanup Screening Levels. These were: bis(2-ethyl hexyl)phthalate 1) near the Fiddlehead Outfall, and 2) in East Bay near the mouth of Indian/Moxlie Creek. Tributyltin concentrations inside the West Bay Marina and near the Fiddlehead exceeded the PSDDA/SMS interim screening level of 73ugTBT/kg which requires biological testing to be performed.

For the Midwest Site, no chemicals were measured above the SMS. Toxicity evaluation using the amphipod and juvenile polychaete bioassays indicated that sediments from the Midwest Site should not have adverse effects on benthic communities. Based on a preponderance of evidence, it is recommended that the Midwest Site be re-scored by the Sediment Management Unit and be considered for removal from the Contaminated Sediment Site List.

Recommendations

Based on the results of this study the following recommendations are made:

- Biological and chemical testing of sediments from the Midwest Site indicates that this site should be re-scored by Ecology's Sediment Management Unit and be considered for de-listing from the Contaminated Sediments Site List.

- Chemicals exceeding the Sediment Management Standards in Budd Inlet are summarized in Table 9. Given the lack of widespread contamination in the study area, no immediate action is recommended. However, any activities with the potential to disturb sediments in these areas should include prior sediment monitoring for the chemicals listed. The purpose of this monitoring would be to evaluate the need for 1) transporting contaminated sediments to adjacent areas, and 2) determining appropriate disposal options for the material if dredging is being considered.

Table 9. Summary of Chemicals Exceeding the SMS in Budd Inlet Sediments

Location	Station No.	Chemical	Standard Exceeded/ Factor
Fiddlehead Outfall	Fido-1	Butylbenzyl Phthalate	SQS/ 1.7
		Bis(2EH) Phthalate	CSL / 2.1
Indian/Moxlie Cr. @ Mouth	IM-1	Phenanthrene	SQS / 1.1
		Fluoranthene	SQS / 1.2
		Butylbenzyl Phthalate	SQS / 2.6
		Bis(2EH) Phthalate	CSL / 1.1

SQS= Sediment Quality Standard- Marine Criteria
CSL= Cleanup Screening Level

- Tributyltin concentrations in bulk sediment from both stations inside the West Bay Marina exceeded the PSDDA/SMS interim screening level of 73 ugTBT/kg. Biological testing is required when the interim screening level is exceeded. Determination of interstitial water TBT levels may be more appropriate and is under consideration by the PSDDA/SMS programs as an alternative to biological testing. However, this alternative has not been implemented.

References

Ecology, 1995a. Sediment Management Standards. Washington Administrative Code (WAC) Chapter 173-204, Washington State Department of Ecology, Olympia, WA.

Ecology, 1995b (draft). Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards (Chapter 173-204 WAC). Washington State Department of Ecology, Olympia, WA.

Ecology, 1996. Sediment Management Standards Contaminated Sediment Site List. Prepared by the Sediment Management Unit, Olympia, WA.

EPA, 1990. Specifications and Guidance for Obtaining Contaminant-Free Sample Containers. OSWER Directive #93240.0-05, U.S. Environmental Protection Agency.

EPA, 1995. Test Methods for Evaluating Solid Waste. SW-846. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

EPA, 1996. Recommendations for Screening Values for Tributyltin in Sediments at Superfund Sites in Puget Sound, Washington. DCN 4000-09-013-AADS, 13-01-AADK, and 33-01-AAAV. Prepared for U.S. Environmental Protection Agency Region 10 Superfund Program by Roy F. Weston, Seattle, WA.

Fox, D. and T. Littleton, 1994. Revised Clarification Paper: Interim Performance Standards for the Sediment Larval Bioassay. Prepared by the ACOE for the PSDDA Agencies.

Littleton, T. and D. Kendall, 1996. Final Clarification Paper - Interim Growth Rate and Mortality Guidelines for the Neanthes 20-Day Growth Bioassay. Prepared by the Army Corps of Engineers for the PSDDA Agencies.

LOTT, 1996. LOTT NPDES Sediment Monitoring Report. Prepared by Beak Consultants, Inc., for the Lacey, Olympia, Tumwater, Thurston County Sewer Partners.

McMillan, R., 1992. Documentation of Budd Inlet Clustering and Cluster Screening. Memorandum to Brett Betts, Washington State Department of Ecology, Sediment Management Unit, SWRO.

Merrill, E.G. and T.L. Wade, 1985. *Carbonized Coal Products as a Source of Aromatic Hydrocarbons to Sediments from a Highly Industrialized Estuary*. Environmental Science and Technology, Vol. 19:597-603.

Michelsen, T., T. Shaw, and S. Stirling, 1996. Testing, Reporting, and Evaluation of Tributyltin Data in PSDDA and SMS Programs. PSDDA Issue Paper and SMS Technical Information Memorandum.

NOAA, 1988. Summary Report for the Olympia Harbor Navigation Improvement Project, 1988. Prepared by NOAA/NMFS Northwest Fisheries Center, Seattle, WA.

PSEP, 1996. Puget Sound Estuary Program (PSEP): Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA.

TCHD, 1991. Olympia/West Bay Marina Sampling. Prepared by the Thurston County Health Department, Olympia, WA, as part of the Budd/Deschutes Watershed Evaluation.

Quevauviller, P., A. Bruchet, and O.F.X. Donard, 1991. *Leaching of Organotin Compounds from Polyvinyl Chloride (PVC) Material*. Applied Organometallic Chemistry 5:125-129.

Verschueren, K., 1983. Handbook of Environmental Data on Organic Chemicals. 2nd Ed. Van Nostrand Reinhold Co., New York, NY.

Figures

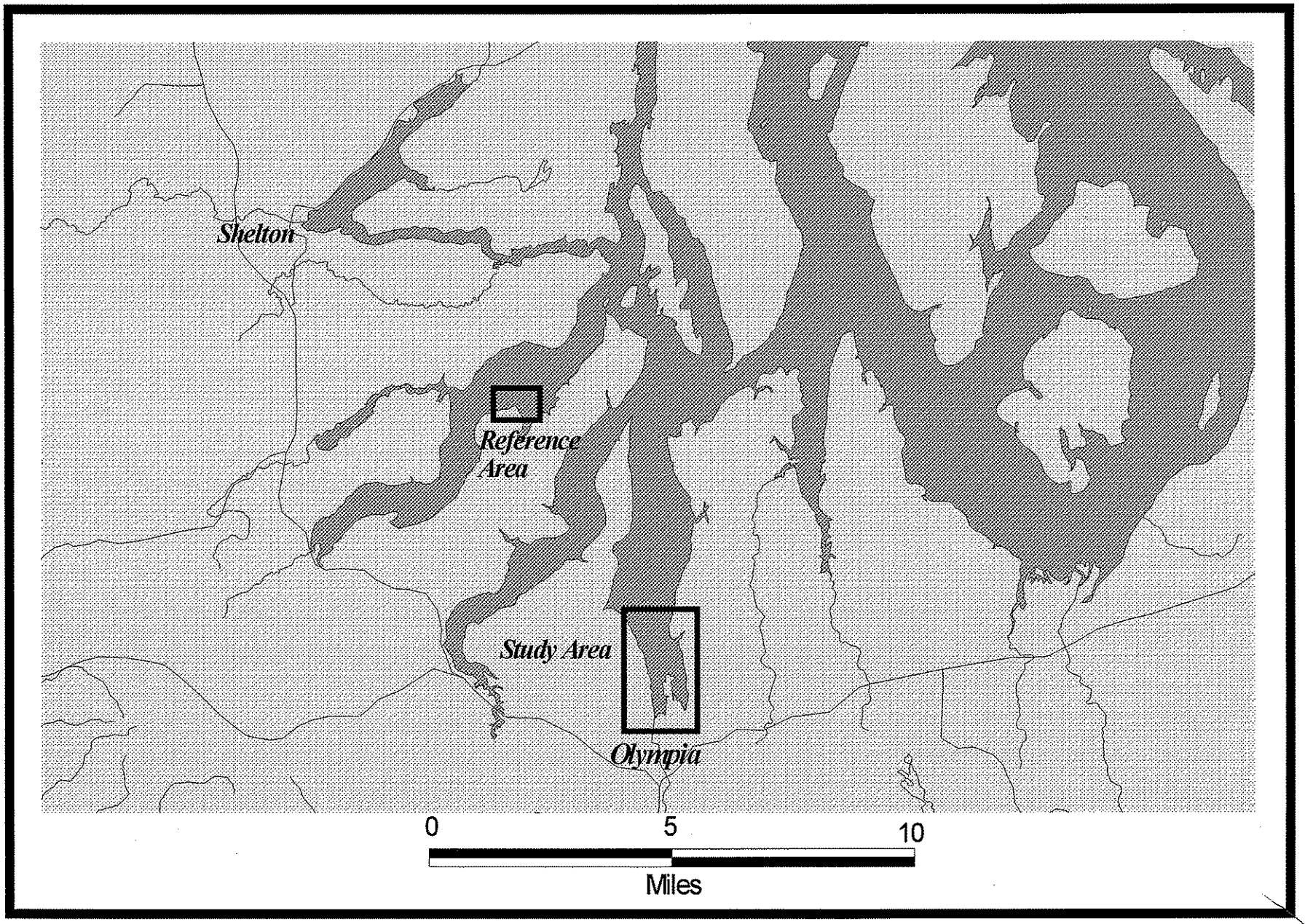

Figure 1: Budd Inlet Sediment Characterization Project, Study Area.

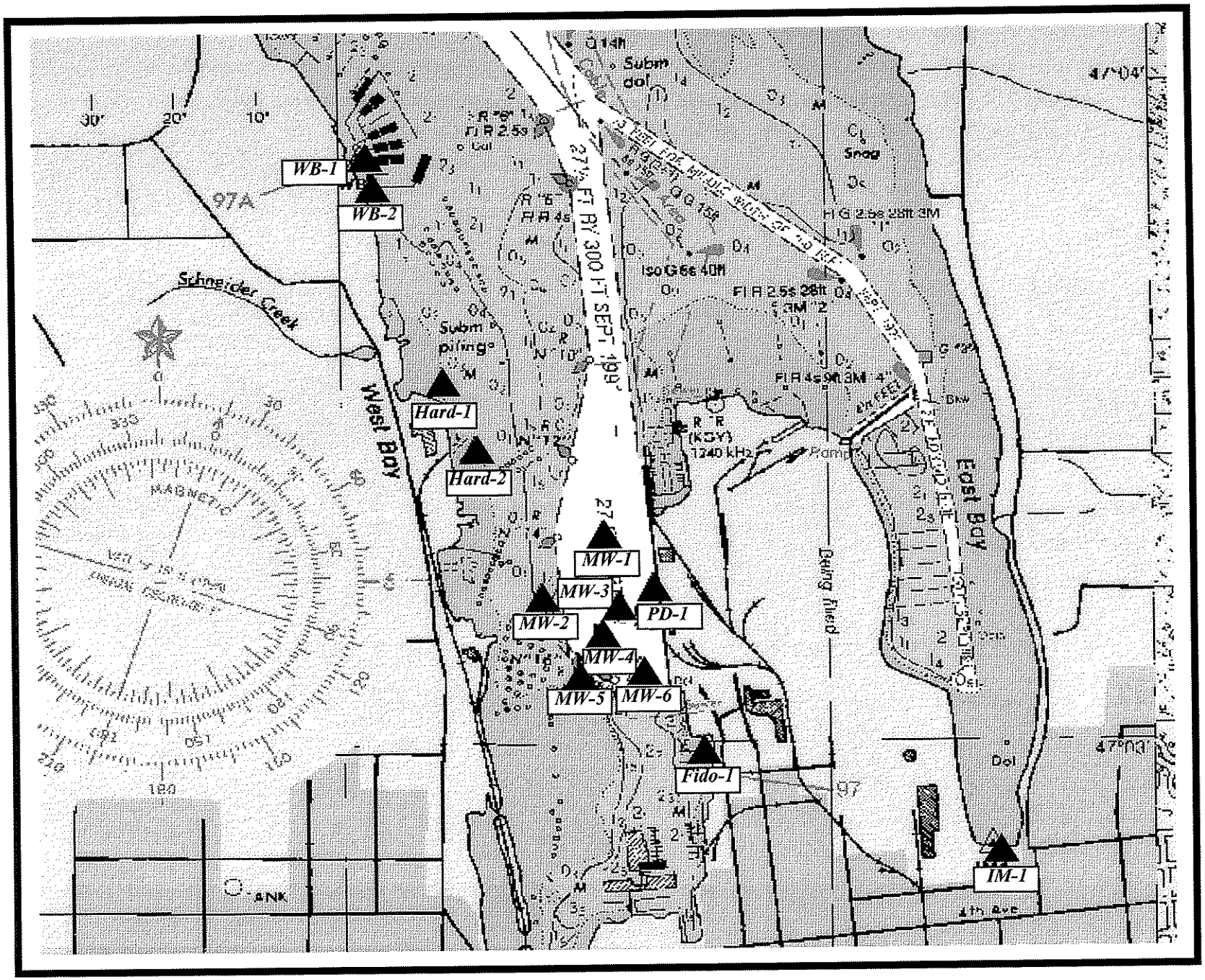

Figure 2: Budd Inlet Station Locations

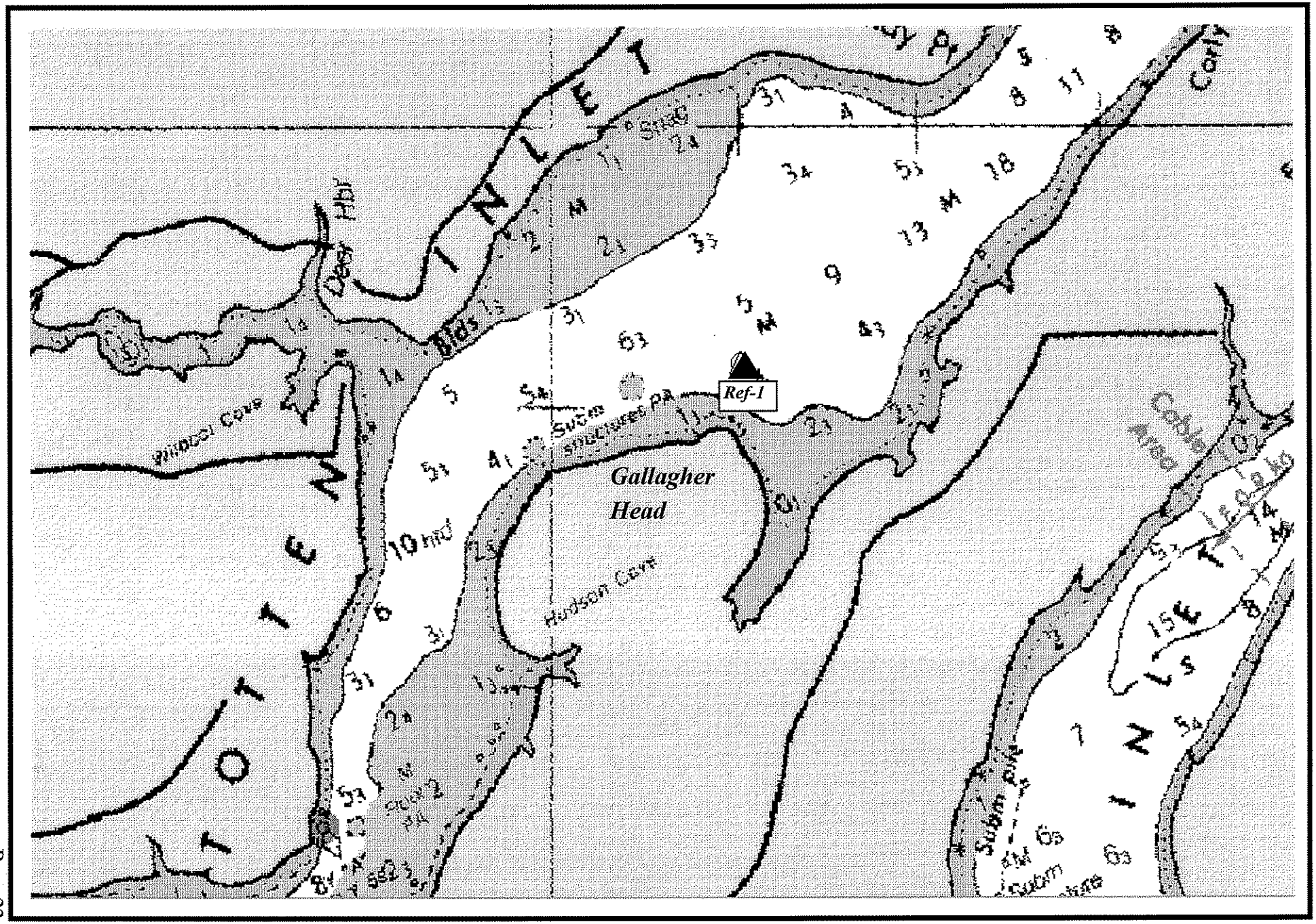

Figure 2 (cont.): Reference Station Location in Totten Inlet

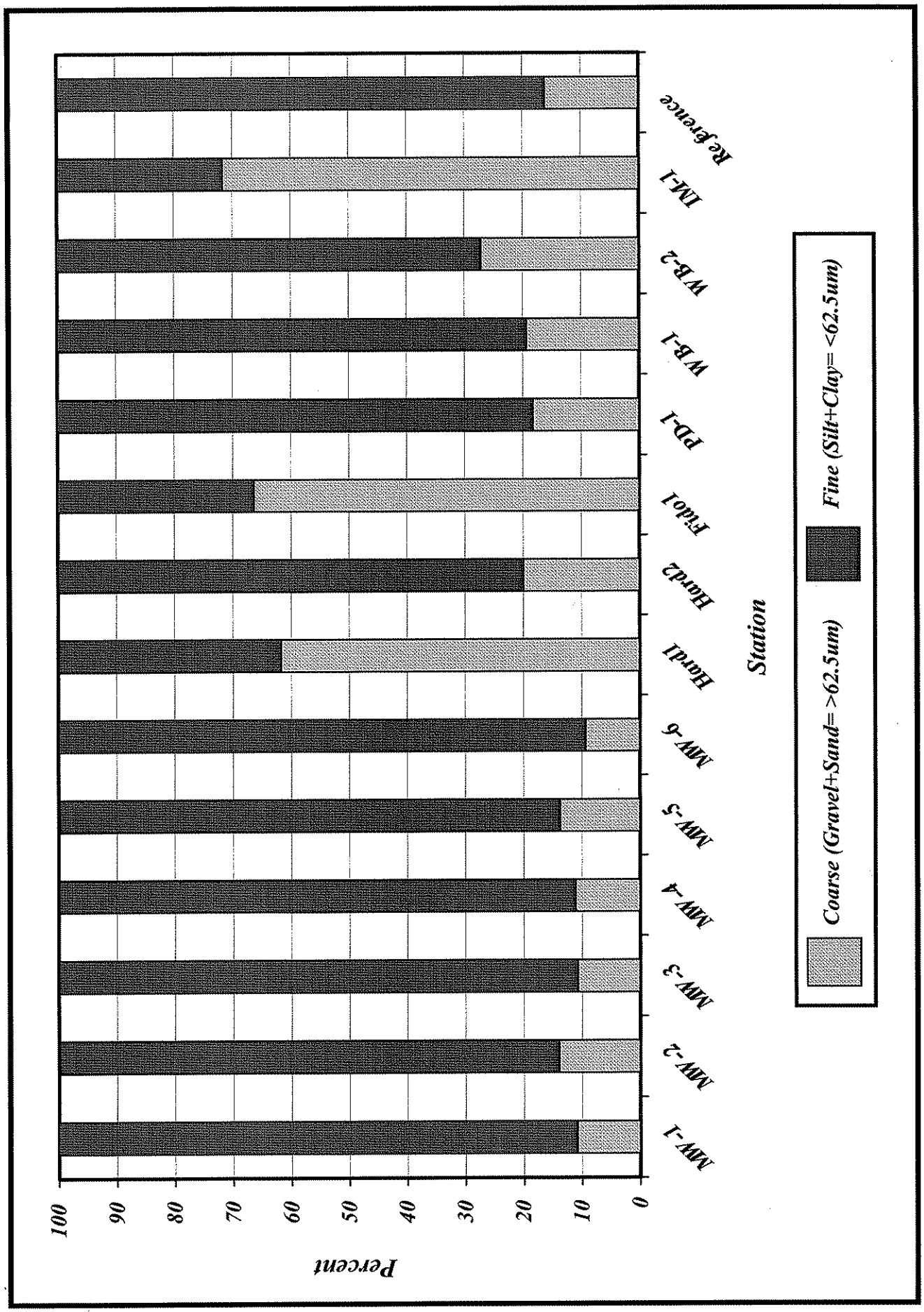

Figure 3: Grain Size Distribution of Budd Inlet Sediments

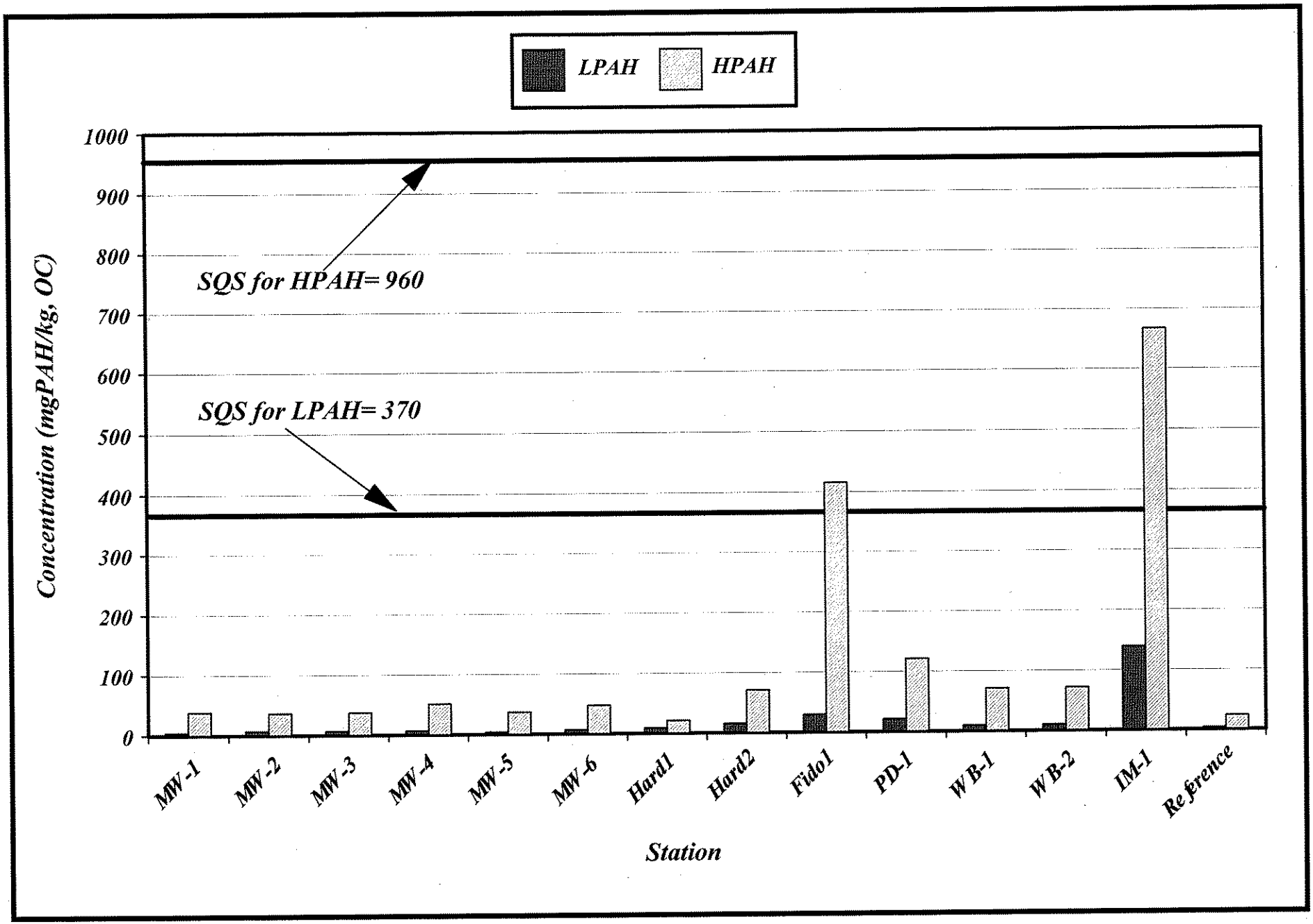

Figure 4: PAH Distribution in Budd Inlet Sediments.

Appendix A

Sampling Site Descriptions

Table A1: Station Location Information for Budd Inlet Sediment Study.

I. Midwest Site

Station	Latitude Degrees	Latitude Minutes	Longitude Degrees	Longitude Minutes	Depth @ MLLW (ft)	Description
MW-1	47	3.321	122	54.460	35	North End of Turning Basin
MW-2	47	3.224	122	54.589	12	Outside Turning Basin West Side
MW-3	47	3.221	122	54.428	36	Center of Turning Basin
MW-4	47	3.167	122	54.467	30	Southwest Area of Turning Basin
MW-5	47	3.011	122	54.506	29	Near Red Nun #16
MW-6	47	3.111	122	54.387	32	South End of Turning Basin
Reference	47	3.154	122	58.985	32	Totten Inlet NW of Gallagher Head

II. Site Screening

Name	Station	Latitude Degrees	Latitude Minutes	Longitude Degrees	Longitude Minutes	Depth @ MLLW (ft)	Description
Hardel Plywood	Hard-1	47	3.550	122	54.790	Intertidal	North End of Site
Hardel Plywood	Hard-2	47	3.448	122	54.727	2	Offshore of Concrete Structer
Fiddlehead Outfall	Fido-1	47	2.992	122	54.255	5	Near Fiddlehead Outfall
Port of Olympia Dock	PD-1	47	3.239	122	54.360	40	North End Below Triple Light Tower
West Bay Marina	WB-1	47	3.866	122	54.936	4	Mouth of Haulout Dock
West Bay Marina	WB-2	47	3.851	122	54.934	7	South End of Marina
Indian Moxlie Creek	IM-1	47	2.843	122	53.664	Intertidal	East Bay at Drain Outlet

Table A2: Budd Inlet Sediment Project- Sample Log.

Station	Grab No.	Depth (ft)	Date	Time	Sediment Penetration (cm)	Sample Description
MW-1	1	39	6/9/98	934	17	Black to gray silty sand, some H2S odor, burrowing shrimp present
	2	38	6/9/98	955	17	Black to gray silty sand, some H2S odor, burrowing shrimp present
MW-2	1	13	6/9/98	1025	17	Black to gray silty sand, H2S odor, midshipmen in sample
	2	13	6/9/98	1040	17	Black to gray silty sand, H2S odor, no critters in sample
MW-3	1	36	6/9/98	1100	17	Light brown to black silt w/some sand, H2S odor
	2	35	6/9/98	1112	17	Light brown to black silt w/some sand, H2S odor
MW-4	1	30	6/9/98	1134	17	Brown to black sand w/some silt, H2S odor, no critters in sample
	2	29	6/9/98	1156	17	Brown to black sand w/some silt, H2S odor, no critters in sample
MW-5	1	28	6/9/98	1256	17	Black to brown silt w/some sand, H2S odor, more watery sample then other sites
	2	28	6/9/98	1308	17	Black to brown silt w/some sand, H2S odor, white precp. On sed. Surface, watery
MW-6	1	32	6/9/98	1336	17	Black to brown silt w/some sand, strong H2S odor
	2	32	6/9/98	1349	17	Black to brown silt, H2S odor, Nerid worm in sample
REF-1	1	38	6/9/98	1530	17	Grayish silt w/worms and seawhip, no H2S
	2	40	6/9/98	1545	17	Grayish silt w/worms and seawhip, no H2S
Hard-1	1	6	6/10/98	900	11	Black to brown sandy silt w/shell fragments, and wood debris
Hard-2	1	8	6/10/98	915	17	Light gray to brown silty, w/some sand. Slight H2S odor and shell fragments
Fido-1	1	9	6/10/98	955	13	Black sandy w/some silt w/shell and gravel debris, strong H2S odor
PD-1	1	43	6/9/98	1430	17	Black fine silt w/H2S odor

Recorder: Dale Norton

Table A2: Budd Inlet Sediment Project- Sample Log.

Station	Grab No.	Depth (ft)	Date	Time	Sediment Penetration (cm)	Sample Description
WB-1	1	7	6/10/98	1030	16	Brown gray to black silt, wood debris, H2S odor w/paint chips on sed surface
WB-2	1	8	6/10/98	1100	15	Brown to black silt w/shell fragments, paint chips and wood debris, H2S odor
IM-1	1	Intertidal	6/10/98	1200	10	Gray to black sandy w/silt, H2S odor, shell and gravel, some worms and oil droplets

Recorder: Dale Norton

Appendix B

Case Narratives for Laboratory Analyses

Washington State Department of Ecology
Manchester Laboratory

August 13, 1998

TO: Dale Norton

FROM: Debbie Lacroix, Chemist DL

SUBJECT: General Chemistry Quality Assurance memo for the Budd Inlet Sediments Project

SUMMARY

The data generated by the analysis of these samples can be used with the qualifications discussed in this memo.

SAMPLE INFORMATION

Samples 98248080-96 from the Budd Inlet Sediments project were received by the Manchester Laboratory on 6/10-6/11/98 in good condition. Analysis for percent solids was performed immediately after sample arrival. The samples were then stored in the freezer until TOC analysis could be performed.

HOLDING TIMES

All analyses were performed within applicable EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analysis and verified by initial and verification standards and blanks. All initial and continuing calibration verification standards were within the relevant EPA control limits. All balances are calibrated yearly with calibration verification occurring monthly.

Procedural Blanks

All procedural blanks were within acceptable limits.

Precision Data

The results of the duplicate and triplicate analysis of samples were used to evaluate the precision on this sample set. Relative percent differences (RPD) were within their acceptance windows of +/- 20 %. The relative standard deviations (RSD) were within their acceptance windows of +/- 20 % except for sample 248080 at 104°C. The duplicate and triplicate were within acceptance windows for RPD. The % solids analysis at 70°C for sample this sample was much lower than the duplicate and triplicate. Therefore, the calculated TOC result at 104°C was not acceptable. The sample could not be re-analyzed due to insufficient sample. Therefore, the result is qualified as an estimate.

Laboratory Control Sample (LCS) Analyses

LCS analyses were within their acceptance windows of +/- 20 %.

Please call Debbie Lacroix at 871-8812 with any questions or concerns about this project.

cc: Project File

State of Washington Department of Ecology
Manchester Environmental Laboratory
7411 Beach Dr. East Port Orchard WA. 98366

July 7, 1998

Project: Budd Inlet Sediments

Samples: 24-8080-88, 8090-93, 95-96

Laboratory: Rosa Environmental

By: Pam Covey

Case Summary

These samples required fifteen (15) Grain Size analyses on sediment using Puget Sound Estuary Protocol (PSEP) method for gravel, sand, silt and clay fractions only. The lab performed a duplicate analysis on one sample as part of the project, at no extra cost.

The samples were received at the Manchester Environmental Laboratory on June 10 and 11, 1998 and transported to the contract lab on June 16, 1998 for Grain Size analyses.

The analyses were reviewed for qualitative and quantitative accuracy, validity and usefulness.

The results are acceptable for use as reported.

REG Lab WMBE
Rosa Environmental & Geotechnical Laboratory, LLC

400 Ninth Avenue N., Suite B
Seattle, WA 98109-5187
(206) 287-9122

Client: Washington State Dept. Of Ecology	REGL Project No.: 1004-009
Client Project: Budd Inlet	Batch No.: 1004-009-01

Case Narrative

1. The samples were received on June 16, 1998, and were in good condition. There were fifteen samples. A duplicate was run on one sample and is reported in the QA Summary.
2. The testing was performed according to Puget Sound Estuary Program grain size distribution protocols, with modifications for only the major components (gravel, sand, silt, and clay).
3. Sample 24-8088 had a QA (before/after) ratio of 1.11, which is outside of our acceptance limits (0.95 to 1.05). The data is reported based on the actual weight retained on the #230 sieve and the 20 second pipette reading, in accordance with PSEP guidance. This discrepancy is probably due to an unrepresentative moisture content.
4. Sample 24-8087 had what appeared to be a piece of sticky material in it (chewing gum, caulking, etc.?). The material was discovered following the washing step and just before sieving. The material was weighed separately and was added to the total weight retained.
5. There were no other anomalies to the samples or the testing.

Approved by: Harold Bam
Title: Laboratory Manager

Date: 6/23/98

June 26, 1998

To: Dale Norton

From: Randy Knox, Metals Chemist RK

Subject: Budd Inlet Sediments Project.....Sediment

QUALITY ASSURANCE SUMMARY

Data quality for this project met all quality assurance and quality control criteria. No significant quality assurance issues were noted with the data.

SAMPLE INFORMATION

The samples from the Budd Inlet Sediments Project were received by the Manchester Laboratory on 6/10 and 6/11/98 in good condition.

HOLDING TIMES

All analyses were performed within the specified method holding times for metals analysis (28 days for mercury, 180 days for all other metals).

INSTRUMENT CALIBRATION

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards were within the relevant method control limits. AA calibration gave a correlation coefficient (r) of 0.995 or greater, also meeting method calibration requirements.

PROCEDURAL BLANKS

The procedural blanks associated with these samples showed no analytically significant levels of analyte.

SPIKED SAMPLES ANALYSIS

Spiked and duplicate spiked sample analyses were performed on this data set. All spike recoveries were within the acceptance limits of +/- 25%. Recovery of the duplicate spike for copper was 74%. Since the average copper spike recovery was acceptable, copper data was not qualified.

PRECISION DATA

The results of the spiked and duplicate spiked samples were used to evaluate precision on this sample set. The relative percent difference (RPD) for all analytes was within the 20% acceptance window for duplicate analysis.

SERIAL DILUTION

A five times serial dilution of one sample was analyzed by ICP and the analytical results, corrected for dilution, compared to the original sample analysis. The RPD (relative % difference) for analytes at levels 50X greater than the detection level was acceptable, within ±10%.

LABORATORY CONTROL SAMPLE (LCS) ANALYSIS

LCS analyses were within the windows established for each parameter.

Please call Randy Knox at SCAN 360-871-8811 or Jim Ross at SCAN 360-871-8808 to further discuss this project.

RLK:rlk

MANCHESTER ENVIRONMENTAL LABORATORY
7411 Beach Drive E. Port Orchard Washington 98366

CASE NARRATIVE

September 29, 1998

Subject: Budd Inlet

Samples: 98-248080 to –248094 and –248095 toi -248096

Case No. 179798

Officer: Dale Norton

By: Dickey D. Huntamer
Organics Analysis Unit

SEMIVOLATILES

ANALYTICAL METHODS:

The semivolatile sediment samples were extracted following the Manchester modification of the EPA SW 846 8270 procedure. Analysis of the sample extracts was done by capillary GC/MS. Normal QA/QC procedures were performed with the analyses.

HOLDING TIMES:

The samples were frozen until extraction. All extract-holding times were within the recommended limits.

BLANKS:

Low levels of some target compounds were detected in the laboratory blanks. The EPA five times rule was applied to all target compounds, which were found in the blank.

SURROGATES:

The semivolatile surrogate compounds were added to the sample prior to extraction. All surrogate recoveries were within the acceptable limits and no data qualifiers were added.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

All spike recoveries and Relative Percent Differences (RPD) were within acceptable limits except for aniline, hexachloroethane, benzoic acid, 3-nitroaniline, 2,4-dinitrophenol and 4-nitroaniline. Hexachloro-cyclopentadiene was not recovered in the matrix spikes. The "J" qualifier was added to the results for these compounds except for hexachlorocyclopentadiene which was flagged as "REJ" in the matrix spike source sample, -248080.

Benzoic Acid data should be ~~reviewed~~ rejected ~~by Appr. SX~~ due to calibration Data D.N.

ANALYTICAL COMMENTS:

The solid content of the sediments was low; around 30% for some samples, and consequently quantitation levels are higher. Detection levels generally were two to four times lower than the quantitation level reported depending on the compound.

Two certified reference materials were analyzed with the samples. These were OCS8180 (NIST SRM 1941a) and OCS8180A (HS-6).

The data is acceptable for use as qualified.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
EXP	-	The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3 X 10^6.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
Bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

MANCHESTER ENVIRONMENTAL LABORATORY
7411 Beach Drive E. Port Orchard Washington 98366

CASE NARRATIVE

September 21, 1998

Subject: Budd Inlet

Samples: 98-248087 to -248092 and -248096

Case No. 179798

Officer: Dale Norton

By: Dickey D. Huntamer
Organics Analysis Unit

CHLORINATED PHENOLS

ANALYTICAL METHODS:

The semivolatile sediment samples were extracted following the Manchester modification of the EPA SW 846 8270 procedure. Analysis of the sample extracts was done by capillary GC/MS using selected ion monitoring (SIM) mode. Normal QA/QC procedures were performed with the analyses.

HOLDING TIMES:

The samples were frozen until extraction. All extract-holding times were within the recommended limits.

BLANKS:

Low levels of some target compounds were detected in the laboratory blanks. The EPA five times rule was applied to all target compounds, which were found in the blank. The amount of phenol was significant enough to affect the detection of phenol under the 5X rule. The 4-methylphenol in the blank was not significant enough to affect the results under the 5X rule.

SURROGATES:

The semivolatile surrogate compounds were added to the sample prior to extraction. Surrogate spiking levels were one-twentieth the normal BNA level. All surrogate recoveries were within the acceptable limits.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Matrix spikes were also added at one-twentieth the normal BNA amounts. All spike recoveries and Relative Percent Differences (RPD) were acceptable except for phenol and 4-methylphenol. Both had high native amounts in the sample, which may have affected the recovery calculations. The "J" qualifier was added to the results for phenol and 4-methylphenol.

ANALYTICAL COMMENTS:

Because the project officer required lower quantitation limits for the chlorinated phenols a special method was developed for this analysis. Low level calibration standards were prepared at $1/10^{th}$ the normal amounts. Selected ion monitoring (SIM) was used in place of full scan to increase the sensitivity.

The concentration of pentachlorophenol (PCP) in the continuing calibration was low compared to the initial calibration. Consequently results for PCP are qualified as estimates, "J".

The data is acceptable for use as qualified.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
EXP	-	The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
Bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

CN Budd Inlet Chlorinated Phenols.doc

Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

September 22, 1998

Subject: Budd Inlet
Samples: 98278010 - 013
Case No. 179798
Officer: Dale Norton
By: Greg Perez
Organics Analysis Unit

POLYCHLORINATED BIPHENYLS

SUMMARY:

No difficulties were encountered with this analysis. The data is usable as qualified.

ANALYTICAL METHODS:

The solid samples were Soxhlet extracted using acetone as the solvent. The samples were treated with mercury to remove sulfur and then treated with sulfuric acid to remove interferences. Analysis was done by Method 8080 using dual column capillary GC analysis with Electron Capture Detectors (ECD).

BLANKS:

No target compounds were detected in the laboratory blanks.

SURROGATES:

Surrogate recoveries for the sediment samples were acceptable.

HOLDING TIMES:

The samples were analyzed within the recommended holding time.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Recoveries for the matrix spikes were within acceptable limits.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

MANCHESTER ENVIRONMENTAL LABORATORY
7411 Beach Drive E, Port Orchard Washington 98366

August 7, 1998

Subject: **Budd Inlet**

Samples: 98248087, 98248091, 98248093 - 98248096

Case No. 1797-98

Officer: Dale Norton

By: Karin Feddersen KF
Analytical Management Unit

Organotins

ANALYTICAL METHODS:

The samples were extracted following the methods given in Puget Sound Estuary Program (PSEP) "Recommended Guidelines for Measuring Organic Compounds in Puget Sound Sediment and Tissue Samples" Recommended Methods for Organotin Compounds.

The samples were extracted by tumbling with sodium sulfate and methylene chloride/10% methanol and 0.1% by weight tropolone. After extraction the samples were solvent exchanged to hexane. The organotin compounds were hexylated using the Grignard reaction given in Krone et al (1989) including the silica gel/alumina cleanup.

Analysis was by capillary Gas Chromatography using Single Ion Monitoring (SIM) mode GC/MS. All samples are reported on a dry weight basis.

HOLDING TIMES:

The samples were stored frozen following PSEP Guidelines until extraction. All samples were analyzed within the recommended 40 days from extraction.

BLANKS:

Monobutyltin was detected in the laboratory blanks, most likely due to contaminated Grignard reagent. All Monobutyltin results are qualified as estimates.

SURROGATES:

No surrogate recovery QC limits have been established for this method. Recovery of tripentyl tin ranged from 63% to 109%.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Sample 98248095 was used for matrix spikes and analyzed with the samples. Recoveries for Terabutyltin were below 5% in both spikes. Non-detect results for this analyte have been rejected. Detected results may be biased low and have been qualified as estimates.

Tributyltin and Dibutyltin were detected at a higher native concentration in the sample than in one of the spikes. Recoveries could not be calculated (NC).

Non-homogeneity of the samples most likely contributed to the very different recoveries for these compounds and Monobutyltin. All results are qualified as estimates.

ANALYTICAL COMMENTS:

Use the dilution results from samples 98248093 and 98248095 for Tributyltin, Dibutyltin and Monobutyltin. Use the dilution results from samples 98248094 for Tributyltin and Dibutyltin. Use the original analyses results for Tetrabutyltin.

Sequim Bay Reference Sediments were analyzed with the samples. These are samples which presumably were spiked with 100 ng/gm (100ug/Kg) wet weight of Tributyltin. No value for Tributyltin has been established for the Sequim Bay Reference Sediment so the accuracy of the analysis cannot be precisely determined. However, the values appear to be fairly closely associated with the surrogate recoveries. These samples are identified as OCS8175A1 and OCS8175A2.

OCS8175A1	83	ug/Kg	Tributyltin Chloride
	82	%	Tripentyltin surrogate recovery
OCS8175A2	89	ug/Kg	Tributyltin Chloride
	90	%	Tripentyltin surrogate recovery

(Note that the data sheets report these values as dry weight. The percent solids has been determined to be 60.4% for this material.)

Duplicate samples of PACS-2 were also analyzed with the samples. The value for PACS-2 has been certified as 0.98 +/- 0.13 mg/Kg Tributyltin, and 1.09 +\- 0.15 mg\Kg Dibutyltin, as elemental Tin. These values are approximately equivalent to 2800 ug/Kg as chloride. The values obtained for these samples appear to be fairly closely associated with the surrogate recoveries. These samples are identified as OCS8175A3 and OCS8175A4.

OCS8175A3	2090	ug/Kg	Tributyltin Chloride
	2000	ug/Kg	Dibutyltin Chloride
	72	%	Tripentyltin surrogate recovery
OCS8175A4	1850	ug/Kg	Tributyltin Chloride
	2010	ug/Kg	Dibutyltin Chloride
	65	%	Tripentyltin surrogate recovery

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

Appendix C

Sample Reports for Chemical and Biological Analysis

Conventionals

Percent Solids
Total Organic Carbon
Grain Size

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Organic Carbon (70 C)

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Project Officer: Dale Norton
Date Reported: 27-JUL-98

Method: PSEP-TOC
Matrix: Frozen Sediment/soil
Analyte: Total Organic Carbon

Sample	QC	Field ID	Result	Qualifier	Units	Received	Analyzed
98248080		MW-1	3.38		%	06/10/98	07/22/98
98248080	Duplicate		3.45		%	06/10/98	07/22/98
98248080	Replicate		3.39		%	06/10/98	07/22/98
98248081		MW-2	4.44		%	06/10/98	07/22/98
98248082		MW-3	3.45		%	06/10/98	07/22/98
98248083		MW-4	3.53		%	06/10/98	07/22/98
98248084		MW-4A	3.41		%	06/10/98	07/22/98
98248085		MW-5	3.79		%	06/10/98	07/22/98
98248086		MW-6	3.61		%	06/10/98	07/22/98
98248086	Duplicate		3.63		%	06/10/98	07/22/98
98248086	Replicate		3.57		%	06/10/98	07/22/98
98248087		REF	2.49		%	06/10/98	07/23/98
98248088		HARD1	7.57		%	06/11/98	07/23/98
98248090		HARD2	5.46		%	06/11/98	07/24/98
98248091		FIDO1	4.08		%	06/11/98	07/24/98
98248092		PD-1	4.28		%	06/10/98	07/24/98
98248093		WB1	6.16		%	06/11/98	07/24/98
98248095		WB2	6.25		%	06/11/98	07/24/98
98248096		IM1	1.77		%	06/11/98	07/24/98

Authorized By: Debbie Kaarvy Release Date: 8-13-98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Percent Solids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Project Officer: Dale Norton
Date Reported: 12-JUN-98

Method: EPA160.3
Matrix: Sediment/Soil
Analyte: Solids

Sample	QC	Field ID	Result	Qualifier	Units	Received	Analyzed
98248080		MW-1	29.0		%	06/10/98	06/11/98
98248080	Duplicate		29.0		%	06/10/98	06/11/98
98248080	Duplicate		29.1		%	06/10/98	06/11/98
98248081		MW-2	30.7		%	06/10/98	06/11/98
98248082		MW-3	29.9		%	06/10/98	06/11/98
98248083		MW-4	31.1		%	06/10/98	06/11/98
98248084		MW-4A	31.1		%	06/10/98	06/11/98
98248085		MW-5	22.5		%	06/10/98	06/11/98
98248086		MW-6	29.5		%	06/10/98	06/11/98
98248086	Duplicate		25.1		%	06/10/98	06/11/98
98248086	Duplicate		25.2		%	06/10/98	06/11/98
98248087		REF	33.2		%	06/10/98	06/11/98
98248088		HARD1	41.2		%	06/11/98	06/11/98
98248090		HARD2	38.4		%	06/11/98	06/11/98
98248091		FIDO1	50.3		%	06/11/98	06/11/98
98248092		PD-1	23.5		%	06/10/98	06/11/98
98248093		WB1	32.3		%	06/11/98	06/11/98
98248095		WB2	31.5		%	06/11/98	06/11/98
98248096		IM1	60.5		%	06/11/98	06/11/98

Authorized By: Debbie Harrow Release Date: 8-13-98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Organic Carbon (104 C)

Project Name: **Budd Inlet Sediments** **LIMS Project ID:** 1797-98

Project Officer: Dale Norton
Date Reported: 27-JUL-98

Method: PSEP-TOCM
Matrix: Frozen Sediment/soil
Analyte: Total Organic Carbon

Sample	QC	Field ID	Result	Qualifier	Units	Received	Analyzed
98248080		MW-1	2.07	J	%	06/10/98	07/22/98
98248080	Duplicate		3.52		%	06/10/98	07/22/98
98248080	Replicate		3.42		%	06/10/98	07/22/98
98248081		MW-2	4.61		%	06/10/98	07/22/98
98248082		MW-3	3.70		%	06/10/98	07/22/98
98248083		MW-4	3.63		%	06/10/98	07/22/98
98248084		MW-4A	3.53		%	06/10/98	07/22/98
98248085		MW-5	4.61		%	06/10/98	07/22/98
98248086		MW-6	3.52		%	06/10/98	07/22/98
98248086	Duplicate		4.15		%	06/10/98	07/22/98
98248086	Replicate		4.05		%	06/10/98	07/22/98
98248087		REF	1.98		%	06/10/98	07/23/98
98248088		HARD1	7.64		%	06/11/98	07/23/98
98248090		HARD2	5.67		%	06/11/98	07/24/98
98248091		FIDO1	4.45		%	06/11/98	07/24/98
98248092		PD-1	4.37		%	06/10/98	07/24/98
98248093		WB1	6.53		%	06/11/98	07/24/98
98248095		WB2	6.70		%	06/11/98	07/24/98
98248096		IM1	1.76		%	06/11/98	07/24/98

Authorized By: Debbie Lacroix Release Date: 8-13-98

Rosa Environmental and Geotechnical Laboratory, LLC

Washington State Department of Ecology
Manchester Laboratory

Budd Inlet

Table 1. Major Components of Apparent Grain Size Distribution by PSEP Methodology

Sample Number	Gravel (>2,000)	Sand (2,000< x <62.5)	Silt (62.5< x <4)	Clay (<4)
24-8083A	0.0	11.8	53.7	34.4
24-8083B	0.0	13.4	55.4	31.2
24-8080	0.0	10.8	58.7	30.6
24-8081	0.0	13.9	60.0	26.1
24-8082	0.0	10.7	55.4	33.9
24-8084	0.1	9.5	56.4	34.0
24-8085	0.0	13.7	56.9	29.3
24-8086	0.0	9.3	60.3	30.4
24-8087	0.3	15.8	50.3	33.6
24-8088	10.4	51.3	25.3	13.0
24-8090	0.3	19.6	58.8	21.3
24-8091	5.2	61.1	21.8	12.0
24-8092	0.7	17.5	58.4	23.5
24-8093	0.8	18.5	62.8	18.0
24-8095	2.0	25.1	55.1	17.9
24-8096	5.2	66.4	22.0	6.4

1. Testing performed according to PSEP "Apparent Grain Size Distribution" protocol, with modifications for determination of only the major components

Rosa Environmental and Geotechnical Laboratory, LLC

Washington State Department of Ecology
Manchester Laboratory

Budd Inlet

Table 2. QA Summary

Sample Number	Gravel (>2,000)	Sand (2,000< x <62.5)	Silt (62.5< x <4)	Clay (<4)
24-8083A	0.0	11.8	53.7	34.4
24-8083B	0.0	13.4	55.4	31.2
Average	0.00	12.64	54.53	32.83

Metals

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Sample: M8168SB1

Project Officer: Dale Norton

Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	0.5	U
Chromium	1	U
Copper	0.5	U
Lead	2	U
Nickel	1	U
Zinc	0.5	U

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments
LIMS Project ID: 1797-98

Sample: M8168SL1
Method: EPA200.7

Date Prepared: 06/17/98
Matrix: Sediment/Soil

Project Officer: Dale Norton
Date Analyzed: 06/18/98
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	101	%
Chromium	101	%
Copper	105	%
Lead	100	%
Nickel	101	%
Zinc	97	%

Authorized By: Randy L Knox Release Date: 6/25/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 **Date Received:** 06/10/98 **Method:** EPA200.7
Field ID: MW-1 **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Cadmium	0.75	
Chromium	35.7	
Copper	70.3	
Lead	15	
Nickel	29.6	
Zinc	79.7	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248081
Field ID: MW-2
Project Officer: Dale Norton

Date Received: 06/10/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.4	
Chromium	37.3	
Copper	70.7	
Lead	19	
Nickel	29.4	
Zinc	92.4	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248082
Field ID: MW-3
Project Officer: Dale Norton

Date Received: 06/10/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.8	
Chromium	35.3	
Copper	69.7	
Lead	18	
Nickel	28.5	
Zinc	86.5	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248083
Field ID: MW-4
Project Officer: Dale Norton

Date Received: 06/10/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.6	
Chromium	37.3	
Copper	71.8	
Lead	19	
Nickel	35.0	
Zinc	91.5	

Authorized By: Randy L Knox Release Date: 6/25/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248084
Field ID: MW-4A
Project Officer: Dale Norton

Date Received: 06/10/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.5	
Chromium	36.3	
Copper	71.4	
Lead	20	
Nickel	29.7	
Zinc	89.1	

Authorized By: Randy S Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248085
Field ID: MW-5
Project Officer: Dale Norton

Date Received: 06/10/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.6	
Chromium	31.7	
Copper	63.1	
Lead	17	
Nickel	24.2	
Zinc	80.8	

Authorized By: Randy L Knox Release Date: 6/25/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248086
Field ID: MW-6
Project Officer: Dale Norton

Date Received: 06/10/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.2	
Chromium	35.3	
Copper	71.5	
Lead	17	
Nickel	29.3	
Zinc	86.6	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248087 **Date Received:** 06/10/98 **Method:** EPA200.7
Field ID: REF **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Cadmium	0.65	
Chromium	42.4	
Copper	40.3	
Lead	14	
Nickel	32.8	
Zinc	76.9	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248088
Field ID: HARD1
Project Officer: Dale Norton

Date Received: 06/11/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	0.86	
Chromium	34.2	
Copper	81.1	
Lead	63.4	
Nickel	21.6	
Zinc	124	

Authorized By: Randy L. Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248088 (Matrix Spike - LMX1) **Date Received:** 06/11/98 **Method:** EPA200.7
Field ID: HARD1 **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** % Recovery

Analyte	Result	Qualifier
Cadmium	87	
Chromium	94	
Copper	100	
Lead	92	
Nickel	87	
Zinc	99	

Authorized By: Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248088 (Matrix Spike - LMX2) **Date Received:** 06/11/98 **Method:** EPA200.7
Field ID: HARD1 **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** % Recovery

Analyte	Result	Qualifier
Cadmium	87	
Chromium	95	
Copper	74	
Lead	99	
Nickel	86	
Zinc	96	

Authorized By: _____ Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248090
Field ID: HARD2
Project Officer: Dale Norton

Date Received: 06/11/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	2.2	
Chromium	33.1	
Copper	62.4	
Lead	32.7	
Nickel	24.1	
Zinc	126	

Authorized By: Randy K. Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248091 **Date Received:** 06/11/98 **Method:** EPA200.7
Field ID: FIDO1 **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.5	
Chromium	30.9	
Copper	89.6	
Lead	72.2	
Nickel	21.1	
Zinc	261	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248092 **Date Received:** 06/10/98 **Method:** EPA200.7
Field ID: PD-1 **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Cadmium	1.7	
Chromium	34.3	
Copper	74.6	
Lead	17	
Nickel	26.1	
Zinc	99.5	

Authorized By: Randy L Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248093 **Date Received:** 06/11/98 **Method:** EPA200.7
Field ID: WB1 **Date Prepared:** 06/17/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 06/18/98 **Units:** mg/Kg dw

Analyte	Result	Qualifier
Cadmium	2.5	
Chromium	34.2	
Copper	172	
Lead	24.3	
Nickel	26.3	
Zinc	130	

Authorized By: Randy L. Knox Release Date: 6/25/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095
Field ID: WB2
Project Officer: Dale Norton

Date Received: 06/11/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	2.1	
Chromium	31.7	
Copper	133	
Lead	26.2	
Nickel	26.6	
Zinc	114	

Authorized By: Randy L. Knox Release Date: 6/25/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248096
Field ID: IM1
Project Officer: Dale Norton

Date Received: 06/11/98
Date Prepared: 06/17/98
Date Analyzed: 06/18/98

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg dw

Analyte	Result	Qualifier
Cadmium	0.5	U
Chromium	**30.0**	
Copper	**25.0**	
Lead	**36.8**	
Nickel	**26.3**	
Zinc	**88.2**	

Authorized By: Randy S. Knox Release Date: 6/25/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Arsenic

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Project Officer: Dale Norton
Date Reported: 24-JUN-98

Method: EPA206.2
Matrix: Sediment/Soil
Analyte: Arsenic

Sample	QC	Field ID	Result	Qualifier	Units	Received	Analyzed
98248080		MW-1	**8.28**		mg/Kg dw	06/10/98	06/22/98
98248081		MW-2	**9.40**		mg/Kg dw	06/10/98	06/22/98
98248082		MW-3	**8.55**		mg/Kg dw	06/10/98	06/22/98
98248083		MW-4	**9.24**		mg/Kg dw	06/10/98	06/22/98
98248084		MW-4A	**9.25**		mg/Kg dw	06/10/98	06/22/98
98248085		MW-5	**7.52**		mg/Kg dw	06/10/98	06/22/98
98248086		MW-6	**8.57**		mg/Kg dw	06/10/98	06/22/98
98248087		REF	**8.20**		mg/Kg dw	06/10/98	06/22/98
98248088		HARD1	**9.24**		mg/Kg dw	06/11/98	06/22/98
98248090		HARD2	**8.75**		mg/Kg dw	06/11/98	06/22/98
98248091		FIDO1	**5.2**		mg/Kg dw	06/11/98	06/22/98
98248092		PD-1	**7.79**		mg/Kg dw	06/10/98	06/22/98
98248093		WB1	**10.0**		mg/Kg dw	06/11/98	06/22/98
98248095		WB2	**10.0**		mg/Kg dw	06/11/98	06/22/98
98248096		IM1	**4.96**		mg/Kg dw	06/11/98	06/22/98
98248096	Matrix Spike		**94 %**			06/11/98	06/22/98
98248096	Matrix Spike		**95 %**			06/11/98	06/22/98
M8168SB1			0.3	U	mg/Kg dw		06/22/98
M8168SL1			**105 %**				06/22/98

Authorized By: Kathy Conrad Release Date: 6/24/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Mercury

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Project Officer: Dale Norton
Date Reported: 26-JUN-98

Method: EPA245.5
Matrix: Sediment/Soil
Analyte: Mercury

Sample	QC	Field ID	Result	Qualifier	Units	Received	Analyzed
98248080		MW-1	**0.181**		mg/Kg dw	06/10/98	06/17/98
98248081		MW-2	**0.170**		mg/Kg dw	06/10/98	06/17/98
98248082		MW-3	**0.16**		mg/Kg dw	06/10/98	06/17/98
98248083		MW-4	**0.179**		mg/Kg dw	06/10/98	06/17/98
98248084		MW-4A	**0.17**		mg/Kg dw	06/10/98	06/17/98
98248085		MW-5	**0.16**		mg/Kg dw	06/10/98	06/17/98
98248086		MW-6	**0.17**		mg/Kg dw	06/10/98	06/17/98
98248086	Duplicate		**0.16**		mg/Kg dw	06/10/98	06/17/98
98248086	Matrix Spike		**96 %**			06/10/98	06/17/98
98248086	Matrix Spike		**90 %**			06/10/98	06/17/98
98248087		REF	**0.11**		mg/Kg dw	06/10/98	06/17/98
98248088		HARD1	**0.187**		mg/Kg dw	06/11/98	06/17/98
98248090		HARD2	**0.258**		mg/Kg dw	06/11/98	06/17/98
98248091		FIDO1	**0.236**		mg/Kg dw	06/11/98	06/17/98
98248092		PD-1	**0.20**		mg/Kg dw	06/10/98	06/17/98
98248093		WB1	**0.254**		mg/Kg dw	06/11/98	06/17/98
98248095		WB2	**0.267**		mg/Kg dw	06/11/98	06/17/98
98248096		IM1	**0.067**		mg/Kg dw	06/11/98	06/17/98
M8167SG1			**105**		mg/Kg dw		06/17/98
M8167SH1			0.005	U	mg/Kg dw		06/17/98

Authorized By: Randy L. Knox Release Date: 6/26/98

Organics

Semivolatiles
Phenolics
Polychlorinated Biphenyls
Butyltins

Semivolatiles

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	525	UJ	**Acenaphthene**	**8.2**	**J**
Pyridine	525	U	2,4-Dinitrophenol	2100	UJ
Aniline	105	UJ	4-Nitrophenol	525	U
Phenol	105	UJ	**Dibenzofuran**	**13**	**J**
Bis(2-Chloroethyl)Ether	210	U	2,4-Dinitrotoluene	105	U
2-Chlorophenol	210	U	Diethylphthalate	525	U
1,3-Dichlorobenzene	210	U	**Fluorene**	**15**	**J**
1,4-Dichlorobenzene	105	U	4-Chlorophenyl-Phenylether	105	U
1,2-Dichlorobenzene	105	U	4-Nitroaniline	105	U
Benzyl Alcohol	105	U	4,6-Dinitro-2-Methylphenol	1050	UJ
2-Methylphenol	105	U	N-Nitrosodiphenylamine	105	U
2,2'-Oxybis[1-chloropropane]	105	U	1,2-Diphenylhydrazine	105	U
N-Nitroso-Di-N-Propylamine	105	U	4-Bromophenyl-Phenylether	105	U
4-Methylphenol	**64**	**J**	Hexachlorobenzene	105	U
Hexachloroethane	105	UJ	Pentachlorophenol	525	UJ
Nitrobenzene	105	U	**Phenanthrene**	**53**	**J**
Isophorone	105	U	**Anthracene**	**35**	**J**
2-Nitrophenol	525	U	Caffeine	105	U
2,4-Dimethylphenol	105	U	Carbazole	105	U
Bis(2-Chloroethoxy)Methane	105	U	**Di-N-Butylphthalate**	**1350**	
Benzoic Acid	**3770**	~~J~~ Rej	**Fluoranthene**	**167**	
2,4-Dichlorophenol	105	U	Benzidine	4200	UJ
1,2,4-Trichlorobenzene	105	U	**Pyrene**	**178**	
Naphthalene	**25**	**J**	**Retene**	**112**	
4-Chloroaniline	105	UJ	Butylbenzylphthalate	105	U
Hexachlorobutadiene	105	U	**Benzo(a)anthracene**	**70**	**J**
4-Chloro-3-Methylphenol	105	U	3,3'-Dichlorobenzidine	2100	U
2-Methylnaphthalene	**12**	**J**	**Chrysene**	**85**	**J**
1-Methylnaphthalene	**6.1**	**J**	Bis(2-Ethylhexyl) Phthalate	210	UJ
Hexachlorocyclopentadiene		REJ	Di-N-Octyl Phthalate	210	U
2,4,6-Trichlorophenol	525	U	**Benzo(b)fluoranthene**	**137**	
2,4,5-Trichlorophenol	105	U	**Benzo(k)fluoranthene**	**42**	**J**
2-Chloronaphthalene	105	U	**Benzo(a)pyrene**	**70**	**J**
2-Nitroaniline	525	U	**3B-Coprostanol**	**1290**	
Dimethylphthalate	105	U	**Indeno(1,2,3-cd)pyrene**	**207**	**J**
2,6-Dinitrotoluene	210	U	**Dibenzo(a,h)anthracene**	**196**	**J**
Acenaphthylene	105	U	**Benzo(ghi)perylene**	**99**	**J**
3-Nitroaniline	210	UJ			

Authorized By: _____ Release Date: 9/29/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080
Field ID: MW-1
Project Officer: Dale Norton

Date Collected: 06/09/98
Date Prepared: 06/29/98
Date Analyzed: 07/16/98

Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	84	%
D5-Phenol	94	%
D4-2-Chlorophenol	82	%
1,2-Dichlorobenzene-D4	31	%
D5-Nitrobenzene	45	%
2-Fluorobiphenyl	78	%
D10-Pyrene	84	%
D14-Terphenyl	85	%

Authorized By: _____ Release Date: 7/29/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 (Matrix Spike - LMX1) **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/15/98 **Units:** % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	88		Acenaphthene	79	
Pyridine		NAF	2,4-Dinitrophenol	47	
Aniline	4		4-Nitrophenol	95	
Phenol	78		Dibenzofuran	80	
Bis(2-Chloroethyl)Ether	76		2,4-Dinitrotoluene	56	
2-Chlorophenol	82		Diethylphthalate	91	
1,3-Dichlorobenzene	56		Fluorene	80	
1,4-Dichlorobenzene	60		4-Chlorophenyl-Phenylether	81	
1,2-Dichlorobenzene	64		4-Nitroaniline	50	
Benzyl Alcohol	84		4,6-Dinitro-2-Methylphenol	65	
2-Methylphenol	87		N-Nitrosodiphenylamine	69	
2,2'-Oxybis[1-chloropropane]	81		1,2-Diphenylhydrazine	84	
N-Nitroso-Di-N-Propylamine	97		4-Bromophenyl-Phenylether	85	
4-Methylphenol	88		Hexachlorobenzene	85	
Hexachloroethane	19		Pentachlorophenol	86	
Nitrobenzene	73		Phenanthrene	78	
Isophorone	85		Anthracene	80	
2-Nitrophenol	51		Caffeine		NAF
2,4-Dimethylphenol	117		Carbazole		NAF
Bis(2-Chloroethoxy)Methane	82		Di-N-Butylphthalate	61	
Benzoic Acid	41	RJ	Fluoranthene	82	
2,4-Dichlorophenol	87		Benzidine		NAF
1,2,4-Trichlorobenzene	72		Pyrene	82	
Naphthalene	74		Retene		NAF
4-Chloroaniline	9		Butylbenzylphthalate	90	
Hexachlorobutadiene	70		Benzo(a)anthracene	83	
4-Chloro-3-Methylphenol	96		3,3'-Dichlorobenzidine		NAF
2-Methylnaphthalene	77		Chrysene	84	
1-Methylnaphthalene		NAF	Bis(2-Ethylhexyl) Phthalate	84	
Hexachlorocyclopentadiene		REJ	Di-N-Octyl Phthalate	98	
2,4,6-Trichlorophenol	89		Benzo(b)fluoranthene	99	
2,4,5-Trichlorophenol	96		Benzo(k)fluoranthene	86	
2-Chloronaphthalene	74		Benzo(a)pyrene	97	
2-Nitroaniline	95		3B-Coprostanol		NAF
Dimethylphthalate	84		Indeno(1,2,3-cd)pyrene	83	
2,6-Dinitrotoluene	65		Dibenzo(a,h)anthracene	82	
Acenaphthylene	79		Benzo(ghi)perylene	81	
3-Nitroaniline	36				

Authorized By: _____ Release Date: 9/19/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 (Matrix Spike - LMX1) **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/15/98 **Units:** % Recovery

Surrogate Recoveries

2-Fluorophenol	84	%
D5-Phenol	93	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	62	%
D5-Nitrobenzene	72	%
2-Fluorobiphenyl	80	%
D10-Pyrene	88	%
D14-Terphenyl	88	%

Authorized By: _____ Release Date: 9/29/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 (Matrix Spike - LMX2) **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/15/98 **Units:** % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	90		Acenaphthene	81	
Pyridine		NAF	2,4-Dinitrophenol	54	
Aniline	7		4-Nitrophenol	96	
Phenol	81		Dibenzofuran	82	
Bis(2-Chloroethyl)Ether	81		2,4-Dinitrotoluene	63	
2-Chlorophenol	82		Diethylphthalate	94	
1,3-Dichlorobenzene	54		Fluorene	83	
1,4-Dichlorobenzene	57		4-Chlorophenyl-Phenylether	83	
1,2-Dichlorobenzene	64		4-Nitroaniline	50	
Benzyl Alcohol	86		4,6-Dinitro-2-Methylphenol	68	
2-Methylphenol	90		N-Nitrosodiphenylamine	71	
2,2'-Oxybis[1-chloropropane]	83		1,2-Diphenylhydrazine	87	
N-Nitroso-Di-N-Propylamine	96		4-Bromophenyl-Phenylether	85	
4-Methylphenol	92		Hexachlorobenzene	87	
Hexachloroethane	17		Pentachlorophenol	88	
Nitrobenzene	75		Phenanthrene	80	
Isophorone	87		Anthracene	82	
2-Nitrophenol	53		Caffeine		NAF
2,4-Dimethylphenol	118		Carbazole		NAF
Bis(2-Chloroethoxy)Methane	83		Di-N-Butylphthalate	61	
Benzoic Acid	~~40~~	Rej	Fluoranthene	84	
2,4-Dichlorophenol	88		Benzidine		NAF
1,2,4-Trichlorobenzene	74		Pyrene	87	
Naphthalene	73		Retene		NAF
4-Chloroaniline	13		Butylbenzylphthalate	94	
Hexachlorobutadiene	69		Benzo(a)anthracene	85	
4-Chloro-3-Methylphenol	99		3,3'-Dichlorobenzidine		NAF
2-Methylnaphthalene	78		Chrysene	87	
1-Methylnaphthalene		NAF	Bis(2-Ethylhexyl) Phthalate	86	
Hexachlorocyclopentadiene		REJ	Di-N-Octyl Phthalate	100	
2,4,6-Trichlorophenol	91		Benzo(b)fluoranthene	100	
2,4,5-Trichlorophenol	97		Benzo(k)fluoranthene	84	
2-Chloronaphthalene	76		Benzo(a)pyrene	100	
2-Nitroaniline	100		3B-Coprostanol		NAF
Dimethylphthalate	85		Indeno(1,2,3-cd)pyrene	85	
2,6-Dinitrotoluene	69		Dibenzo(a,h)anthracene	85	
Acenaphthylene	80		Benzo(ghi)perylene	87	
3-Nitroaniline	41				

Authorized By: _____ Release Date: 7/29/98 Page: 3

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 (Matrix Spike - LMX2) **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/15/98 **Units:** % Recovery

Surrogate Recoveries

2-Fluorophenol	84	%
D5-Phenol	95	%
D4-2-Chlorophenol	78	%
1,2-Dichlorobenzene-D4	62	%
D5-Nitrobenzene	77	%
2-Fluorobiphenyl	82	%
D10-Pyrene	92	%
D14-Terphenyl	93	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248081 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	516	U	**Acenaphthene**	**19**	**J**
Pyridine	516	UJ	2,4-Dinitrophenol	2060	UJ
Aniline	103	U	4-Nitrophenol	516	U
Phenol	328	UJ	**Dibenzofuran**	**24**	**J**
Bis(2-Chloroethyl)Ether	206	U	2,4-Dinitrotoluene	103	U
2-Chlorophenol	206	U	Diethylphthalate	516	U
1,3-Dichlorobenzene	206	U	**Fluorene**	**24**	**J**
1,4-Dichlorobenzene	103	U	4-Chlorophenyl-Phenylether	103	U
1,2-Dichlorobenzene	103	U	4-Nitroaniline	103	U
Benzyl Alcohol	103	U	4,6-Dinitro-2-Methylphenol	1030	UJ
2-Methylphenol	103	U	N-Nitrosodiphenylamine	103	U
2,2'-Oxybis[1-chloropropane]	103	U	1,2-Diphenylhydrazine	103	U
N-Nitroso-Di-N-Propylamine	103	U	4-Bromophenyl-Phenylether	103	U
4-Methylphenol	**161**		Hexachlorobenzene	103	U
Hexachloroethane	103	U	Pentachlorophenol	516	UJ
Nitrobenzene	103	U	**Phenanthrene**	**109**	
Isophorone	103	U	**Anthracene**	**46**	**J**
2-Nitrophenol	516	U	Caffeine	103	U
2,4-Dimethylphenol	103	U	Carbazole	103	U
Bis(2-Chloroethoxy)Methane	103	U	Di-N-Butylphthalate	103	UJ
Benzoic Acid	~~3720~~	~~J~~ Rej	**Fluoranthene**	**261**	
2,4-Dichlorophenol	103	U	Benzidine	4120	UJ
1,2,4-Trichlorobenzene	103	U	**Pyrene**	**294**	
Naphthalene	**84**	**J**	**Retene**	**158**	
4-Chloroaniline	103	U	Butylbenzylphthalate	516	U
Hexachlorobutadiene	103	U	**Benzo(a)anthracene**	**92**	**J**
4-Chloro-3-Methylphenol	103	U	3,3'-Dichlorobenzidine	2060	U
2-Methylnaphthalene	**22**	**J**	**Chrysene**	**115**	
1-Methylnaphthalene	**13**	**J**	Bis(2-Ethylhexyl) Phthalate	244	UJ
Hexachlorocyclopentadiene	103	U	Di-N-Octyl Phthalate	206	U
2,4,6-Trichlorophenol	516	U	**Benzo(b)fluoranthene**	**168**	
2,4,5-Trichlorophenol	103	U	**Benzo(k)fluoranthene**	**55**	**J**
2-Chloronaphthalene	103	U	**Benzo(a)pyrene**	**72**	**J**
2-Nitroaniline	516	U	**3B-Coprostanol**	**1290**	
Dimethylphthalate	103	U	**Indeno(1,2,3-cd)pyrene**	**215**	**J**
2,6-Dinitrotoluene	206	U	**Dibenzo(a,h)anthracene**	**192**	**J**
Acenaphthylene	**22**	**J**	**Benzo(ghi)perylene**	**122**	
3-Nitroaniline	206	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248081 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	79	%
D5-Phenol	92	%
D4-2-Chlorophenol	75	%
1,2-Dichlorobenzene-D4	33	%
D5-Nitrobenzene	52	%
2-Fluorobiphenyl	75	%
D10-Pyrene	91	%
D14-Terphenyl	92	%

Authorized By: _____ Release Date: 9/27/98

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248082 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-3 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	519	UJ	**Acenaphthene**	**10**	**J**
Pyridine	519	U	2,4-Dinitrophenol	2070	UJ
Aniline	104	U	4-Nitrophenol	519	U
Phenol	104	U	**Dibenzofuran**	**17**	**J**
Bis(2-Chloroethyl)Ether	207	U	2,4-Dinitrotoluene	104	U
2-Chlorophenol	207	U	Diethylphthalate	519	U
1,3-Dichlorobenzene	207	U	**Fluorene**	**21**	**J**
1,4-Dichlorobenzene	104	U	4-Chlorophenyl-Phenylether	104	U
1,2-Dichlorobenzene	104	U	4-Nitroaniline	104	U
Benzyl Alcohol	104	U	4,6-Dinitro-2-Methylphenol	1040	UJ
2-Methylphenol	104	U	N-Nitrosodiphenylamine	104	U
2,2'-Oxybis[1-chloropropane]	104	U	1,2-Diphenylhydrazine	104	U
N-Nitroso-Di-N-Propylamine	104	U	4-Bromophenyl-Phenylether	104	U
4-Methylphenol	**63**	**J**	Hexachlorobenzene	104	U
Hexachloroethane	104	U	Pentachlorophenol	519	UJ
Nitrobenzene	104	U	**Phenanthrene**	**87**	**J**
Isophorone	104	U	**Anthracene**	**51**	**J**
2-Nitrophenol	519	U	Caffeine	104	U
2,4-Dimethylphenol	104	U	**Carbazole**	**15**	**J**
Bis(2-Chloroethoxy)Methane	104	U	Di-N-Butylphthalate	104	UJ
Benzoic Acid	~~3700~~	~~J~~ Rej	**Fluoranthene**	**199**	
2,4-Dichlorophenol	104	U	Benzidine	4150	UJ
1,2,4-Trichlorobenzene	104	U	**Pyrene**	**279**	
Naphthalene	**46**	**J**	**Retene**	**100**	**J**
4-Chloroaniline	104	U	Butylbenzylphthalate	519	U
Hexachlorobutadiene	104	U	Benzo(a)anthracene	104	U
4-Chloro-3-Methylphenol	104	U	3,3'-Dichlorobenzidine	2070	U
2-Methylnaphthalene	**19**	**J**	**Chrysene**	**113**	
1-Methylnaphthalene	**10**	**J**	Bis(2-Ethylhexyl) Phthalate	213	UJ
Hexachlorocyclopentadiene	104	U	Di-N-Octyl Phthalate	207	U
2,4,6-Trichlorophenol	519	U	**Benzo(b)fluoranthene**	**210**	
2,4,5-Trichlorophenol	104	U	**Benzo(k)fluoranthene**	**64**	**J**
2-Chloronaphthalene	104	U	**Benzo(a)pyrene**	**81**	**J**
2-Nitroaniline	519	U	**3B-Coprostanol**	**1080**	
Dimethylphthalate	104	U	**Indeno(1,2,3-cd)pyrene**	**227**	**J**
2,6-Dinitrotoluene	207	U	Dibenzo(a,h)anthracene	207	U
Acenaphthylene	**14**	**J**	**Benzo(ghi)perylene**	**111**	
3-Nitroaniline	207	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248082 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-3 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	80	%
D5-Phenol	95	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	36	%
D5-Nitrobenzene	32	%
2-Fluorobiphenyl	75	%
D10-Pyrene	90	%
D14-Terphenyl	90	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248083 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-4 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	517	UJ	Acenaphthene	103	U
Pyridine	517	U	2,4-Dinitrophenol	2070	UJ
Aniline	103	U	4-Nitrophenol	517	U
Phenol	103	UJ	**Dibenzofuran**	**17**	**J**
Bis(2-Chloroethyl)Ether	207	U	2,4-Dinitrotoluene	103	U
2-Chlorophenol	207	U	Diethylphthalate	517	U
1,3-Dichlorobenzene	207	U	**Fluorene**	**15**	**J**
1,4-Dichlorobenzene	103	U	4-Chlorophenyl-Phenylether	103	U
1,2-Dichlorobenzene	103	U	4-Nitroaniline	103	U
Benzyl Alcohol	103	U	4,6-Dinitro-2-Methylphenol	1030	UJ
2-Methylphenol	**2.7**	**J**	N-Nitrosodiphenylamine	103	U
2,2'-Oxybis[1-chloropropane]	103	U	1,2-Diphenylhydrazine	103	U
N-Nitroso-Di-N-Propylamine	103	U	4-Bromophenyl-Phenylether	103	U
4-Methylphenol	**55**	**J**	Hexachlorobenzene	103	U
Hexachloroethane	103	U	Pentachlorophenol	517	UJ
Nitrobenzene	103	U	**Phenanthrene**	**84**	**J**
Isophorone	103	U	**Anthracene**	**49**	**J**
2-Nitrophenol	517	U	Caffeine	103	U
2,4-Dimethylphenol	103	U	Carbazole	103	U
Bis(2-Chloroethoxy)Methane	103	U	**Di-N-Butylphthalate**	**1100**	
Benzoic Acid	**3690**	**J** Rej	**Fluoranthene**	**186**	
2,4-Dichlorophenol	103	U	Benzidine	4140	UJ
1,2,4-Trichlorobenzene	103	U	**Pyrene**	**278**	
Naphthalene	**42**	**J**	**Retene**	**144**	
4-Chloroaniline	103	U	**Butylbenzylphthalate**	**27**	**J**
Hexachlorobutadiene	103	U	Benzo(a)anthracene	103	U
4-Chloro-3-Methylphenol	103	U	3,3'-Dichlorobenzidine	2070	U
2-Methylnaphthalene	**17**	**J**	**Chrysene**	**140**	
1-Methylnaphthalene	**10**	**J**	Bis(2-Ethylhexyl) Phthalate	283	UJ
Hexachlorocyclopentadiene	103	U	Di-N-Octyl Phthalate	207	U
2,4,6-Trichlorophenol	517	U	**Benzo(b)fluoranthene**	**197**	
2,4,5-Trichlorophenol	103	U	**Benzo(k)fluoranthene**	**65**	**J**
2-Chloronaphthalene	103	U	**Benzo(a)pyrene**	**94**	**J**
2-Nitroaniline	517	U	**3B-Coprostanol**	**1040**	
Dimethylphthalate	103	U	**Indeno(1,2,3-cd)pyrene**	**234**	**J**
2,6-Dinitrotoluene	207	U	**Dibenzo(a,h)anthracene**	**193**	**J**
Acenaphthylene	**17**	**J**	**Benzo(ghi)perylene**	**124**	
3-Nitroaniline	207	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248083 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-4 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	76	%
D5-Phenol	90	%
D4-2-Chlorophenol	74	%
1,2-Dichlorobenzene-D4	46	%
D5-Nitrobenzene	43	%
2-Fluorobiphenyl	79	%
D10-Pyrene	96	%
D14-Terphenyl	94	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248084 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-4A **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	523	UJ	Acenaphthene	104	U
Pyridine	523	U	2,4-Dinitrophenol	2090	UJ
Aniline	104	U	4-Nitrophenol	523	U
Phenol	104	UJ	**Dibenzofuran**	**16**	**J**
Bis(2-Chloroethyl)Ether	209	U	2,4-Dinitrotoluene	104	U
2-Chlorophenol	209	U	Diethylphthalate	523	U
1,3-Dichlorobenzene	209	U	**Fluorene**	**18**	**J**
1,4-Dichlorobenzene	104	U	4-Chlorophenyl-Phenylether	104	U
1,2-Dichlorobenzene	104	U	4-Nitroaniline	104	U
Benzyl Alcohol	104	U	4,6-Dinitro-2-Methylphenol	1040	UJ
2-Methylphenol	104	U	N-Nitrosodiphenylamine	104	U
2,2'-Oxybis[1-chloropropane]	104	U	1,2-Diphenylhydrazine	104	U
N-Nitroso-Di-N-Propylamine	104	U	4-Bromophenyl-Phenylether	104	U
4-Methylphenol	**52**	**J**	Hexachlorobenzene	104	U
Hexachloroethane	104	U	Pentachlorophenol	523	UJ
Nitrobenzene	104	U	**Phenanthrene**	**105**	
Isophorone	104	U	**Anthracene**	**64**	**J**
2-Nitrophenol	523	U	Caffeine	104	U
2,4-Dimethylphenol	104	U	**Carbazole**	**20**	**J**
Bis(2-Chloroethoxy)Methane	104	U	Di-N-Butylphthalate	130	UJ
Benzoic Acid	**3640**	**J**	**Fluoranthene**	**424**	
2,4-Dichlorophenol	104	U	Benzidine	4180	UJ
1,2,4-Trichlorobenzene	104	U	**Pyrene**	**423**	
Naphthalene	**40**	**J**	**Retene**	**111**	
4-Chloroaniline	104	U	Butylbenzylphthalate	523	U
Hexachlorobutadiene	104	U	**Benzo(a)anthracene**	**140**	
4-Chloro-3-Methylphenol	104	U	3,3'-Dichlorobenzidine	2090	U
2-Methylnaphthalene	**17**	**J**	**Chrysene**	**190**	
1-Methylnaphthalene	**10**	**J**	Bis(2-Ethylhexyl) Phthalate	214	UJ
Hexachlorocyclopentadiene	104	U	Di-N-Octyl Phthalate	209	U
2,4,6-Trichlorophenol	523	U	**Benzo(b)fluoranthene**	**237**	
2,4,5-Trichlorophenol	104	U	**Benzo(k)fluoranthene**	**99**	**J**
2-Chloronaphthalene	104	U	**Benzo(a)pyrene**	**106**	
2-Nitroaniline	523	U	**3B-Coprostanol**	**1040**	
Dimethylphthalate	104	U	**Indeno(1,2,3-cd)pyrene**	**242**	**J**
2,6-Dinitrotoluene	209	U	**Dibenzo(a,h)anthracene**	**201**	**J**
Acenaphthylene	**17**	**J**	**Benzo(ghi)perylene**	**137**	
3-Nitroaniline	209	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248084 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-4A **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	72	%
D5-Phenol	87	%
D4-2-Chlorophenol	70	%
1,2-Dichlorobenzene-D4	40	%
D5-Nitrobenzene	30	%
2-Fluorobiphenyl	78	%
D10-Pyrene	94	%
D14-Terphenyl	92	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248085 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-5 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	593	UJ	Acenaphthene	119	U
Pyridine	593	U	2,4-Dinitrophenol	2370	UJ
Aniline	237	U	4-Nitrophenol	593	U
Phenol	130	UJ	**Dibenzofuran**	**10**	**J**
Bis(2-Chloroethyl)Ether	237	U	2,4-Dinitrotoluene	119	U
2-Chlorophenol	237	U	Diethylphthalate	593	U
1,3-Dichlorobenzene	237	U	**Fluorene**	**11**	**J**
1,4-Dichlorobenzene	119	U	4-Chlorophenyl-Phenylether	119	U
1,2-Dichlorobenzene	119	U	4-Nitroaniline	119	U
Benzyl Alcohol	119	U	4,6-Dinitro-2-Methylphenol	1190	UJ
2-Methylphenol	119	U	N-Nitrosodiphenylamine	119	U
2,2'-Oxybis[1-chloropropane]	119	U	1,2-Diphenylhydrazine	119	U
N-Nitroso-Di-N-Propylamine	119	U	4-Bromophenyl-Phenylether	119	U
4-Methylphenol	**76**	**J**	Hexachlorobenzene	119	U
Hexachloroethane	119	U	Pentachlorophenol	593	UJ
Nitrobenzene	119	U	**Phenanthrene**	**64**	**J**
Isophorone	119	U	**Anthracene**	**37**	**J**
2-Nitrophenol	593	U	Caffeine	119	U
2,4-Dimethylphenol	119	U	Carbazole	119	U
Bis(2-Chloroethoxy)Methane	119	U	**Di-N-Butylphthalate**	**1640**	
Benzoic Acid	~~4190~~	~~J~~ R	**Fluoranthene**	**168**	
2,4-Dichlorophenol	119	U	Benzidine	4750	UJ
1,2,4-Trichlorobenzene	119	U	**Pyrene**	**213**	
Naphthalene	**24**	**J**	**Retene**	**111**	**J**
4-Chloroaniline	119	U	Butylbenzylphthalate	593	U
Hexachlorobutadiene	119	U	**Benzo(a)anthracene**	**78**	**J**
4-Chloro-3-Methylphenol	119	U	3,3'-Dichlorobenzidine	2370	U
2-Methylnaphthalene	**12**	**J**	**Chrysene**	**96**	**J**
1-Methylnaphthalene	**4.2**	**J**	Bis(2-Ethylhexyl) Phthalate	219	UJ
Hexachlorocyclopentadiene	119	U	Di-N-Octyl Phthalate	237	U
2,4,6-Trichlorophenol	593	U	**Benzo(b)fluoranthene**	**151**	
2,4,5-Trichlorophenol	119	U	**Benzo(k)fluoranthene**	**47**	**J**
2-Chloronaphthalene	119	U	**Benzo(a)pyrene**	**70**	**J**
2-Nitroaniline	593	U	**3B-Coprostanol**	**1310**	
Dimethylphthalate	119	U	**Indeno(1,2,3-cd)pyrene**	**242**	**J**
2,6-Dinitrotoluene	237	U	**Dibenzo(a,h)anthracene**	**220**	**J**
Acenaphthylene	119	U	**Benzo(ghi)perylene**	**113**	**J**
3-Nitroaniline	237	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248085 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-5 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	78	%
D5-Phenol	91	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	44	%
D5-Nitrobenzene	39	%
2-Fluorobiphenyl	79	%
D10-Pyrene	87	%
D14-Terphenyl	87	%

Authorized By: D. H. Release Date: 9/27/98

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248086 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-6 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	584	UJ	**Acenaphthene**	**11**	**J**
Pyridine	584	U	2,4-Dinitrophenol	2340	UJ
Aniline	117	U	4-Nitrophenol	584	U
Phenol	102	UJ	**Dibenzofuran**	**18**	**J**
Bis(2-Chloroethyl)Ether	234	U	2,4-Dinitrotoluene	117	U
2-Chlorophenol	234	U	Diethylphthalate	584	U
1,3-Dichlorobenzene	234	U	**Fluorene**	**19**	**J**
1,4-Dichlorobenzene	117	U	4-Chlorophenyl-Phenylether	117	U
1,2-Dichlorobenzene	117	U	4-Nitroaniline	117	U
Benzyl Alcohol	117	U	4,6-Dinitro-2-Methylphenol	1170	UJ
2-Methylphenol	117	U	N-Nitrosodiphenylamine	117	U
2,2'-Oxybis[1-chloropropane]	117	U	1,2-Diphenylhydrazine	117	U
N-Nitroso-Di-N-Propylamine	117	U	4-Bromophenyl-Phenylether	117	U
4-Methylphenol	**212**		Hexachlorobenzene	117	U
Hexachloroethane	117	U	Pentachlorophenol	584	UJ
Nitrobenzene	117	U	**Phenanthrene**	**99**	**J**
Isophorone	117	U	**Anthracene**	**58**	**J**
2-Nitrophenol	584	U	Caffeine	117	U
2,4-Dimethylphenol	117	U	**Carbazole**	**24**	**J**
Bis(2-Chloroethoxy)Methane	117	U	**Di-N-Butylphthalate**	**3220**	
Benzoic Acid	~~4170~~	~~J~~ RJ	**Fluoranthene**	**224**	
2,4-Dichlorophenol	117	U	Benzidine	4670	UJ
1,2,4-Trichlorobenzene	117	U	**Pyrene**	**314**	
Naphthalene	**36**	**J**	**Retene**	**105**	**J**
4-Chloroaniline	117	U	**Butylbenzylphthalate**	**40**	**J**
Hexachlorobutadiene	117	U	Benzo(a)anthracene	117	U
4-Chloro-3-Methylphenol	117	U	3,3'-Dichlorobenzidine	2340	U
2-Methylnaphthalene	**16**	**J**	**Chrysene**	**170**	
1-Methylnaphthalene	**8.3**	**J**	Bis(2-Ethylhexyl) Phthalate	272	UJ
Hexachlorocyclopentadiene	117	U	Di-N-Octyl Phthalate	234	U
2,4,6-Trichlorophenol	584	U	**Benzo(b)fluoranthene**	**238**	
2,4,5-Trichlorophenol	117	U	**Benzo(k)fluoranthene**	**62**	**J**
2-Chloronaphthalene	117	U	**Benzo(a)pyrene**	**117**	
2-Nitroaniline	584	U	**3B-Coprostanol**	**1460**	
Dimethylphthalate	117	U	**Indeno(1,2,3-cd)pyrene**	**252**	**J**
2,6-Dinitrotoluene	234	U	**Dibenzo(a,h)anthracene**	**218**	**J**
Acenaphthylene	**15**	**J**	**Benzo(ghi)perylene**	**127**	
3-Nitroaniline	234	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248086 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: MW-6 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	76	%
D5-Phenol	90	%
D4-2-Chlorophenol	74	%
1,2-Dichlorobenzene-D4	35	%
D5-Nitrobenzene	32	%
2-Fluorobiphenyl	75	%
D10-Pyrene	91	%
D14-Terphenyl	90	%

Authorized By: _____ Release Date: 9/27/98

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248087 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: REF **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	458	UJ	Acenaphthene	92	U
Pyridine	458	U	2,4-Dinitrophenol	1830	UJ
Aniline	92	U	4-Nitrophenol	458	U
Phenol	100	UJ	**Dibenzofuran**	**7.2**	**J**
Bis(2-Chloroethyl)Ether	183	U	2,4-Dinitrotoluene	92	U
2-Chlorophenol	183	U	Diethylphthalate	458	U
1,3-Dichlorobenzene	183	U	**Fluorene**	**3.7**	**J**
1,4-Dichlorobenzene	92	U	4-Chlorophenyl-Phenylether	92	U
1,2-Dichlorobenzene	92	U	4-Nitroaniline	92	U
Benzyl Alcohol	92	U	4,6-Dinitro-2-Methylphenol	916	UJ
2-Methylphenol	92	U	N-Nitrosodiphenylamine	92	U
2,2'-Oxybis[1-chloropropane]	92	U	1,2-Diphenylhydrazine	92	U
N-Nitroso-Di-N-Propylamine	92	U	4-Bromophenyl-Phenylether	92	U
4-Methylphenol	92	U	Hexachlorobenzene	92	U
Hexachloroethane	92	U	Pentachlorophenol	458	UJ
Nitrobenzene	92	U	**Phenanthrene**	**37**	**J**
Isophorone	92	U	**Anthracene**	**11**	**J**
2-Nitrophenol	458	U	Caffeine	92	U
2,4-Dimethylphenol	92	U	Carbazole	92	U
Bis(2-Chloroethoxy)Methane	92	U	Di-N-Butylphthalate	206	UJ
Benzoic Acid	~~3220~~	~~J~~ Rej	**Fluoranthene**	**81**	**J**
2,4-Dichlorophenol	92	U	Benzidine	3660	UJ
1,2,4-Trichlorobenzene	92	U	**Pyrene**	**71**	**J**
Naphthalene	**23**	**J**	**Retene**	**112**	
4-Chloroaniline	92	U	Butylbenzylphthalate	458	U
Hexachlorobutadiene	92	U	Benzo(a)anthracene	92	U
4-Chloro-3-Methylphenol	92	U	3,3'-Dichlorobenzidine	1830	U
2-Methylnaphthalene	**9**	**J**	**Chrysene**	**43**	**J**
1-Methylnaphthalene	**6.4**	**J**	Bis(2-Ethylhexyl) Phthalate	103	UJ
Hexachlorocyclopentadiene	92	U	Di-N-Octyl Phthalate	183	U
2,4,6-Trichlorophenol	458	U	**Benzo(b)fluoranthene**	**74**	**J**
2,4,5-Trichlorophenol	92	U	**Benzo(k)fluoranthene**	**28**	**J**
2-Chloronaphthalene	92	U	**Benzo(a)pyrene**	**26**	**J**
2-Nitroaniline	458	U	3B-Coprostanol	804	U
Dimethylphthalate	92	U	**Indeno(1,2,3-cd)pyrene**	**181**	**J**
2,6-Dinitrotoluene	183	U	Dibenzo(a,h)anthracene	183	U
Acenaphthylene	**7.5**	**J**	**Benzo(ghi)perylene**	**85**	**J**
3-Nitroaniline	183	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248087 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: REF **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	76	%
D5-Phenol	87	%
D4-2-Chlorophenol	73	%
1,2-Dichlorobenzene-D4	37	%
D5-Nitrobenzene	60	%
2-Fluorobiphenyl	76	%
D10-Pyrene	91	%
D14-Terphenyl	90	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248088 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	221	UJ	**Acenaphthene**	**42**	**J**
Pyridine	221	U	2,4-Dinitrophenol	884	UJ
Aniline	44	U	4-Nitrophenol	221	U
Phenol	166	UJ	**Dibenzofuran**	**75**	
Bis(2-Chloroethyl)Ether	88	U	2,4-Dinitrotoluene	44	U
2-Chlorophenol	88	U	Diethylphthalate	221	U
1,3-Dichlorobenzene	88	U	**Fluorene**	**53**	
1,4-Dichlorobenzene	44	U	4-Chlorophenyl-Phenylether	44	U
1,2-Dichlorobenzene	**25**	**J**	4-Nitroaniline	44	U
Benzyl Alcohol	44	U	4,6-Dinitro-2-Methylphenol	442	UJ
2-Methylphenol	44	U	N-Nitrosodiphenylamine	44	U
2,2'-Oxybis[1-chloropropane]	44	U	1,2-Diphenylhydrazine	44	U
N-Nitroso-Di-N-Propylamine	44	U	4-Bromophenyl-Phenylether	44	U
4-Methylphenol	**210**		Hexachlorobenzene	44	U
Hexachloroethane	44	U	**Pentachlorophenol**	**124**	**J**
Nitrobenzene	44	U	**Phenanthrene**	**288**	
Isophorone	44	U	**Anthracene**	**65**	
2-Nitrophenol	221	U	Caffeine	44	U
2,4-Dimethylphenol	44	U	**Carbazole**	**36**	**J**
Bis(2-Chloroethoxy)Methane	44	U	**Di-N-Butylphthalate**	**1030**	
Benzoic Acid	~~1650~~	~~J~~ Rej	**Fluoranthene**	**400**	
2,4-Dichlorophenol	44	U	Benzidine	1770	UJ
1,2,4-Trichlorobenzene	44	U	**Pyrene**	**393**	
Naphthalene	**186**		**Retene**	**369**	
4-Chloroaniline	44	U	**Butylbenzylphthalate**	**56**	**J**
Hexachlorobutadiene	44	U	Benzo(a)anthracene	44	U
4-Chloro-3-Methylphenol	44	U	3,3'-Dichlorobenzidine	884	U
2-Methylnaphthalene	**72**		**Chrysene**	**152**	
1-Methylnaphthalene	**45**		**Bis(2-Ethylhexyl) Phthalate**	**490**	
Hexachlorocyclopentadiene	44	U	**Di-N-Octyl Phthalate**	**91**	
2,4,6-Trichlorophenol	221	U	**Benzo(b)fluoranthene**	**160**	
2,4,5-Trichlorophenol	44	U	**Benzo(k)fluoranthene**	**54**	
2-Chloronaphthalene	44	U	**Benzo(a)pyrene**	**94**	
2-Nitroaniline	221	U	**3B-Coprostanol**	**423**	
Dimethylphthalate	44	U	**Indeno(1,2,3-cd)pyrene**	**131**	**J**
2,6-Dinitrotoluene	88	U	**Dibenzo(a,h)anthracene**	**93**	
Acenaphthylene	**26**	**J**	**Benzo(ghi)perylene**	**91**	
3-Nitroaniline	88	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248088 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	79	%
D5-Phenol	93	%
D4-2-Chlorophenol	78	%
1,2-Dichlorobenzene-D4	44	%
D5-Nitrobenzene	70	%
2-Fluorobiphenyl	76	%
D10-Pyrene	88	%
D14-Terphenyl	89	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248090 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	216	UJ	**Acenaphthene**	**63**	
Pyridine	216	U	2,4-Dinitrophenol	864	UJ
Aniline	43	U	4-Nitrophenol	216	U
Phenol	114	UJ	**Dibenzofuran**	**41**	**J**
Bis(2-Chloroethyl)Ether	86	U	2,4-Dinitrotoluene	43	U
2-Chlorophenol	86	U	Diethylphthalate	216	U
1,3-Dichlorobenzene	86	U	**Fluorene**	**64**	
1,4-Dichlorobenzene	43	U	4-Chlorophenyl-Phenylether	43	U
1,2-Dichlorobenzene	43	U	4-Nitroaniline	43	U
Benzyl Alcohol	43	U	4,6-Dinitro-2-Methylphenol	432	UJ
2-Methylphenol	43	U	N-Nitrosodiphenylamine	43	U
2,2'-Oxybis[1-chloropropane]	43	U	1,2-Diphenylhydrazine	43	U
N-Nitroso-Di-N-Propylamine	43	U	4-Bromophenyl-Phenylether	43	U
4-Methylphenol	**158**		Hexachlorobenzene	43	U
Hexachloroethane	43	U	**Pentachlorophenol**	**134**	**J**
Nitrobenzene	43	U	**Phenanthrene**	**403**	
Isophorone	43	U	**Anthracene**	**142**	
2-Nitrophenol	216	U	Caffeine	43	U
2,4-Dimethylphenol	43	U	**Carbazole**	**43**	
Bis(2-Chloroethoxy)Methane	43	U	Di-N-Butylphthalate	134	UJ
Benzoic Acid	~~1550~~	~~J~~ Rej	**Fluoranthene**	**753**	
2,4-Dichlorophenol	43	U	Benzidine	1730	UJ
1,2,4-Trichlorobenzene	43	U	**Pyrene**	**843**	
Naphthalene	**140**		**Retene**	**158**	
4-Chloroaniline	43	U	**Butylbenzylphthalate**	**77**	**J**
Hexachlorobutadiene	43	U	**Benzo(a)anthracene**	**315**	
4-Chloro-3-Methylphenol	43	U	3,3'-Dichlorobenzidine	864	U
2-Methylnaphthalene	**54**		**Chrysene**	**383**	
1-Methylnaphthalene	**27**	**J**	**Bis(2-Ethylhexyl) Phthalate**	**1430**	
Hexachlorocyclopentadiene	43	U	**Di-N-Octyl Phthalate**	**77**	**J**
2,4,6-Trichlorophenol	216	U	**Benzo(b)fluoranthene**	**465**	
2,4,5-Trichlorophenol	43	U	**Benzo(k)fluoranthene**	**189**	
2-Chloronaphthalene	43	U	**Benzo(a)pyrene**	**343**	
2-Nitroaniline	216	U	**3B-Coprostanol**	**532**	
Dimethylphthalate	43	U	**Indeno(1,2,3-cd)pyrene**	**270**	
2,6-Dinitrotoluene	86	U	**Dibenzo(a,h)anthracene**	**125**	
Acenaphthylene	**28**	**J**	**Benzo(ghi)perylene**	**214**	
3-Nitroaniline	86	U			

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Analysis Report for

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Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248090 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	81	%
D5-Phenol	95	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	51	%
D5-Nitrobenzene	44	%
2-Fluorobiphenyl	76	%
D10-Pyrene	84	%
D14-Terphenyl	83	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248091 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: FIDO1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	352	UJ	**Acenaphthene**	**46**	**J**
Pyridine	352	U	2,4-Dinitrophenol	1410	UJ
Aniline	71	U	4-Nitrophenol	352	U
Phenol	267	UJ	**Dibenzofuran**	**42**	**J**
Bis(2-Chloroethyl)Ether	141	U	2,4-Dinitrotoluene	71	U
2-Chlorophenol	141	U	Diethylphthalate	352	U
1,3-Dichlorobenzene	141	U	**Fluorene**	**86**	
1,4-Dichlorobenzene	**49**	**J**	4-Chlorophenyl-Phenylether	71	U
1,2-Dichlorobenzene	71	U	4-Nitroaniline	71	U
Benzyl Alcohol	71	U	4,6-Dinitro-2-Methylphenol	705	UJ
2-Methylphenol	71	U	N-Nitrosodiphenylamine	71	UJ
2,2'-Oxybis[1-chloropropane]	71	U	1,2-Diphenylhydrazine	71	U
N-Nitroso-Di-N-Propylamine	71	U	4-Bromophenyl-Phenylether	71	U
4-Methylphenol	**155**		Hexachlorobenzene	71	U
Hexachloroethane	71	U	Pentachlorophenol	259	U
Nitrobenzene	71	U	**Phenanthrene**	**526**	
Isophorone	71	U	**Anthracene**	**394**	
2-Nitrophenol	352	U	Caffeine	71	U
2,4-Dimethylphenol	71	U	**Carbazole**	**134**	
Bis(2-Chloroethoxy)Methane	71	U	Di-N-Butylphthalate	659	UJ
Benzoic Acid	~~2550~~	~~J~~ Rej	**Fluoranthene**	**5500**	
2,4-Dichlorophenol	71	U	Benzidine	2820	UJ
1,2,4-Trichlorobenzene	71	U	**Pyrene**	**4250**	
Naphthalene	**41**	**J**	**Retene**	**819**	
4-Chloroaniline	**387**		**Butylbenzylphthalate**	**352**	**J**
Hexachlorobutadiene	71	U	**Benzo(a)anthracene**	**1100**	
4-Chloro-3-Methylphenol	71	U	3,3'-Dichlorobenzidine	1410	U
2-Methylnaphthalene	**37**	**J**	**Chrysene**	**2180**	
1-Methylnaphthalene	**19**	**J**	**Bis(2-Ethylhexyl) Phthalate**	**6690**	**E**
Hexachlorocyclopentadiene	71	U	**Di-N-Octyl Phthalate**	**254**	
2,4,6-Trichlorophenol	352	U	**Benzo(b)fluoranthene**	**1540**	
2,4,5-Trichlorophenol	71	U	**Benzo(k)fluoranthene**	**587**	
2-Chloronaphthalene	71	U	**Benzo(a)pyrene**	**598**	
2-Nitroaniline	352	U	**3B-Coprostanol**	**3060**	
Dimethylphthalate	**231**		**Indeno(1,2,3-cd)pyrene**	**465**	
2,6-Dinitrotoluene	141	U	Dibenzo(a,h)anthracene	141	U
Acenaphthylene	**114**		**Benzo(ghi)perylene**	**356**	
3-Nitroaniline	141	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248091 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: FIDO1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	88	%
D5-Phenol	101	%
D4-2-Chlorophenol	84	%
1,2-Dichlorobenzene-D4	56	%
D5-Nitrobenzene	61	%
2-Fluorobiphenyl	87	%
D10-Pyrene	106	%
D14-Terphenyl	103	%

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248092 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: PD-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	649	UJ	**Acenaphthene**	**87**	**J**
Pyridine	649	U	2,4-Dinitrophenol	2600	UJ
Aniline	130	U	4-Nitrophenol	649	U
Phenol	176	UJ	**Dibenzofuran**	**88**	**J**
Bis(2-Chloroethyl)Ether	260	U	2,4-Dinitrotoluene	130	U
2-Chlorophenol	260	U	Diethylphthalate	649	U
1,3-Dichlorobenzene	260	U	**Fluorene**	**108**	**J**
1,4-Dichlorobenzene	130	U	4-Chlorophenyl-Phenylether	130	U
1,2-Dichlorobenzene	130	U	4-Nitroaniline	130	U
Benzyl Alcohol	130	U	4,6-Dinitro-2-Methylphenol	1300	UJ
2-Methylphenol	130	U	N-Nitrosodiphenylamine	130	U
2,2'-Oxybis[1-chloropropane]	130	U	1,2-Diphenylhydrazine	130	U
N-Nitroso-Di-N-Propylamine	130	U	4-Bromophenyl-Phenylether	130	U
4-Methylphenol	**304**		Hexachlorobenzene	130	U
Hexachloroethane	130	U	Pentachlorophenol	649	UJ
Nitrobenzene	130	U	**Phenanthrene**	**400**	
Isophorone	130	U	**Anthracene**	**211**	
2-Nitrophenol	649	U	Caffeine	130	U
2,4-Dimethylphenol	130	U	**Carbazole**	**49**	**J**
Bis(2-Chloroethoxy)Methane	130	U	**Di-N-Butylphthalate**	**2950**	
Benzoic Acid	~~4670~~	~~J~~ Rej	**Fluoranthene**	**935**	
2,4-Dichlorophenol	130	U	Benzidine	5190	UJ
1,2,4-Trichlorobenzene	130	U	**Pyrene**	**1210**	
Naphthalene	**52**	**J**	**Retene**	**102**	**J**
4-Chloroaniline	130	U	Butylbenzylphthalate	130	U
Hexachlorobutadiene	130	U	**Benzo(a)anthracene**	**526**	
4-Chloro-3-Methylphenol	130	U	3,3'-Dichlorobenzidine	2600	U
2-Methylnaphthalene	**32**	**J**	**Chrysene**	**548**	
1-Methylnaphthalene	**16**	**J**	Bis(2-Ethylhexyl) Phthalate	451	UJ
Hexachlorocyclopentadiene	130	U	Di-N-Octyl Phthalate	260	U
2,4,6-Trichlorophenol	649	U	**Benzo(b)fluoranthene**	**620**	
2,4,5-Trichlorophenol	130	U	**Benzo(k)fluoranthene**	**232**	
2-Chloronaphthalene	130	U	**Benzo(a)pyrene**	**316**	
2-Nitroaniline	649	U	**3B-Coprostanol**	**1750**	
Dimethylphthalate	130	U	**Indeno(1,2,3-cd)pyrene**	**351**	**J**
2,6-Dinitrotoluene	260	U	**Dibenzo(a,h)anthracene**	**261**	
Acenaphthylene	**31**	**J**	**Benzo(ghi)perylene**	**194**	
3-Nitroaniline	260	U			

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Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248092 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: PD-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	78	%
D5-Phenol	97	%
D4-2-Chlorophenol	79	%
1,2-Dichlorobenzene-D4	44	%
D5-Nitrobenzene	43	%
2-Fluorobiphenyl	81	%
D10-Pyrene	89	%
D14-Terphenyl	88	%

Authorized By: _____ Release Date: 9/27/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248093 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: WB1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	257	UJ	**Acenaphthene**	**31**	**J**
Pyridine	257	U	2,4-Dinitrophenol	1030	UJ
Aniline	51	U	4-Nitrophenol	257	U
Phenol	154	UJ	**Dibenzofuran**	**43**	**J**
Bis(2-Chloroethyl)Ether	103	U	2,4-Dinitrotoluene	51	U
2-Chlorophenol	103	U	Diethylphthalate	257	U
1,3-Dichlorobenzene	103	U	**Fluorene**	**48**	**J**
1,4-Dichlorobenzene	51	U	4-Chlorophenyl-Phenylether	51	U
1,2-Dichlorobenzene	51	U	4-Nitroaniline	51	U
Benzyl Alcohol	51	U	4,6-Dinitro-2-Methylphenol	514	UJ
2-Methylphenol	51	U	N-Nitrosodiphenylamine	51	U
2,2'-Oxybis[1-chloropropane]	51	U	1,2-Diphenylhydrazine	51	U
N-Nitroso-Di-N-Propylamine	51	U	4-Bromophenyl-Phenylether	51	U
4-Methylphenol	**123**		Hexachlorobenzene	51	U
Hexachloroethane	51	U	**Pentachlorophenol**	**127**	**J**
Nitrobenzene	51	U	**Phenanthrene**	**242**	
Isophorone	**15**	**J**	**Anthracene**	**152**	
2-Nitrophenol	257	U	Caffeine	51	U
2,4-Dimethylphenol	51	U	**Carbazole**	**44**	**J**
Bis(2-Chloroethoxy)Methane	51	U	Di-N-Butylphthalate	118	UJ
Benzoic Acid	~~1900~~	~~J~~ Rej	**Fluoranthene**	**802**	
2,4-Dichlorophenol	51	U	Benzidine	2060	UJ
1,2,4-Trichlorobenzene	51	U	**Pyrene**	**1030**	
Naphthalene	**62**		**Retene**	**160**	
4-Chloroaniline	51	U	Butylbenzylphthalate	257	U
Hexachlorobutadiene	51	U	**Benzo(a)anthracene**	**334**	
4-Chloro-3-Methylphenol	51	U	3,3'-Dichlorobenzidine	1030	U
2-Methylnaphthalene	**31**	**J**	**Chrysene**	**586**	
1-Methylnaphthalene	**18**	**J**	Bis(2-Ethylhexyl) Phthalate	336	UJ
Hexachlorocyclopentadiene	51	U	Di-N-Octyl Phthalate	103	U
2,4,6-Trichlorophenol	257	U	**Benzo(b)fluoranthene**	**605**	
2,4,5-Trichlorophenol	51	U	**Benzo(k)fluoranthene**	**223**	
2-Chloronaphthalene	51	U	**Benzo(a)pyrene**	**279**	
2-Nitroaniline	257	U	**3B-Coprostanol**	**1020**	
Dimethylphthalate	**54**		**Indeno(1,2,3-cd)pyrene**	**237**	**J**
2,6-Dinitrotoluene	103	U	**Dibenzo(a,h)anthracene**	**125**	
Acenaphthylene	**48**	**J**	**Benzo(ghi)perylene**	**166**	
3-Nitroaniline	103	U			

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248093 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: WB1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	77	%
D5-Phenol	88	%
D4-2-Chlorophenol	71	%
1,2-Dichlorobenzene-D4	41	%
D5-Nitrobenzene	49	%
2-Fluorobiphenyl	75	%
D10-Pyrene	84	%
D14-Terphenyl	84	%

Authorized By: D. Norton Release Date: 9/27/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: WB2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	256	UJ	**Acenaphthene**	**39**	**J**
Pyridine	256	U	2,4-Dinitrophenol	1020	UJ
Aniline	51	U	4-Nitrophenol	256	U
Phenol	122	UJ	**Dibenzofuran**	**52**	
Bis(2-Chloroethyl)Ether	102	U	2,4-Dinitrotoluene	51	U
2-Chlorophenol	102	U	Diethylphthalate	256	U
1,3-Dichlorobenzene	102	U	**Fluorene**	**47**	**J**
1,4-Dichlorobenzene	51	U	4-Chlorophenyl-Phenylether	51	U
1,2-Dichlorobenzene	51	U	4-Nitroaniline	51	U
Benzyl Alcohol	51	U	4,6-Dinitro-2-Methylphenol	512	UJ
2-Methylphenol	51	U	N-Nitrosodiphenylamine	51	U
2,2'-Oxybis[1-chloropropane]	51	U	1,2-Diphenylhydrazine	51	U
N-Nitroso-Di-N-Propylamine	51	U	4-Bromophenyl-Phenylether	51	U
4-Methylphenol	**135**		Hexachlorobenzene	51	U
Hexachloroethane	51	U	Pentachlorophenol	256	UJ
Nitrobenzene	51	U	**Phenanthrene**	**240**	
Isophorone	51	U	**Anthracene**	**142**	
2-Nitrophenol	256	U	Caffeine	51	U
2,4-Dimethylphenol	51	U	**Carbazole**	**46**	**J**
Bis(2-Chloroethoxy)Methane	51	U	Di-N-Butylphthalate	210	UJ
Benzoic Acid	~~1940~~	~~J~~ Rej	**Fluoranthene**	**784**	
2,4-Dichlorophenol	51	U	Benzidine	2050	UJ
1,2,4-Trichlorobenzene	51	U	**Pyrene**	**1190**	
Naphthalene	**107**		**Retene**	**127**	
4-Chloroaniline	51	U	Butylbenzylphthalate	751	U
Hexachlorobutadiene	51	U	**Benzo(a)anthracene**	**291**	
4-Chloro-3-Methylphenol	51	U	3,3'-Dichlorobenzidine	1020	U
2-Methylnaphthalene	**37**	**J**	**Chrysene**	**564**	
1-Methylnaphthalene	**20**	**J**	Bis(2-Ethylhexyl) Phthalate	362	UJ
Hexachlorocyclopentadiene	51	U	Di-N-Octyl Phthalate	102	U
2,4,6-Trichlorophenol	256	U	**Benzo(b)fluoranthene**	**660**	
2,4,5-Trichlorophenol	51	U	**Benzo(k)fluoranthene**	**180**	
2-Chloronaphthalene	51	U	**Benzo(a)pyrene**	**276**	
2-Nitroaniline	256	U	**3B-Coprostanol**	**740**	
Dimethylphthalate	**158**		**Indeno(1,2,3-cd)pyrene**	**244**	**J**
2,6-Dinitrotoluene	102	U	**Dibenzo(a,h)anthracene**	**136**	
Acenaphthylene	**50**	**J**	**Benzo(ghi)perylene**	**176**	
3-Nitroaniline	102	U			

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: WB2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	80	%
D5-Phenol	93	%
D4-2-Chlorophenol	74	%
1,2-Dichlorobenzene-D4	43	%
D5-Nitrobenzene	38	%
2-Fluorobiphenyl	78	%
D10-Pyrene	89	%
D14-Terphenyl	89	%

Authorized By: _____ Release Date: 9/17/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248096 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: IM1 **Date Prepared:** 06/29/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	260	UJ	**Acenaphthene**	**75**	
Pyridine	260	U	2,4-Dinitrophenol	1040	UJ
Aniline	52	U	4-Nitrophenol	260	U
Phenol	60	UJ	**Dibenzofuran**	**59**	
Bis(2-Chloroethyl)Ether	104	U	2,4-Dinitrotoluene	52	U
2-Chlorophenol	104	U	Diethylphthalate	260	U
1,3-Dichlorobenzene	104	U	**Fluorene**	**112**	
1,4-Dichlorobenzene	52	U	4-Chlorophenyl-Phenylether	52	U
1,2-Dichlorobenzene	52	U	4-Nitroaniline	52	U
Benzyl Alcohol	52	UJ	4,6-Dinitro-2-Methylphenol	521	UJ
2-Methylphenol	**9.3**	J	N-Nitrosodiphenylamine	52	U
2,2'-Oxybis[1-chloropropane]	52	U	1,2-Diphenylhydrazine	52	U
N-Nitroso-Di-N-Propylamine	52	U	4-Bromophenyl-Phenylether	52	U
4-Methylphenol	**55**		Hexachlorobenzene	52	U
Hexachloroethane	52	U	**Pentachlorophenol**	**133**	J
Nitrobenzene	52	U	**Phenanthrene**	**1940**	
Isophorone	52	U	**Anthracene**	**294**	
2-Nitrophenol	260	U	Caffeine	52	U
2,4-Dimethylphenol	52	U	**Carbazole**	**217**	
Bis(2-Chloroethoxy)Methane	52	U	Di-N-Butylphthalate	60	UJ
Benzoic Acid	~~1880~~	~~J~~ Rej	**Fluoranthene**	**3390**	
2,4-Dichlorophenol	52	U	Benzidine	2080	UJ
1,2,4-Trichlorobenzene	52	U	**Pyrene**	**2600**	
Naphthalene	**40**	J	**Retene**	**120**	
4-Chloroaniline	52	U	**Butylbenzylphthalate**	**261**	
Hexachlorobutadiene	52	U	**Benzo(a)anthracene**	**801**	
4-Chloro-3-Methylphenol	52	U	3,3'-Dichlorobenzidine	1040	U
2-Methylnaphthalene	**25**	J	**Chrysene**	**1240**	
1-Methylnaphthalene	**17**	J	**Bis(2-Ethylhexyl) Phthalate**	**1480**	
Hexachlorocyclopentadiene	52	U	**Di-N-Octyl Phthalate**	**165**	
2,4,6-Trichlorophenol	260	U	**Benzo(b)fluoranthene**	**1170**	
2,4,5-Trichlorophenol	52	U	**Benzo(k)fluoranthene**	**458**	
2-Chloronaphthalene	52	U	**Benzo(a)pyrene**	**772**	
2-Nitroaniline	260	U	**3B-Coprostanol**	**945**	
Dimethylphthalate	**18**	J	**Indeno(1,2,3-cd)pyrene**	**578**	
2,6-Dinitrotoluene	104	U	**Dibenzo(a,h)anthracene**	**208**	
Acenaphthylene	**40**	J	**Benzo(ghi)perylene**	**472**	
3-Nitroaniline	104	U			

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248096 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: IM1 **Date Prepared:** 06/29/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	88	%
D5-Phenol	100	%
D4-2-Chlorophenol	85	%
1,2-Dichlorobenzene-D4	54	%
D5-Nitrobenzene	74	%
2-Fluorobiphenyl	88	%
D10-Pyrene	95	%
D14-Terphenyl	94	%

Authorized By: D. Norton Release Date: 9/27/98 Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Lab ID: OBS8180A1 **Method:** SW8270
QC Type: Laboratory Method Blank **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/15/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	173	UJ	Acenaphthene	35	U
Pyridine	173	U	2,4-Dinitrophenol	693	U
Aniline	35	U	4-Nitrophenol	173	U
Phenol	**19**	**J**	Dibenzofuran	35	U
Bis(2-Chloroethyl)Ether	69	U	2,4-Dinitrotoluene	35	UJ
2-Chlorophenol	69	U	**Diethylphthalate**	**23**	**J**
1,3-Dichlorobenzene	69	U	Fluorene	35	U
1,4-Dichlorobenzene	35	U	4-Chlorophenyl-Phenylether	35	U
1,2-Dichlorobenzene	35	U	4-Nitroaniline	35	U
Benzyl Alcohol	35	U	4,6-Dinitro-2-Methylphenol	347	UJ
2-Methylphenol	35	U	N-Nitrosodiphenylamine	35	U
2,2'-Oxybis[1-chloropropane]	35	U	1,2-Diphenylhydrazine	35	U
N-Nitroso-Di-N-Propylamine	35	U	4-Bromophenyl-Phenylether	35	U
4-Methylphenol	**2**	**J**	Hexachlorobenzene	35	U
Hexachloroethane	35	U	Pentachlorophenol	173	UJ
Nitrobenzene	35	U	Phenanthrene	35	U
Isophorone	35	U	Anthracene	35	U
2-Nitrophenol	173	U	Caffeine	35	U
2,4-Dimethylphenol	35	U	Carbazole	35	U
Bis(2-Chloroethoxy)Methane	35	U	**Di-N-Butylphthalate**	**560**	
Benzoic Acid	~~693~~	~~UJ~~ Rej	Fluoranthene	35	U
2,4-Dichlorophenol	35	U	Benzidine	1390	UJ
1,2,4-Trichlorobenzene	35	U	Pyrene	35	U
Naphthalene	35	U	Retene	35	U
4-Chloroaniline	35	U	Butylbenzylphthalate	173	U
Hexachlorobutadiene	35	U	Benzo(a)anthracene	35	U
4-Chloro-3-Methylphenol	35	U	3,3'-Dichlorobenzidine	693	UJ
2-Methylnaphthalene	35	U	Chrysene	35	U
1-Methylnaphthalene	35	U	**Bis(2-Ethylhexyl) Phthalate**	**38**	**J**
Hexachlorocyclopentadiene	35	U	Di-N-Octyl Phthalate	69	U
2,4,6-Trichlorophenol	173	U	Benzo(b)fluoranthene	35	U
2,4,5-Trichlorophenol	35	U	Benzo(k)fluoranthene	35	U
2-Chloronaphthalene	35	U	Benzo(a)pyrene	35	U
2-Nitroaniline	173	U	3B-Coprostanol	173	U
Dimethylphthalate	35	U	Indeno(1,2,3-cd)pyrene	173	U
2,6-Dinitrotoluene	69	U	Dibenzo(a,h)anthracene	69	U
Acenaphthylene	35	U	Benzo(ghi)perylene	35	U
3-Nitroaniline	69	U			

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Lab ID: OBS8180A1
QC Type: Laboratory Method Blank
Project Officer: Dale Norton

Date Prepared: 06/29/98
Date Analyzed: 07/15/98

Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	30	%
D5-Phenol	34	%
D4-2-Chlorophenol	29	%
1,2-Dichlorobenzene-D4	25	%
D5-Nitrobenzene	33	%
2-Fluorobiphenyl	32	%
D10-Pyrene	42	%
D14-Terphenyl	43	%

Authorized By: D. Norton Release Date: 9/22/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Lab ID: OBS8180A2 **Method:** SW8270
QC Type: Laboratory Method Blank **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	525	UJ	Acenaphthene	105	U
Pyridine	525	U	2,4-Dinitrophenol	2100	UJ
Aniline	105	U	4-Nitrophenol	525	U
Phenol	**68**	**J**	Dibenzofuran	105	U
Bis(2-Chloroethyl)Ether	210	U	2,4-Dinitrotoluene	105	U
2-Chlorophenol	210	U	Diethylphthalate	525	U
1,3-Dichlorobenzene	210	U	Fluorene	105	U
1,4-Dichlorobenzene	105	U	4-Chlorophenyl-Phenylether	105	U
1,2-Dichlorobenzene	105	U	4-Nitroaniline	105	U
Benzyl Alcohol	**20**	**J**	4,6-Dinitro-2-Methylphenol	1050	UJ
2-Methylphenol	105	U	**N-Nitrosodiphenylamine**	**9.8**	**J**
2,2'-Oxybis[1-chloropropane]	105	U	1,2-Diphenylhydrazine	105	U
N-Nitroso-Di-N-Propylamine	105	U	4-Bromophenyl-Phenylether	105	U
4-Methylphenol	105	U	Hexachlorobenzene	105	U
Hexachloroethane	105	U	Pentachlorophenol	525	UJ
Nitrobenzene	105	U	Phenanthrene	105	U
Isophorone	105	U	Anthracene	105	U
2-Nitrophenol	525	U	Caffeine	105	U
2,4-Dimethylphenol	105	U	Carbazole	105	U
Bis(2-Chloroethoxy)Methane	105	U	**Di-N-Butylphthalate**	**104**	**J**
Benzoic Acid	~~2100~~	~~UJ~~ Rej	Fluoranthene	105	U
2,4-Dichlorophenol	105	U	Benzidine	4200	UJ
1,2,4-Trichlorobenzene	105	U	Pyrene	105	U
Naphthalene	105	U	Retene	105	U
4-Chloroaniline	105	U	Butylbenzylphthalate	525	U
Hexachlorobutadiene	105	U	Benzo(a)anthracene	105	U
4-Chloro-3-Methylphenol	105	U	3,3'-Dichlorobenzidine	2100	U
2-Methylnaphthalene	105	U	Chrysene	105	U
1-Methylnaphthalene	105	U	**Bis(2-Ethylhexyl) Phthalate**	**98**	**J**
Hexachlorocyclopentadiene	105	U	Di-N-Octyl Phthalate	210	U
2,4,6-Trichlorophenol	525	U	Benzo(b)fluoranthene	105	U
2,4,5-Trichlorophenol	105	U	Benzo(k)fluoranthene	105	U
2-Chloronaphthalene	105	U	Benzo(a)pyrene	105	U
2-Nitroaniline	525	U	3B-Coprostanol	525	U
Dimethylphthalate	105	U	Indeno(1,2,3-cd)pyrene	525	U
2,6-Dinitrotoluene	210	U	Dibenzo(a,h)anthracene	210	U
Acenaphthylene	105	U	Benzo(ghi)perylene	105	U
3-Nitroaniline	210	U			

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Lab ID: OBS8180A2
QC Type: Laboratory Method Blank
Project Officer: Dale Norton

Date Prepared: 06/29/98
Date Analyzed: 07/16/98

Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	85	%
D5-Phenol	91	%
D4-2-Chlorophenol	81	%
1,2-Dichlorobenzene-D4	73	%
D5-Nitrobenzene	95	%
2-Fluorobiphenyl	85	%
D10-Pyrene	88	%
D14-Terphenyl	88	%

Authorized By: _____ Release Date: 9/29/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Lab ID: OCS8180 **Method:** SW8270
QC Type: NIST SRM 1941a **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/16/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	207	UJ	**Acenaphthene**	**36**	**J**
Pyridine	207	U	2,4-Dinitrophenol	828	UJ
Aniline	41	U	4-Nitrophenol	207	U
Phenol	**616**		**Dibenzofuran**	**87**	
Bis(2-Chloroethyl)Ether	83	U	2,4-Dinitrotoluene	41	U
2-Chlorophenol	83	U	Diethylphthalate	207	U
1,3-Dichlorobenzene	**112**		**Fluorene**	**58**	
1,4-Dichlorobenzene	**72**		4-Chlorophenyl-Phenylether	41	U
1,2-Dichlorobenzene	**15**	**J**	4-Nitroaniline	41	U
Benzyl Alcohol	41	U	4,6-Dinitro-2-Methylphenol	414	UJ
2-Methylphenol	41	U	N-Nitrosodiphenylamine	41	U
2,2'-Oxybis[1-chloropropane]	41	U	1,2-Diphenylhydrazine	41	U
N-Nitroso-Di-N-Propylamine	41	U	4-Bromophenyl-Phenylether	41	U
4-Methylphenol	**96**		**Hexachlorobenzene**	**58**	
Hexachloroethane	41	U	Pentachlorophenol	207	UJ
Nitrobenzene	41	U	**Phenanthrene**	**381**	
Isophorone	**36**	**J**	**Anthracene**	**163**	
2-Nitrophenol	207	U	Caffeine	83	U
2,4-Dimethylphenol	41	U	**Carbazole**	**22**	**J**
Bis(2-Chloroethoxy)Methane	41	U	Di-N-Butylphthalate	235	UJ
Benzoic Acid	~~3020~~	~~J~~ Rej	**Fluoranthene**	**768**	
2,4-Dichlorophenol	41	U	Benzidine	1660	UJ
1,2,4-Trichlorobenzene	**16**	**J**	**Pyrene**	**596**	
Naphthalene	**586**		**Retene**	**45**	
4-Chloroaniline	41	U	**Butylbenzylphthalate**	**48**	**J**
Hexachlorobutadiene	41	U	**Benzo(a)anthracene**	**343**	
4-Chloro-3-Methylphenol	41	U	3,3'-Dichlorobenzidine	828	U
2-Methylnaphthalene	**228**		**Chrysene**	**508**	
1-Methylnaphthalene	**108**		**Bis(2-Ethylhexyl) Phthalate**	**1130**	
Hexachlorocyclopentadiene	41	U	Di-N-Octyl Phthalate	83	U
2,4,6-Trichlorophenol	207	U	**Benzo(b)fluoranthene**	**1050**	
2,4,5-Trichlorophenol	41	U	**Benzo(k)fluoranthene**	**353**	
2-Chloronaphthalene	41	U	**Benzo(a)pyrene**	**518**	
2-Nitroaniline	207	U	**3B-Coprostanol**	**509**	
Dimethylphthalate	41	U	**Indeno(1,2,3-cd)pyrene**	**554**	
2,6-Dinitrotoluene	83	U	**Dibenzo(a,h)anthracene**	**186**	
Acenaphthylene	**78**		**Benzo(ghi)perylene**	**492**	
3-Nitroaniline	83	U			

Authorized By: _____ Release Date: 9/27/94

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Lab ID: OCS8180
QC Type: NIST SRM 1941a
Project Officer: Dale Norton

Date Prepared: 06/29/98
Date Analyzed: 07/16/98

Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	70	%
D5-Phenol	108	%
D4-2-Chlorophenol	69	%
1,2-Dichlorobenzene-D4	63	%
D5-Nitrobenzene	88	%
2-Fluorobiphenyl	75	%
D10-Pyrene	85	%
D14-Terphenyl	88	%

Authorized By: _____ Release Date: 9/27/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Lab ID: OCS8180A **Method:** SW8270
QC Type: Canadian Marine Sediment Reference Material **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/15/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	494	UJ	**Acenaphthene**	**130**	
Pyridine	494	U	2,4-Dinitrophenol	1980	UJ
Aniline	99	U	4-Nitrophenol	498	U
Phenol	**467**		**Dibenzofuran**	**943**	
Bis(2-Chloroethyl)Ether	198	U	2,4-Dinitrotoluene	99	U
2-Chlorophenol	198	U	Diethylphthalate	494	U
1,3-Dichlorobenzene	198	U	**Fluorene**	**369**	
1,4-Dichlorobenzene	99	U	4-Chlorophenyl-Phenylether	99	U
1,2-Dichlorobenzene	99	U	4-Nitroaniline	99	U
Benzyl Alcohol	99	UJ	4,6-Dinitro-2-Methylphenol	988	UJ
2-Methylphenol	99	U	N-Nitrosodiphenylamine	98	U
2,2'-Oxybis[1-chloropropane]	99	U	1,2-Diphenylhydrazine	99	U
N-Nitroso-Di-N-Propylamine	99	U	4-Bromophenyl-Phenylether	99	U
4-Methylphenol	**254**		Hexachlorobenzene	99	U
Hexachloroethane	99	U	Pentachlorophenol	494	UJ
Nitrobenzene	99	U	**Phenanthrene**	**2760**	
Isophorone	**33**	J	**Anthracene**	**926**	
2-Nitrophenol	494	U	Caffeine	99	U
2,4-Dimethylphenol	99	U	**Carbazole**	**204**	
Bis(2-Chloroethoxy)Methane	99	U	Di-N-Butylphthalate	878	UJ
Benzoic Acid	~~4980~~	~~J~~ Rej	**Fluoranthene**	**3100**	
2,4-Dichlorophenol	99	U	Benzidine	3950	UJ
1,2,4-Trichlorobenzene	99	U	**Pyrene**	**2280**	
Naphthalene	**3360**		**Retene**	**280**	
4-Chloroaniline	99	U	Butylbenzylphthalate	494	U
Hexachlorobutadiene	99	U	**Benzo(a)anthracene**	**1380**	
4-Chloro-3-Methylphenol	99	U	3,3'-Dichlorobenzidine	1980	UJ
2-Methylnaphthalene	**2040**		**Chrysene**	**2000**	
1-Methylnaphthalene	**1100**		**Bis(2-Ethylhexyl) Phthalate**	**1460**	
Hexachlorocyclopentadiene	99	U	Di-N-Octyl Phthalate	198	U
2,4,6-Trichlorophenol	494	U	**Benzo(b)fluoranthene**	**3690**	
2,4,5-Trichlorophenol	99	U	**Benzo(k)fluoranthene**	**1420**	
2-Chloronaphthalene	99	U	**Benzo(a)pyrene**	**1620**	
2-Nitroaniline	494	U	**3B-Coprostanol**	**1060**	
Dimethylphthalate	99	U	**Indeno(1,2,3-cd)pyrene**	**1960**	
2,6-Dinitrotoluene	198	U	**Dibenzo(a,h)anthracene**	**547**	
Acenaphthylene	**429**		**Benzo(ghi)perylene**	**1530**	
3-Nitroaniline	198	U			

Authorized By: _____ Release Date: 7/27/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Lab ID: OCS8180A

QC Type: Canadian Marine Sediment Reference Material for PAH

Project Officer: Dale Norton

Date Prepared: 06/29/98

Date Analyzed: 07/15/98

Method: SW8270

Matrix: Frozen Sediment/soil

Units: ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	80	%
D5-Phenol	88	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	63	%
D5-Nitrobenzene	90	%
2-Fluorobiphenyl	79	%
D10-Pyrene	85	%
D14-Terphenyl	87	%

Authorized By: D. Hatten Release Date: 9/27/98

Phenolics

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248087 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: REF **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Phenol	32	UJ
2-Chlorophenol	**8.5**	
2-Methylphenol	4.9	U
4-Methylphenol	11	U
2,4-Dimethylphenol	4.9	U
2,4-Dichlorophenol	4.9	U
4-Chloro-3-Methylphenol	4.9	U
2,4,6-Trichlorophenol	4.9	U
2,4,5-Trichlorophenol	4.9	U
Pentachlorophenol	**69**	**J**

Surrogate Recoveries

2-Fluorobiphenyl	**55**	**%**
D14-Terphenyl	**66**	**%**
D10-Pyrene	**58**	**%**
D5-Phenol	**67**	**%**
2-Fluorophenol	**66**	**%**
D4-2-Chlorophenol	**61**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248088
Field ID: HARD1
Project Officer: Dale Norton

Date Collected: 06/10/98
Date Prepared: 07/30/98
Date Analyzed: 08/19/98

Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Phenol	60	UJ
2-Chlorophenol	11	
2-Methylphenol	21	
4-Methylphenol	200	
2,4-Dimethylphenol	9.8	
2,4-Dichlorophenol	4	
4-Chloro-3-Methylphenol	3.9	U
2,4,6-Trichlorophenol	7.9	
2,4,5-Trichlorophenol	15	
Pentachlorophenol	92	J

Surrogate Recoveries

2-Fluorobiphenyl	54	%
D14-Terphenyl	71	%
D10-Pyrene	63	%
D5-Phenol	63	%
2-Fluorophenol	57	%
D4-2-Chlorophenol	57	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248089 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD1A **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Phenol	64	UJ
2-Chlorophenol	4.2	U
2-Methylphenol	**7.4**	
4-Methylphenol	**301**	
2,4-Dimethylphenol	**6.5**	
2,4-Dichlorophenol	**4.8**	
4-Chloro-3-Methylphenol	4.2	U
2,4,6-Trichlorophenol	**7.1**	
2,4,5-Trichlorophenol	**16**	
Pentachlorophenol	**81**	**J**

Surrogate Recoveries

2-Fluorobiphenyl	**62**	**%**
D14-Terphenyl	**76**	**%**
D10-Pyrene	**66**	**%**
D5-Phenol	**72**	**%**
2-Fluorophenol	**68**	**%**
D4-2-Chlorophenol	**67**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248090 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD2 **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Phenol	41	UJ
2-Chlorophenol	4.1	U
2-Methylphenol	**4.5**	
4-Methylphenol	**121**	**J**
2,4-Dimethylphenol	**4.8**	
2,4-Dichlorophenol	**3.2**	**J**
4-Chloro-3-Methylphenol	4.1	U
2,4,6-Trichlorophenol	4.1	U
2,4,5-Trichlorophenol	4.1	U
Pentachlorophenol	**86**	**J**

Surrogate Recoveries

2-Fluorobiphenyl	**64**	**%**
D14-Terphenyl	**78**	**%**
D10-Pyrene	**68**	**%**
D5-Phenol	**77**	**%**
2-Fluorophenol	**75**	**%**
D4-2-Chlorophenol	**75**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248090 (Matrix Spike - LMX1) **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD2 **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** % Recovery

Analyte	Result	Qualifier
Phenol	78	
2-Chlorophenol	76	
2-Methylphenol	82	
4-Methylphenol	134	
2,4-Dimethylphenol	67	
2,4-Dichlorophenol	69	
4-Chloro-3-Methylphenol	81	
2,4,6-Trichlorophenol	76	
2,4,5-Trichlorophenol	74	
Pentachlorophenol	43	

Surrogate Recoveries

2-Fluorobiphenyl	58	%
D14-Terphenyl	72	%
D10-Pyrene	64	%
D5-Phenol	73	%
2-Fluorophenol	74	%
D4-2-Chlorophenol	68	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248090 (Matrix Spike - LMX2) **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: HARD2 **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** % Recovery

Analyte	Result	Qualifier
Phenol	53	
2-Chlorophenol	60	
2-Methylphenol	64	
4-Methylphenol	46	
2,4-Dimethylphenol	57	
2,4-Dichlorophenol	52	
4-Chloro-3-Methylphenol	64	
2,4,6-Trichlorophenol	62	
2,4,5-Trichlorophenol	59	
Pentachlorophenol	61	

Surrogate Recoveries

2-Fluorobiphenyl	50	%
D14-Terphenyl	63	%
D10-Pyrene	55	%
D5-Phenol	59	%
2-Fluorophenol	58	%
D4-2-Chlorophenol	59	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248091 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: FIDO1 **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Phenol	39	UJ
2-Chlorophenol	3.1	U
2-Methylphenol	**1.8**	**J**
4-Methylphenol	**112**	
2,4-Dimethylphenol	**4.2**	
2,4-Dichlorophenol	3.1	U
4-Chloro-3-Methylphenol	3.1	U
2,4,6-Trichlorophenol	3.1	U
2,4,5-Trichlorophenol	3.1	U
Pentachlorophenol	**95**	**J**

Surrogate Recoveries

2-Fluorobiphenyl	**56**	**%**
D14-Terphenyl	**79**	**%**
D10-Pyrene	**66**	**%**
D5-Phenol	**70**	**%**
2-Fluorophenol	**70**	**%**
D4-2-Chlorophenol	**65**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248092 **Date Collected:** 06/09/98 **Method:** SW8270
Field ID: PD-1 **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Phenol	52	UJ
2-Chlorophenol	7.8	U
2-Methylphenol	7.8	U
4-Methylphenol	**65**	
2,4-Dimethylphenol	7.8	U
2,4-Dichlorophenol	7.8	U
4-Chloro-3-Methylphenol	7.8	U
2,4,6-Trichlorophenol	7.8	U
2,4,5-Trichlorophenol	7.8	U
Pentachlorophenol	**108**	**J**

Surrogate Recoveries

2-Fluorobiphenyl	**55**	**%**
D14-Terphenyl	**68**	**%**
D10-Pyrene	**60**	**%**
D5-Phenol	**68**	**%**
2-Fluorophenol	**68**	**%**
D4-2-Chlorophenol	**67**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248096 **Date Collected:** 06/10/98 **Method:** SW8270
Field ID: IM1 **Date Prepared:** 07/30/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/19/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Phenol	27	UJ
2-Chlorophenol	2.4	U
2-Methylphenol	**2**	**J**
4-Methylphenol	**22**	
2,4-Dimethylphenol	2.4	U
2,4-Dichlorophenol	**1.8**	**J**
4-Chloro-3-Methylphenol	2.4	U
2,4,6-Trichlorophenol	2.4	U
2,4,5-Trichlorophenol	2.4	U
Pentachlorophenol	**57**	**J**

Surrogate Recoveries

2-Fluorobiphenyl	**64**	**%**
D14-Terphenyl	**73**	**%**
D10-Pyrene	**64**	**%**
D5-Phenol	**77**	**%**
2-Fluorophenol	**75**	**%**
D4-2-Chlorophenol	**75**	**%**

Authorized By: _____ Release Date: 9/23/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments
LIMS Project ID: 1797-98

Lab ID: OBS8211A1
QC Type: Laboratory Method Blank
Project Officer: Dale Norton
Date Prepared: 07/30/98
Date Analyzed: 08/19/98
Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Phenol	**13**	
2-Chlorophenol	3.5	U
2-Methylphenol	3.5	U
4-Methylphenol	**1.9**	**J**
2,4-Dimethylphenol	3.5	U
2,4-Dichlorophenol	3.5	U
4-Chloro-3-Methylphenol	3.5	U
2,4,6-Trichlorophenol	3.5	U
2,4,5-Trichlorophenol	3.5	U
Pentachlorophenol	35	U

Surrogate Recoveries

2-Fluorobiphenyl	**70**	**%**
D14-Terphenyl	**82**	**%**
D10-Pyrene	**72**	**%**
D5-Phenol	**78**	**%**
D4-2-Chlorophenol	**74**	**%**
2-Fluorophenol	**77**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids Low level targets only

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Lab ID: OBS8211A2
QC Type: Laboratory Method Blank
Project Officer: Dale Norton

Date Prepared: 07/30/98
Date Analyzed: 08/19/98

Method: SW8270
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Phenol	**14**	
2-Chlorophenol	3.5	U
2-Methylphenol	3.5	U
4-Methylphenol	**1.5**	**J**
2,4-Dimethylphenol	3.5	U
2,4-Dichlorophenol	3.5	U
4-Chloro-3-Methylphenol	3.5	U
2,4,6-Trichlorophenol	3.5	U
2,4,5-Trichlorophenol	3.5	U
Pentachlorophenol	35	U

Surrogate Recoveries

2-Fluorobiphenyl	**70**	**%**
D14-Terphenyl	**87**	**%**
D10-Pyrene	**78**	**%**
D5-Phenol	**81**	**%**
D4-2-Chlorophenol	**78**	**%**
2-Fluorophenol	**79**	**%**

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Polychlorinated Biphenyls

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248080 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	100	U
PCB - 1221	100	U
PCB - 1232	100	U
PCB - 1242	51	U
PCB - 1248	100	U
PCB - 1254	**15**	**J**
PCB - 1260	51	U

Surrogate Recoveries

Decachlorobiphenyl	**94**	**%**
Tetrachloro-m-xylene	**86**	**%**

Authorized By: _____ Release Date: 9/29/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248081 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-2 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	99	U
PCB - 1221	99	U
PCB - 1232	99	U
PCB - 1242	50	U
PCB - 1248	99	U
PCB - 1254	**26**	**J**
PCB - 1260	50	U

Surrogate Recoveries

Decachlorobiphenyl	**89**	**%**
Tetrachloro-m-xylene	**84**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248082 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-3 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	100	U
PCB - 1221	100	U
PCB - 1232	100	U
PCB - 1242	50	U
PCB - 1248	100	U
PCB - 1254	100	U
PCB - 1260	50	U

Surrogate Recoveries

Decachlorobiphenyl	**81**	**%**
Tetrachloro-m-xylene	**91**	**%**

Authorized By: _____ Release Date: 9/22/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248083 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-4 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	99	U
PCB - 1221	99	U
PCB - 1232	99	U
PCB - 1242	50	U
PCB - 1248	99	U
PCB - 1254	**26**	**J**
PCB - 1260	50	U

Surrogate Recoveries

Decachlorobiphenyl	**97**	**%**
Tetrachloro-m-xylene	**94**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248084 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-4A **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	100	U
PCB - 1221	100	U
PCB - 1232	100	U
PCB - 1242	50	U
PCB - 1248	100	U
PCB - 1254	**20**	**J**
PCB - 1260	50	U

Surrogate Recoveries

Decachlorobiphenyl	**76**	**%**
Tetrachloro-m-xylene	**73**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248084 (Matrix Spike - LMX1) **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-4A **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** % Recovery

Analyte	Result	Qualifier
PCB - 1242	100	
PCB - 1260	68	

Surrogate Recoveries

Decachlorobiphenyl	73	%
Tetrachloro-m-xylene	87	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248084 (Matrix Spike - LMX2) **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-4A **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** % Recovery

Analyte	Result	Qualifier
PCB - 1242	60	
PCB - 1260	60	

Surrogate Recoveries

Decachlorobiphenyl	69	%
Tetrachloro-m-xylene	78	%

Authorized By: _____ Release Date: 9/22/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248085 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-5 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	110	U
PCB - 1221	110	U
PCB - 1232	110	U
PCB - 1242	57	U
PCB - 1248	110	U
PCB - 1254	**19**	**J**
PCB - 1260	57	U

Surrogate Recoveries

Decachlorobiphenyl	**96**	**%**
Tetrachloro-m-xylene	**95**	**%**

Authorized By: _____ Release Date: 9/22/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248086 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: MW-6 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	110	U
PCB - 1221	110	U
PCB - 1232	110	U
PCB - 1242	56	U
PCB - 1248	110	U
PCB - 1254	110	U
PCB - 1260	56	U

Surrogate Recoveries

Decachlorobiphenyl	**86**	**%**
Tetrachloro-m-xylene	**85**	**%**

Authorized By: _____ Release Date: 9/22/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248087 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: REF **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	88	U
PCB - 1221	88	U
PCB - 1232	88	U
PCB - 1242	44	U
PCB - 1248	88	U
PCB - 1254	88	U
PCB - 1260	44	U

Surrogate Recoveries

Decachlorobiphenyl	**96**	**%**
Tetrachloro-m-xylene	**91**	**%**

Authorized By: _____ Release Date: 9/3-4/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248091 **Date Collected:** 06/10/98 **Method:** SW8080
Field ID: FIDO1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	68	U
PCB - 1221	68	U
PCB - 1232	68	U
PCB - 1242	**88**	**J**
PCB - 1248	68	U
PCB - 1254	**68**	**J**
PCB - 1260	34	U

Surrogate Recoveries

Decachlorobiphenyl	**71**	**%**
Tetrachloro-m-xylene	**73**	**%**

Authorized By: _____ Release Date: 9/22/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248092 **Date Collected:** 06/09/98 **Method:** SW8080
Field ID: PD-1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	120	U
PCB - 1221	120	U
PCB - 1232	120	U
PCB - 1242	62	U
PCB - 1248	120	U
PCB - 1254	120	U
PCB - 1260	62	U

Surrogate Recoveries

Decachlorobiphenyl	**70**	**%**
Tetrachloro-m-xylene	**71**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248096 **Date Collected:** 06/10/98 **Method:** SW8080
Field ID: IM1 **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	50	U
PCB - 1221	50	U
PCB - 1232	50	U
PCB - 1242	25	U
PCB - 1248	50	U
PCB - 1254	36	U
PCB - 1260	25	U

Surrogate Recoveries

Decachlorobiphenyl	**94**	**%**
Tetrachloro-m-xylene	**95**	**%**

Authorized By: _____ Release Date: 9/2/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Lab ID: OBS8180A1
QC Type: Laboratory Method Blank
Project Officer: Dale Norton

Date Prepared: 06/29/98
Date Analyzed: 08/04/98

Method: SW8080
Matrix: Frozen Sediment/soil
Units: ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	54	U
PCB - 1221	54	U
PCB - 1232	54	U
PCB - 1242	27	U
PCB - 1248	54	U
PCB - 1254	54	U
PCB - 1260	27	U

Surrogate Recoveries

Decachlorobiphenyl	**92**	**%**
Tetrachloro-m-xylene	**86**	**%**

Authorized By: _____ Release Date: 9/22/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Lab ID: OBS8180A2 **Method:** SW8080
QC Type: Laboratory Method Blank **Date Prepared:** 06/29/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 08/04/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	54	U
PCB - 1221	54	U
PCB - 1232	54	U
PCB - 1242	27	U
PCB - 1248	54	U
PCB - 1254	54	U
PCB - 1260	27	U

Surrogate Recoveries

Decachlorobiphenyl	**92**	**%**
Tetrachloro-m-xylene	**93**	**%**

Authorized By: _____ Release Date: 9/22/98

Butyltins

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248087 **Date Received:** 06/10/98 **Method:** NOAA-TBT
Field ID: REF **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**5.1**	**J**
Dibutyltin Chloride	**3.9**	**J**
Monobutyltin Chloride	**55**	**J**

Surrogate Recoveries

Tripentyltin Chloride	**92**	**%**

Authorized By: _____ Release Date: 8/13/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248091 **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: FIDO1 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**282**	**J**
Dibutyltin Chloride	**96**	**J**
Monobutyltin Chloride	**217**	**J**
Surrogate Recoveries		
Tripentyltin Chloride	**68**	**%**

Authorized By: _____ Release Date: 8/7/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248093 **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB1 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride	17	J
Tributyltin Chloride	2470	E
Dibutyltin Chloride	598	E
Monobutyltin Chloride	646	E

Surrogate Recoveries

Tripentyltin Chloride	89	%

Authorized By: _____ Release Date: 5/27/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248093 (Dilution - DIL1) **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB1 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride	.41	J
Tributyltin Chloride	1850	J
Dibutyltin Chloride	523	J
Monobutyltin Chloride	508	J

Surrogate Recoveries

Tripentyltin Chloride	63	%

Authorized By: _____ Release Date: 8/7/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248094 **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB1A **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride	6.3	J
Tributyltin Chloride	1260	E
Dibutyltin Chloride	520	E
Monobutyltin Chloride	512	J

Surrogate Recoveries

Tripentyltin Chloride	90	%

Authorized By: _____ Release Date: 8/2/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248094 (Dilution - DIL1) **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB1A **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**1000**	**J**
Dibutyltin Chloride	**445**	**J**
Monobutyltin Chloride	**429**	**J**

Surrogate Recoveries

Tripentyltin Chloride	**75**	**%**

Authorized By: _____ Release Date: 8/12/98 Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095 **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB2 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride	8	J
Tributyltin Chloride	1200	E
Dibutyltin Chloride	895	E
Monobutyltin Chloride	845	E

Surrogate Recoveries

Tripentyltin Chloride	85	%

Authorized By: _____ Release Date: 8/28/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095 (Matrix Spike - LMX1) **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB2 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** % Recovery

Analyte	Result	Qualifier
Tetrabutyltin Chloride	**1**	
Tributyltin Chloride		NC
Dibutyltin Chloride		NC
Monobutyltin Chloride	**118**	

Surrogate Recoveries

Tripentyltin Chloride	**73**	**%**

Authorized By: _____ Release Date: _____ Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095 (Matrix Spike - LMX2) **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB2 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** % Recovery

Analyte	Result	Qualifier
Tetrabutyltin Chloride	5	
Tributyltin Chloride	252	
Dibutyltin Chloride	58	
Monobutyltin Chloride	11	

Surrogate Recoveries

Tripentyltin Chloride	67	%

Authorized By: _____ Release Date: 8/2/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: 98248095 (Dilution - DIL1) **Date Received:** 06/11/98 **Method:** NOAA-TBT
Field ID: WB2 **Date Prepared:** 06/24/98 **Matrix:** Frozen Sediment/soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**1230**	**J**
Dibutyltin Chloride	**915**	**J**
Monobutyltin Chloride	**850**	**J**

Surrogate Recoveries

Tripentyltin Chloride	**86**	**%**

Authorized By: _____ Release Date: 8/12/98 Page: 4

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: OBS8175A1 **Method:** NOAA-TBT
Blank ID: BLNK **Date Prepared:** 06/24/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 07/22/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride	7	U
Tributyltin Chloride	7	U
Dibutyltin Chloride	7.2	U
Monobutyltin Chloride	**17**	

Surrogate Recoveries

Tripentyltin Chloride	**94**	**%**

Authorized By: _____ Release Date: 8/7/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments
LIMS Project ID: 1797-98

Sample: OBS8175A2
Blank ID: BLNK
Project Officer: Dale Norton

Date Prepared: 06/24/98
Date Analyzed: 07/22/98

Method: NOAA-TBT
Matrix: Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride	7	U
Tributyltin Chloride	7	U
Dibutyltin Chloride	7.2	U
Monobutyltin Chloride	**12**	**J**

Surrogate Recoveries

Tripentyltin Chloride	**109**	**%**

Authorized By: _____ Release Date: 8/19/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments

LIMS Project ID: 1797-98

Sample: OCS8175A1
Blank ID: SBRM
Project Officer: Dale Norton

Date Prepared: 06/24/98
Date Analyzed: 07/23/98

Method: NOAA-TBT
Matrix: Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**137**	**J**
Dibutyltin Chloride	**5.7**	**J**
Monobutyltin Chloride	**51**	**J**
Surrogate Recoveries		
Tripentyltin Chloride	**82**	**%**

Authorized By: _____ Release Date: 8/12/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: OCS8175A2 **Method:** NOAA-TBT
Blank ID: SBRM **Date Prepared:** 06/24/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**147**	**J**
Dibutyltin Chloride	**5**	**J**
Monobutyltin Chloride	**50**	**J**
Surrogate Recoveries		
Tripentyltin Chloride	**90**	**%**

Authorized By: _____ Release Date: 8/12/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: OCS8175A3 **Method:** NOAA-TBT
Blank ID: PCS2 **Date Prepared:** 06/24/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**2090**	**J**
Dibutyltin Chloride	**2000**	**J**
Monobutyltin Chloride	**1700**	**J**

Surrogate Recoveries

Tripentyltin Chloride	**72**	**%**

Authorized By: _____ Release Date: 8/13/98 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Budd Inlet Sediments **LIMS Project ID:** 1797-98

Sample: OCS8175A4 **Method:** NOAA-TBT
Blank ID: PCS2 **Date Prepared:** 06/24/98 **Matrix:** Sediment/Soil
Project Officer: Dale Norton **Date Analyzed:** 07/23/98 **Units:** ug/Kg dw

Analyte	Result	Qualifier
Tetrabutyltin Chloride		REJ
Tributyltin Chloride	**1850**	**J**
Dibutyltin Chloride	**2010**	**J**
Monobutyltin Chloride	**2300**	**J**

Surrogate Recoveries

Tripentyltin Chloride	**65**	**%**

Authorized By: _____ Release Date: 8/13/98 Page: 1

Bioassays

Amphipod
(Ampelisca abdita)

Larval Echinoderm
(Dendraster excentricus)

Juvenile Polychaete
(Neanthes arenaceodentata)

Parametrix Inc.

5808 Lake Washington Blvd N.E. , Kirkland, WA 98033
Phone: 425-822-8880 Fax: 425-889-8808

FAX TRANSMISSION COVER PAGE
FAX # 425-889-8808

Number of Pages (including this page): 6

To: Dale Norton / DOE

From: Todd Pollard

Receiving FAX Number: (360)407-6884

Date: 11-10-98

Comments:

Following is a statistical re-analysis of the echinoderm larval development bioassay performed for the Budd inlet sediment characterization in June 1998. Your request for re-analysis was performed since the reference sediment, which performed poorly, did not provide a valid comparison for the test sediments. Alternately, we have adjusted the statistics so that the test sediments will be compared to the seawater control replicate instead of the reference sediment. Although this seems to solve the problem, it is difficult to compare the sediments to the control. The measured endpoint for this test is the Combined %Mortality and Abnormality. This number is calculated for each replicate by subtracting the number of normal pluteus from the average number of normal pluteus in the controls. For this reason the seawater control is not included in the statistical comparison. To re-analyze the data and include the controls we had to calculate the Combined %Mortality and Abnormality by subtracting the number of normal pluteus in each replicate from the initial seawater embryo count. While doing this allows the inclusion of the seawater controls, the resulting comparison to the test sediments is extremely conservative and should be evaluated with caution. The new statistics fall under the column labeled (p-value control). If you have any questions as to how these statistics were calculated please call me at (425) 822-8880.

cc;file

Station		Normal	Abnormal	Total Survival	Combined Mortality/Abnormality: Combined % Mort./Abnorm.	Mean Combined Station % Mort./Abnorm.	Arc Sine SQRT Transformed Combined Mort./Abnorm.	Arc Sine SQRT Transformed Mean Combined Station Mort./Abnorm.	Arc Sine SQRT Transformed Station Mort./Abnorm. Standard Deviation
	Initial Counts	212			Initial seawater average count is		231		
		243			%Normal Survival 80.0%				
		250			%Abnormal = 11.9%				
		230			Final seawater control count is		231		
		218			This number is used as 100% survival for all further comparisons.				
Seawater	E101	170	31	201	26.4		0.54		
(Control)	E102	185	17	202	19.9				
	E103	163	20	183	29.4		0.57		
	E104	171	28	199	26.0				
	E105	235	29	264	0.0	20.35	0.00	0.37	0.32
248080	E141	112	63	175	51.5		0.80		
	E142	119	58	177	48.5		0.77		
	E143	119	56	175	48.5		0.77		
	E144	121	58	179	47.6		0.76		
	E145	108	48	156	53.2	49.87	0.82	0.78	0.02
248081	E146	84	25	109	63.6		0.92		
	E147	130	53	183	43.7		0.72		
	E148	59	17	76	74.5		1.04		
	E149	129	21	150	44.2		0.73		
	E150	83	19	102	64.1	58.01	0.93	0.87	0.14
248082	E151	112	37	149	51.5		0.80		
	E152	113	28	141	51.1		0.80		
	E153	58	44	102	74.9		1.05		
	E154	49	27	76	78.8		1.09		
	E155	74	24	98	68.0	64.85	0.97	0.94	0.14
248083	E156	114	79	193	50.6		0.79		
	E157	102	39	141	55.8		0.84		
	E158	94	34	128	59.3		0.88		
	E159	72	50	122	68.8		0.98		
	E160	54	23	77	76.6	62.25	1.07	0.91	0.11

Station		Normal	Abnormal	Total Survival	Combined Mortality/Abnormality: Combined % Mort./Abnorm.	Mean Combined Station % Mort./Abnorm.	Arc Sine SQRT Transformed Combined Mort./Abnorm.	Arc Sine SQRT Transformed Mean Combined Station Mort./Abnorm.	Arc Sine SQRT Transformed Station Mort./Abnorm. Standard Deviation
248085	E161	66	36	102	71.4		1.01		
	E162	80	31	111	65.4		0.94		
	E163	125	38	163	45.9		0.74		
	E164	55	70	125	76.2		1.06		
	E165	69	42	111	70.1	65.80	0.99	0.95	0.12
248086	E166	65	28	93	71.9		1.01		
	E167	81	42	123	64.9		0.94		
	E168	89	26	115	61.5		0.90		
	E169	Sample not measured[1]							
	E170	67	16	83	71.0	67.32	1.00	0.96	0.05
248087	E171	99	39	138	57.1		0.86		
(Reference)	E172	117	40	157	49.4		0.78		
	E173	64	33	97	72.3		1.02		
	E174	105	53	158	54.5		0.83		
	E175	77	45	122	66.7	60.00	0.96	0.89	0.10

[1] Replicate accidentally spilled

Station		Abnormality: % Abnormality	Abnormality: Arc Sine SQRT Transformed Abnormality	Arc Sine SQRT Transformed Mean Station Abnormality	Arc Sine SQRT Transformed Station Abnormality Standard Deviation	p-Value (Reference)	p-Value (Control)
Seawater (Control)	E101	15.42	0.40				
	E102	8.42	0.29				
	E103	10.93	0.34				
	E104	14.07	0.38				
	E105	10.98	0.34	0.35	0.04		
248080	E141	36.00	0.64				
	E142	32.77	0.61				
	E143	32.00	0.60				
	E144	32.40	0.61				
	E145	30.77	0.59	0.61	0.02	0.0364	0.0779
248081	E146	22.94	0.50				
	E147	28.96	0.57				
	E148	22.37	0.49				
	E149	14.00	0.38				
	E150	18.63	0.45	0.48	0.07	0.4027	0.0516
248082	E151	24.83	0.52				
	E152	19.86	0.46				
	E153	43.14	0.72				
	E154	35.53	0.64				
	E155	24.49	0.52	0.57	0.10	0.2508	0.0396
248083	E156	40.93	0.69				
	E157	27.66	0.55				
	E158	26.56	0.54				
	E159	40.98	0.69				
	E160	29.87	0.58	0.61	0.08	0.3607	0.0458

		Abnormality					
Station		% Abnormality	Arc Sine SQRT Transformed Abnormality	Arc Sine SQRT Transformed Mean Station Abnormality	Arc Sine SQRT Transformed Station Abnormality Standard Deviation	p-Value (Reference)	p-Value (Control)
248085	E161	35.29	0.64				
	E162	27.93	0.56				
	E163	23.31	0.50				
	E164	56.00	0.85				
	E165	37.84	0.66	0.64	0.13	0.2020	0.0395
248086	E166	30.11	0.58				
	E167	34.15	0.62				
	E168	22.61	0.50				
	E169						
	E170	19.28	0.45	0.54	0.08	0.0922	0.0416
248087 (Reference)	E171	28.26	0.56				
	E172	25.48	0.53				
	E173	34.02	0.62				
	E174	33.54	0.62				
	E175	36.89	0.65	0.60	0.05		

Note: Shaded cells refer to significantly greater Combined % Mort./Abnormality than reference sediment ($p \leq 0.1$).

Final Report

Sediment Monitoring Bioassays for the Budd Inlet Sediment Characterization Study

Prepared for:
Washington State Department of Ecology

July 1998

Parametrix, Inc.

SEDIMENT MONITORING BIOASSAYS FOR THE BUDD INLET SEDIMENT CHARACTERIZATION STUDY

Prepared for

WASHINGTON STATE DEPARTMENT OF ECOLOGY
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EXECUTIVE SUMMARY OF TEST RESULTS

Dendraster excentricus, 18-20 June 1998

Sample I.D.	Combined % Mort./Abnormality (Untransformed)	Combined % Mort./Abnormality (Arc Sine SQRT Transformed)	p-Value (compared to Reference Sediment)
Seawater (Control)	N/A	N/A	N/A
248080	37.34	0.66	0.0350
248081	47.51	0.76	0.3927
248082	56.06	0.85	0.2552
248083	52.81	0.81	0.3615
248085	57.25	0.86	0.2084
248086	59.15	0.88	0.0907*
248087 (Reference)	50.00	0.79	N/A
Reference Toxicant (EC50) = 5.7 ppm Cd			

N/A = All reference and test sediments normalized to the control response.
* = Significantly greater Combined % Mort./Abnormality than reference sediment ($p \leq 0.1$)

Ampelisca abdita, 7-17 July 1998

Sample I.D.	% Mortality (Untransformed)	% Mortality (Arc Sine SQRT Transformed)	p-Value (compared to Reference Sediment)
Narragansett Bay (Control)	8	0.25	0.0562
248080	27	0.54	0.0924
248081	29	0.57	0.0558
248082	15	0.39	0.3435
248083	22	0.47	0.3151
248085	20	0.46	0.3389
248086	25	0.52	0.1401
248087 (Reference)	18	0.42	N/A
Reference Toxicant (LC50) = 0.67 mg/L $CdCl_2$			

N/A = Not applicable
Note: *A. abdita* mortality in test sediments was not significantly ($p \leq 0.05$) greater when compared with mortality in reference sediment.

Neanthes arenaceodentata, 16 June - 6 July 1998

Station	*Neanthes* sp. Mortality (%)	*Neanthes* sp. Mean Growth Rate (mg/day)	*Neanthes* sp. p-Value (compared to Reference Sediment)
West Beach (Control)	0	0.51	0.308
248080	0	0.53	0.211
248081	0	0.68	0.031
248082	0	0.72	0.074
248083	0	0.67	0.016
248085	0	0.49	0.417
248086	0	0.49	0.402
248087 (Reference)	4	0.47	N/A
Reference Toxicant (LC50) = 8.4 mg/L $CdCl_2$			

N/A = Not applicable

Note: *Neanthes* growth rate in test sediments was not significantly ($p \leq 0.05$) lower when compared to growth of *Neanthes* in reference sediment.

1. INTRODUCTION

Parametrix's Environmental Toxicology Laboratory was contracted by the Washington State Department of Ecology to conduct bioassays for the Budd Inlet Sediment Characterization study on six sediment samples and one reference sediment using the following test organisms:

- *Dendraster excentricus* - larvae of the common sand dollar
- *Ampelisca abdita* - a benthic dwelling amphipod
- *Neanthes arenaceodentata* - a benthic dwelling polychaete worm

All tests were conducted according to procedures referenced in the Washington State Department of Ecology (Ecology) Sediment Management Standards (SMS).

2. METHODS AND MATERIALS

2.1 Biological Procedures

Bioassays were conducted according to the following test protocols:

- Parametrix Protocol No. 1015: Bioassay Procedures for Conducting Static Acute Sediment Toxicity Tests According to *Recommended Guidelines for Conducting Laboratory Bioassays On Puget Sound Sediments (PSWQA, 1995)* Using Echinoderm Larvae (*Dendraster excentricus*)

- Parametrix Protocol No. 1011a: Bioassay Procedures for Conducting Static Acute Toxicity Tests According to *Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments* (PSWQA, 1995) Using the Amphipod, *Ampelisca abdita*

- Parametrix Protocol No. 1059: Bioassay Procedures for Conducting Static-Renewal 20-Day Chronic Sediment Toxicity Tests According To Recommended Guidelines for Conducting Laboratory Bioassays On Puget Sound Sediments (PSWQA, 1995) Using the Polychaete *Neanthes arenaceodentata*

Summaries of test conditions are provided in Tables 1, 2, and 3. In addition to the biological observations, total ammonia and sulfide measurements were taken at initiation and termination of all three bioassays.

Table 1. Summary of test conditions for the *Dendraster excentricus* bioassay.

Job Name: Washington State Department of Ecology — Job Number: 55-1583-60

Test Date: 18-20 June 1998

Test Protocol:	Parametrix Protocol No. 1015: Bioassay Procedures for Conducting Static Acute Sediment Toxicity Tests According to *Recommended Guidelines for Conducting Laboratory Bioassays On Puget Sound Sediments (PSWQA, 1995)* Using Echinoderm Larvae (*Dendraster excentricus*)
Test Material:	Sediment collected by Department of Ecology
Test Organisms:	*Dendraster excentricus* (sand dollar)
Source:	Marinus Inc., Long Beach, California
Stock Density:	Approximately 5,000 embryos/mL
Inoculation Volume:	5.0 mL inoculant per test vessel
Test Concentrations:	18 grams of sediment in 900 mL of seawater
Replicates:	5
Reference Toxicant:	Cadmium, as cadmium chloride
Test Duration:	Test is terminated when greater than 90% of the embryos in the seawater controls have reached the 4-armed pluteus stage (approximately 48-96 hours)
Dilution Water:	Natural seawater collected from National Marine Fisheries Service in Mukilteo, Washington (28 ± 2 ppt)
Test Chambers:	1-liter glass jars
Lighting:	14 hours light, 10 hours dark
Temperature:	15 ± 1°C
Aeration:	Gentle aeration at <100 bubbles/minute, if dissolved oxygen drops below 60% of saturation
Chemical Data:	Salinity, pH, dissolved oxygen, and temperature of overlying water at test initiation and every 24 hours; ammonia and sulfide at test initiation and termination.
Effect Measured:	Mortality and abnormality
Test Acceptability:	≥70% normal larval survival in seawater control.

Table 2. Summary of test conditions for the *Ampelisca abdita* bioassay.

Job Name: Washington State Department of Ecology — Job Number: 55-1583-60 (01)

Test Date: 7-17 July 1998

Test Protocol:	Parametrix Protocol No. 1011a: Bioassay Procedures for Conducting Static Acute Toxicity Tests According to *Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments* (PSWQA, 1995) Using the Amphipod, *Ampelisca abdita*
Test Material:	Sediment collected by the Department of Ecology
Test Organisms:	*Ampelisca abdita* (amphipod)
Source:	East Coast Amphipod; Kingston, Rhode Island
Number/Container:	20
Test Concentrations:	175 mL sediment in 775 mL seawater
Replicates:	Five
Reference Toxicant:	Cadmium, as cadmium chloride
Test Duration:	10 days
Dilution Water:	Natural seawater collected from National Marine Fisheries Service in Mukilteo, Washington (28 ± 2 ppt)
Test Chambers:	1 liter glass beakers
Lighting:	Continuous overhead lighting
Temperature:	20 ± 1° C
Aeration:	Gentle aeration at <100 bubbles/minute
Chemical Data:	Salinity, temperature, pH and dissolved oxygen of the overlying water at test initiation and every 24 hours; ammonia and sulfide at test initiation and termination.
Effects Measured:	Mortality
Test Acceptability:	Mean control mortality ≤ 10%

Table 3. Summary of test conditions for the *Neanthes arenaceodentata* bioassay.

Job Name: Washington State Department of Ecology — Job Number: 55-1583-60

Test Date: 16 June - 6 July 1998

Test Protocol:	Parametrix Protocol #1059. Bioassay Procedures for Conducting Static-Renewal 20-Day Chronic Sediment Toxicity Tests According To *Recommended Guidelines for Conducting Laboratory Bioassays On Puget Sound Sediments* (PSWQA 1995) Using the Polychaete *Neanthes* sp.
Test Material:	Sediment provided by the Department of Ecology
Test Organisms:	*Neanthes arenaceodentata* (polychaete worm)
Source:	Dr. Don Reish; Long Beach, California
Number/Container:	Five
Test Concentrations:	175 mL of sediment in 775 mL of seawater
Replicates:	Five
Reference Toxicant:	Cadmium, as cadmium chloride
Test Duration:	20 days
Dilution Water:	Natural seawater collected from National Marine Fisheries Service; Mukilteo, Washington
Test Chambers:	1 liter glass beakers
Lighting:	Continuous overhead lighting
Temperature:	20 ± 1° C
Aeration:	Gentle aeration at <100 bubbles/minute
Renewals:	Every third day
Feeding:	Ground TetraMarin® every other day (40 mg dry wt/test vessel)
Chemical Data:	Salinity, temperature, pH, and dissolved oxygen of overlying water at test initiation and every third day; ammonia and sulfide at test initiation and termination. Interstitial salinity at test initiation.
Effect Measured:	Mortality and growth
Test Acceptability:	Mean control mortality ≤ 10%, and ≥ 0.72 mg/day growth

2.2 Test Sediment

Seven sediment samples were provided to Parametrix's Environmental Toxicology Laboratory located in Kirkland, Washington on 1 June 1998. Upon arrival of the samples, appropriate chain-of-custody (COC) procedures were followed: sample labels were checked against the chain-of-custody form, containers inspected for damage during shipment, and sediment volumes were determined to be adequate. After completing the COC procedures, the samples were purged with nitrogen gas and stored at 4°C until test initiation. All bioassays were initiated within eight weeks of sample collection. Copies of the COC forms are located in Appendix E.

2.3 Control and Reference Sediment

The control sediment used for the *Neanthes* bioassay was collected from West Beach on Whidbey Island, Washington. The control sediment used for the *Ampelisca abdita* bioassay was collected from Narragansett Bay, Massachusetts. Prior to initiation of the *A. abdita* and *Neanthes* tests, the control sediment was sieved through a 500-μm screen and washed with clean seawater to ensure that no indigenous polychaete worms or amphipods remained in the sediment.

Seawater, collected from National Marine Fisheries Service, Mukilteo, Washington, was used for the seawater control in the *Dendraster excentricus* bivalve larval development bioassay.

2.4 Data Analysis

A single-tailed t-Test was used to compare the combined mortality/abnormality (echinoderm), mortality (amphipod/polychaete), or mean growth rate (polychaete) in the reference sediment to the respective endpoint in the test sediments (Zar, 1984). Use of the t-Test requires that the data are normal and variances are homogeneous. An arcsine-square root transformation was performed on the mortality and combined mortality/abnormality data to stabilize the variances and improve the normality of the data (Michelsen and Shaw, 1996).

Mortality data derived from the reference toxicants were used to generate test material response curves and statistically estimate an LC50 and its 95% confidence limits. The LC50 is the concentration of the test material which produces mortality in 50% of the test population for the specified exposure duration. LC50 values were based on the material concentrations and were estimated for the 2-day exposure duration for the *D. excentricus* and the 4-day exposure duration for the *A. abdita* and *Neanthes* reference toxicant tests.

A statistical computer package was used to estimate reference toxicant LC50s and their 95% confidence limits. These programs estimate LC50 values using one of three statistical methods: Probit analysis, moving average method, or binomial probability. The method selected is determined by the quality of the concentration-percent response base (i.e., presence or absence of 100% response, number of partial responses, etc.). The program provides values of the slope for the probit analysis, includes 95% confidence intervals, and statistically evaluates the goodness-of-fit.

3. TEST RESULTS

A summary of bioassay results is located in the Executive Summary and in Tables 4, 5, and 6. The results of the ammonia and sulfide analyses are given in Appendix D. All original raw data, chain-of-custody forms, and project notes are maintained in Parametrix project files.

For the *D. excentricus* bioassay, only one sediment tested (248086) resulted in a significantly ($p \leq 0.1$) greater combined percent mortality/abnormality when compared to the reference sediment (Table 4). For the *A. abdita* test, none of the six sediments tested resulted in significantly ($p \leq 0.05$) reduced survival when compared to the reference sediment (Table 5). For the *Neanthes* bioassay, there were no survival or growth effects (Table 6). It should be noted, however, that the control growth rate for the *Neanthes* bioassay did not meet the 0.72 mg/day requirement. This result does not invalidate this test but will require consultation with Ecology's sediment management personnel for approval on a case-by-case basis.

Table 4. Summary of *D. excentricus* bioassay results.

***Dendraster excentricus*, 18-20 June 1998**

Sample I.D.	Combined % Mort./Abnormality (Untransformed)	Combined % Mort./Abnormality (Arc Sine SQRT Transformed)	p-Value (compared to Reference Sediment)
Seawater (Control)	N/A	N/A	N/A
248080	37.34	0.66	0.0350
248081	47.51	0.76	0.3927
248082	56.06	0.85	0.2552
248083	52.81	0.81	0.3615
248085	57.25	0.86	0.2084
248086	59.15	0.88	0.0907*
248087 (Reference)	50.00	0.79	N/A
Reference Toxicant (EC50) = 5.7 ppm Cd			

N/A = All reference and test sediments normalized to the control response.
* = Significantly greater Combined % Mort./Abnormality than reference sediment ($p \leq 0.1$)

Table 5. Summary of *A. abdita* bioassay results.

***Ampelisca abdita*, 7-17 July 1998**

Sample I.D.	% Mortality (Untransformed)	% Mortality (Arc Sine SQRT Transformed)	p-Value (compared to Reference Sediment)
Narragansett Bay (Control)	8	0.25	0.0562
248080	27	0.54	0.0924
248081	29	0.57	0.0558
248082	15	0.39	0.3435
248083	22	0.47	0.3151
248085	20	0.46	0.3389
248086	25	0.52	0.1401
248087 (Reference)	18	0.42	N/A
Reference Toxicant (LC50) = 0.67 mg/L $CdCl_2$			

N/A = Not applicable
Note: *A. abdita* mortality in test sediments was not significantly ($p \leq 0.05$) greater when compared with mortality in reference sediment.

Table 6. Summary of *Neanthes* sp. bioassay results.

***Neanthes arenaceodentata*, 16 June - 6 July 1998**

	Neanthes sp.		
Station	Mortality (%)	Mean Growth Rate (mg/day)	p-Value (compared to Reference Sediment)
West Beach (Control)	0	0.51	0.308
248080	0	0.53	0.211
248081	0	0.68	0.031
248082	0	0.72	0.074
248083	0	0.67	0.016
248085	0	0.49	0.417
248086	0	0.49	0.402
248087 (Reference)	4	0.47	N/A
Reference Toxicant (LC50) = 8.4 mg/L $CdCl_2$			

N/A = Not applicable
Note: *Neanthes* growth rate in test sediments was not significantly ($p \leq 0.05$) lower when compared to growth of *Neanthes* in reference sediment.

4. REFERENCES

Michelsen, T., and T.C. Shaw. 1996. PSDDA Clarification Paper/SMS Technical Information Memorandum: *Statistical Evaluation of Bioassay Results*. In Sediment Management Program Biennial Report, Dredging Years 1994/1995. Puget Sound Dredged Disposal Analysis Program, Sediment Management Program. March 1996.

Parametrix Protocol No. 1015, Bioassay Procedures for Conducting Static Acute Sediment Toxicity Tests According to *Recommended Guidelines for Conducting Laboratory Bioassays On Puget Sound Sediments (PSWQA, 1995)* Using Echinoderm Larvae (*Dendraster excentricus*). Parametrix, Inc., Kirkland, Washington.

Parametrix Protocol No. 1011a, Bioassay Procedures for Conducting Static Acute Toxicity Tests According to *Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments* (PSWQA, 1995) Using the Amphipod, *Ampelisca abdita*. Parametrix, Inc., Kirkland, Washington.

Parametrix Protocol No. 1059: Bioassay Procedures for Conducting Static-Renewal 20-Day Chronic Sediment Toxicity Tests According To Recommended Guidelines for Conducting Laboratory Bioassays On Puget Sound Sediments (PSWQA, 1995) Using the Polychaete *Neanthes arenaceodentata*. Parametrix, Inc., Kirkland, Washington.

Puget Sound Water Quality Authority. 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments. U.S. Environmental Protection Agency, Region 10.

Hamilton, M.A., R.C. Russo, and R.V. Thurston. 1977. Trimmed Spearman-Karber method for estimating median lethal concentrations in toxicity bioassays. Environ. Sci. Technol. 11(7):714-719; Correction 12(4):417 (1978).

PSDDA Agencies [EPA Region 10, U.S. Army Corps of Engineers (Seattle District), Washington State Department of Ecology, and Washington State Department of Natural Resources]. 1996. Sediment management program biennial report: Dredging years 1994/1995. Seattle/Olympia, Washington.

U.S. EPA Probit Analysis Program used for calculating EC values, Version 1.4.

Washington State Department of Ecology. 1996. Sediment management standards marine bioassays, Task II: recommended quality assurance and quality control deliverables. Washington State Department of Ecology, Publication No. 96-314, Olympia, Washington. 25p.

Zar, J. 1984. *Biostatistical Analysis*. Prentice Hall, Inc. Englewood Cliffs, N.J. 07632. *xii* + 718 pp.

APPENDIX B

Ampelisca abdita BIOASSAY DATA

Washington State Department of Ecology - Budd Inlet Sediment Characterization - Ampelisca abdita bioassay, 7-17 July 1998
Daily Emergence and Mortality Results

Sample	Rep.	*A. abdita* Visible										Mean Emerg.	Emerg. St Dev	Alive	Dead	% Mortality	Mean Sample % Mortality
		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10						
248080	A501	0	2	2	1	0	0	0	0	1	4	1		14	0	30	
	A502	0	0	0	1	1	1	0	0	1	1	0.5		16	0	20	
	A503	0	2	0	0	0	2	2	3	2	0	1.1		14	0	30	
	A504	0	0	0	1	1	1	2	4	5	6	2		12	7	40	
	A505	0	0	0	0	0	0	0	1	0	0	0.1	1.41	17	0	15	27
248081	A506	0	0	0	0	1	0	1	3	3	4	1.2		15	1	25	
	A507	0	2	1	1	1	1	2	3	1	3	1.5		11	6	45	
	A508	1	1	2	1	0	2	0	2	1	3	1.3		15	0	25	
	A509	0	1	0	0	0	2	2	2	2	2	1.1		14	0	30	
	A510	0	0	0	0	0	2	2	2	3	3	1.2	1.14	16	1	20	29
248082	A511	0	0	0	1	0	0	0	1	1	0	0.3		18	1	10	
	A512	0	0	0	0	0	0	0	0	0	0	0		18	0	10	
	A513	2	3	4	3	1	1	0	0	0	0	1.4		16	0	20	
	A514	0	0	0	0	0	0	0	0	0	0	0		17	0	15	
	A515	0	1	0	0	0	1	0	0	1	1	0.4	0.88	16	1	20	15
248083	A516	0	0	1	0	1	0	1	1	0	0	0.4		12	1	40	
	A517	0	0	0	0	1	0	1	2	1	0	0.5		16	0	20	
	A518	0	2	1	0	0	1	0	1	1	0	0.6		16	1	20	
	A519	0	0	1	0	0	1	0	0	1	1	0.4		19	1	5	
	A520	0	0	2	3	2	1	0	0	1	1	1	0.73	15	0	25	22
248085	A521	1	1	2	1	2	2	1	3	1	1	1.5		14	1	30	
	A522	0	2	2	1	1	1	0	1	1	1	1		17	0	15	
	A523	2	4	5	4	4	6	2	2	0	0	2.9		18	0	10	
	A524	0	0	0	0	0	2	2	3	2	2	1.1		15	0	25	
	A525	0	0	0	0	0	2	3	0	1	1	0.7	1.42	16	1	20	20
248086	A526	1	1	2	0	0	0	0	0	1	0	0.5		14	3	30	
	A527	0	0	0	0	0	0	0	0	0	1	0.1		17	1	15	
	A528	1	1	0	0	0	0	0	0	1	0	0.3		16	1	20	
	A529	0	0	0	0	0	2	3	3	2	2	1.2		16	1	20	
	A530	2	1	1	0	0	1	1	1	2	3	1.2	0.92	12	0	40	25
248087	A531	0	0	0	0	0	0	0	0	0	0	0		18	0	10	
(Reference)	A532	0	0	0	0	0	1	0	2	2	2	0.7		19	0	5	
	A533	0	0	0	0	0	0	0	0	0	0	0		15	0	25	
	A534	0	0	0	0	0	0	0	0	1	1	0.2		15	1	25	
	A535	0	0	0	0	0	0	0	0	0	0	0	0.52	15	1	25	18
Control	A536	0	0	0	1	1	1	1	1	2	3	1		16	0	20	
	A537	0	2	3	1	0	0	1	2	0	2	1.1		18	0	10	
	A538	0	0	0	1	0	0	0	0	0	1	0.2		19	0	5	
	A539	0	1	0	0	0	0	1	1	0	1	0.4		20	0	0	
	A540	0	0	0	0	0	0	1	1	1	2	0.5	0.83	19	0	5	8

D = Day

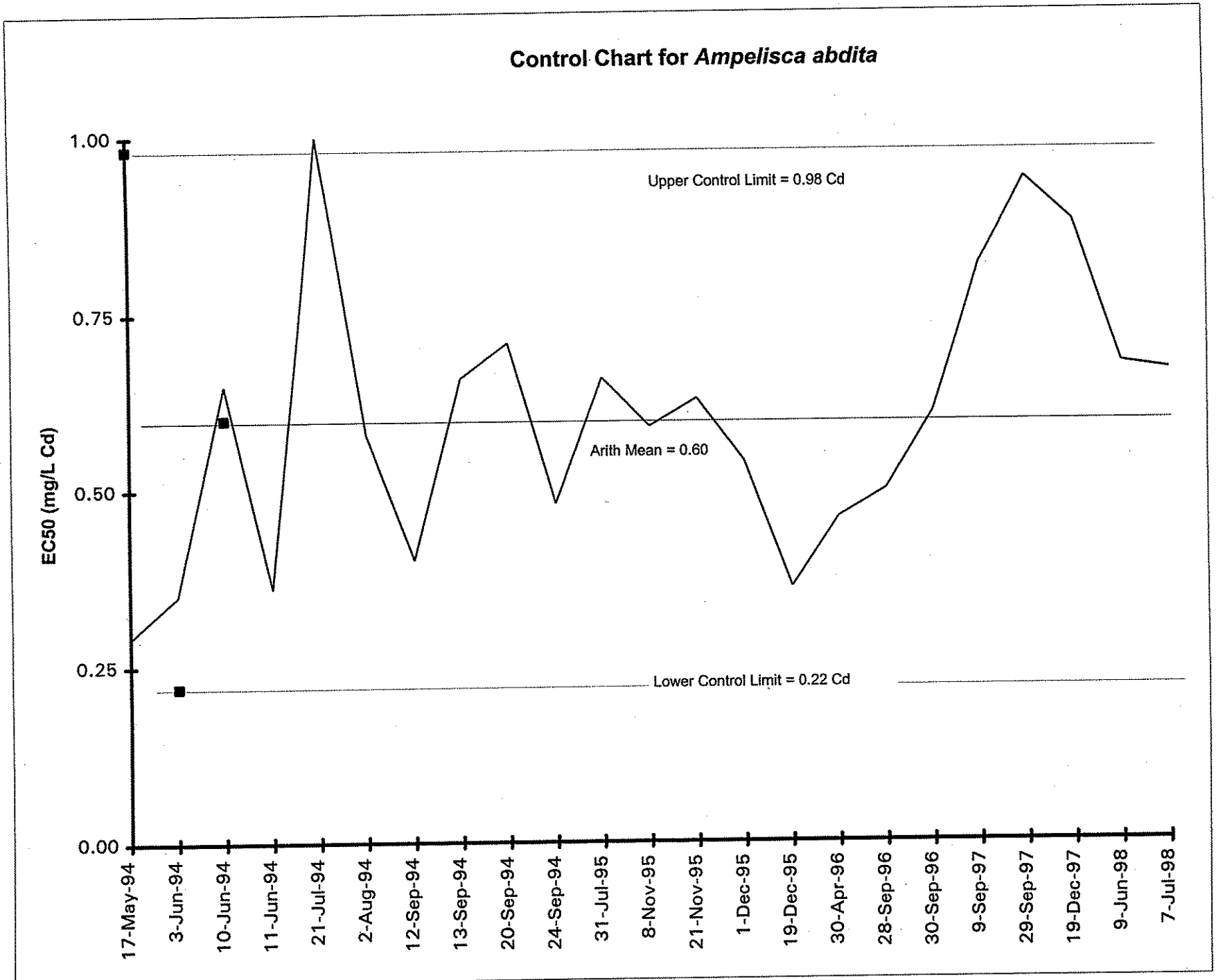
Washington State Department of Ecology - Budd Inlet Sediment Characterization - Ampelisca abdita bioassay, 7-17 July 1998
Daily Emergence and Mortality Results

Sample	Rep.	Mortality (Arc Sine SQRT Trans.)	Sample Mortality	Mortality St Dev	Control p-Value	Reference p-Value
248080	A501	0.58				
	A502	0.46				
	A503	0.58				
	A504	0.68				
	A505	0.40	0.54	0.11	0.0072	0.0924
248081	A506	0.52				
	A507	0.74				
	A508	0.52				
	A509	0.58				
	A510	0.46	0.57	0.10	0.0049	0.0558
248082	A511	0.32				
	A512	0.32				
	A513	0.46				
	A514	0.40				
	A515	0.46	0.39	0.07	0.0652	0.3435
248083	A516	0.68				
	A517	0.46				
	A518	0.46				
	A519	0.23				
	A520	0.52	0.47	0.16	0.0330	0.3151
248085	A521	0.58				
	A522	0.40				
	A523	0.32				
	A524	0.52				
	A525	0.46	0.46	0.10	0.0257	0.3389
248086	A526	0.58				
	A527	0.40				
	A528	0.46				
	A529	0.46				
	A530	0.68	0.52	0.11	0.0104	0.1401
248087	A531	0.32				
(Reference)	A532	0.23				
	A533	0.52				
	A534	0.52				
	A535	0.52	0.42	0.14	0.0562	
Control	A536	0.46				
	A537	0.32				
	A538	0.23				
	A539	0.00				
	A540	0.23	0.25	0.17		0.0562

A. abdita mortality in test sediments was not significantly ($p \leq 0.05$) greater when compared with mortality in reference sediments.

Beak Consultants - City of Bremerton - *Ampelisca abdita* bioassay, 9-19 June 1998
Reference Toxicant

Sample	Rep.	Alive	Dead	% Mortality	Mortality (Arc Sine SQRT Trans.)	Mean Sample Mortality	Mortality St Dev
Ref Tox (CdCl2)							
0.0 mg/L	A	10		0.0	0.00		
0.0 mg/L	B	9	0	10.0	0.32	0.16	0.23
0.094 mg/L	A	7	0	30.0	0.58		
0.094 mg/L	B	3	3	70.0	0.99	0.50	0.29
0.188 mg/L	A	9	0	10.0	0.32		
0.188 mg/L	B	6	3	40.0	0.68	0.25	0.26
0.375 mg/L	A	7	1	30.0	0.58		
0.375 mg/L	B	8	2	20.0	0.46	0.25	0.08
0.75 mg/L	A	4	4	60.0	0.89		
0.75 mg/L	B	6	2	40.0	0.68	0.50	0.14
1.5 mg/L	A	0	10	100.0	1.57		
1.5 mg/L	B	0	8	100.0	1.57	1.00	0.00


Control Chart for *Ampelisca abdita*
1.00
0.75
0.50
0.25
0.00
EC50 (mg/L Cd)
Upper Control Limit = 0.98 Cd
Arith Mean = 0.60
Lower Control Limit = 0.22 Cd
17-May-94
3-Jun-94
10-Jun-94
11-Jun-94
21-Jul-94
2-Aug-94
12-Sep-94
13-Sep-94
20-Sep-94
24-Sep-94
31-Jul-95
8-Nov-95
21-Nov-95
1-Dec-95
19-Dec-95
30-Apr-96
28-Sep-96
30-Sep-96
9-Sep-97
29-Sep-97
19-Dec-97
9-Jun-98
7-Jul-98

Amplsca.xls

TRIMMED SPEARMAN-KARBER METHOD. MONTANA STATE UNIV

FOR REFERENCE, CITE:
HAMILTON, M.A., R.C. RUSSO, AND R.V. THURSTON, 1977.
TRIMMED SPEARMAN-KARBER METHOD FOR ESTIMATING MEDIAN
LETHAL CONCENTRATIONS IN TOXICITY BIOASSAYS.
ENVIRON. SCI. TECHNOL. 11(7): 714-719;
CORRECTION 12(4):417 (1978).

DATE: 7/7/98 TEST NUMBER: AA DURATION: 96 HOURS
CHEMICAL: CDCL2 SPECIES: A. ABDITA

RAW DATA:

CONCENTRATION(MG/L)	0.09	0.19	0.37	0.75	1.50
NUMBER EXPOSED:	20	20	20	20	20
MORTALITIES:	10	5	5	10	20
SPEARMAN-KARBER TRIM:		33.33%			

SPEARMAN-KARBER ESTIMATES: LC50: 0.67
95% LOWER CONFIDENCE: 0.44
95% UPPER CONFIDENCE: 1.02

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

AMPELISCA

(Ampelisca abdita)

DATA PACKET

CLIENT: Washington State Department of Ecology

PROJECT NAME: Budd Inlet

PROJECT NUMBER: 55-1583-60-01

AMPELISCA SEDIMENT SETUP RECORD SHEET

Project Name: Budd Inlet

Date: 7-06-98

Project Number: 55-1583-60-01

Station I.D.	Lab I.D.	Interstitial Salinity	Comments	Initials
248080	A501-505	30		KM
248081	A506-510	30		KM
248082	A511-515	30		KM
248083	A516-520	27		KM
248085	A521-525	29		KM
248086	A526-530	29		KM
248087	A531-535	29		KM
Control	A536-540	25	Native Sediment	KM

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60-01

Day: 0 of Test

Date: 7-7-98

Time: 11:15 am.

Temp: 20.0 °C

Observer(s): KM, BE

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	7.9 ~~7.63~~	7.2	29	
A506	8.1 ~~7.60~~	7.3	29	
A511	8.0 ~~7.53~~	7.2	30	
A521	7.9 ~~7.51~~	6.8	29	
A501	7.9 ~~7.50~~	6.8	30	
A516	8.0 ~~7.50~~	7.2	28	
A526	8.0 ~~7.49~~	7.2	29	
A536	8.0 ~~7.50~~	7.2	29	
Cd Cov A	7.9	7.7	28	
Cd 1.5 A	8.0	7.5	28	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60-01

Day: 1 of Test

Date: 7/8/98

Time: 1000

Temp: 20.5 °C

Observer(s): NM

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.0	7.3	29	
A506	8.1	7.4	30	
A511	8.0	7.4	30	
A521	8.0	7.2	29	
A501	7.9	7.2	30	
A516	8.1	7.4	29	
A526	8.1	7.5	29	
A536	8.1	7.5	29	
C2 conA	8.1	7.6	29	
1.5A	8.1	7.6	29	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60-01

Day: 2 of Test

Date: 7/9/98

Time: 0730

Temp: 20.1 °C

Observer(s): gm

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	7.9	7.0	29	
A506	8.2	6.8	29	
A511	8.1	7.0	29	
A521	8.1	6.9	30	
A501	8.1	6.7	30	
A516	8.1	7.1	30	
A526	8.1	7.1	30	
A536	8.2	7.2	30	
Cd Con A	8.1	7.2	29	
1.5A	8.1	7.0	29	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1563-60-01

Day: 3 of Test

Date: 7/10/98

Time: 0800

Temp: 20.1 °C

Observer(s): JC, GM

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	7.9	7.0	28	
A506	8.5	6.1	29	
A511	8.3	7.1	30	
A521	8.4	7.1	30	
A501	8.4	6.6	30	
A516	8.2	7.1	30	
A526	8.2	7.3	30	
A536	8.3	7.4	30	
Cd Con A	8.1	7.5	29	
1.5A	8.1	7.5	29	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60 · 01

Day: 4 of Test

Date: 7/11/98

Time: 0900

Temp: 20.2 °C

Observer(s): JC

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.1	6.8	29	
A508	8.8	6.7	30	
A511	8.7	6.8	29	
A521	8.7	6.4	29	
A501	8.8	6.8	30	
A516	8.6	7.0	30	
A526	8.6	7.1	30	
A536	8.6	7.3	30	
Cd Con A	8.2	7.5	28	
1.5 A	8.2	7.4	28	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60-01

Day: 5 of Test

Date: 7/12/98

Time: 0850

Temp: 20.3 °C

Observer(s): BE

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.3	6.4	29	
A506	8.8	6.5	30	
A511	8.8	6.6	30	
A521	8.6	6.2	30	
A501	8.6	6.1	29	
A516	8.8	6.7	29	
A526	8.8	6.9	29	
A536	8.8	7.1	30	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60 -01

Day: 6 of Test

Date: 7/13/98

Time: 0800

Temp: 20.1 °C

Observer(s): gm

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.8	6.7	29	
A506	8.9	6.3	29	
A511	8.7	6.4	29	
A521	8.7	6.4	29	
A501	8.6	6.3	29	
A516	8.9	6.7	30	
A526	8.9	6.8	30	
A536	8.9	7.2	30	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name Budd Inlet

Job Number 55-1583-60-01

Day 7 of Test

Date 7/14/98 Time 1515

Temp 21.0 °C

Observer(s) [illegible]

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.7	7.0	30	
A506	8.8	7.2	30	
A511	8.9	7.1	30	
A521	8.7	7.1	30	
A501	8.5	7.3	30	
A516	8.8	7.3	30	
A526	8.6	7.3	31	
A536	8.8	7.3	31	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60-01

Day: 8 of Test

Date: 7/15/98

Time: 0800

Temp: 20.1 °C

Observer(s): gm

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.7	7.2	28	
A506	8.8	7.3	29	
A511	8.8	7.1	29	
A521	8.7	7.2	29	
A516	8.5	7.3	29	
A526	8.7	7.3	30	
A536	8.7	7.3	29	
A501	8.7	7.4	29	

AMPELISCA BIOASSAY CHEMISTRY DATA

Job Name: Budd Inlet

Job Number: 55-1583-60-01

Day: 9 of Test

Date: 7/16/98

Time: 1000

Temp: 20 °C

Observer(s): gm, TP

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.7	7.2	29	
A506	8.6	7.2	29	
A511	8.6	7.2	29	
A521	8.6	7.0	29	
A501	8.4	7.3	30	
A516	8.5	7.3	30	
A526	8.4	7.3	30	
A536	8.5	7.4	30	

AMPELISCA BIOASSAY CHEMISTRY DATA - END OF TEST

Job Name: Budd Inlet

Job Number: 55-1588-60-01

Day: 10 of Test

Date: 7-17-98

Time: 0700

Temp: 21 °C

Observer(s): [signature]

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
A531	8.7	7.1	30	
A506	8.7	7.3	30	
A511	8.6	7.2	30	
A521	8.6	7.1	30	
A501	8.4	4.5	29	aeration line off/too low, turned up
A516	8.5	7.1	31	
A526	8.4	7.2	30	
A536	8.6	7.4	30	

AMPELISCA BIOASSAY BREAKDOWN

Job Name: Budd Inlet Date: 7-17-98

Job Number: 55-1583-60 -01 Day 10 of Test

Container	Found Alive	Found Dead	Comments	Initials
A501	14	0		gm
A502	16	0		gm
A503	14	0		BE
A504	12	7		gm
A505	17	0		gm
A506	15	1		gm
A507	11	6		gm
A508	15	0		gm
A509	14	0		gm
A510	16	1		BE
A511	19	1		JF
A512	18	0		gm
A513	16	0		gm
A514	~~16~~ 17 JF	0		JF
A515	16	1		gm
A516	12	1		JF
A517	16	0		JF
A518	16	1		gm
A519	~~18~~ 19 gm	1		gm
A520	15	0		gm
A521	14	1		gm
A522	17	0		BE
A523	18	0		JF
A524	~~14~~ 15 JF	0		JF
A525	16	1		gm
A526	14	3		gm
A527	17	1		gm
A528	16	1		BE
A529	16	1		gm
A530	12	0		JF
A531	18	0		gm
A532	19	0		BE
A533	15	0		gm
A534	15	0 1 JF		JF
A535	15	1		gm
A536	16	0		gm
A537	18	0		NM
A538	19	0		NM
A539	20	0		NM
A540	19	0		NM

AMPELISCA POSITIVE CONTROL-REFERENCE TOXICANT BREAKDOWN

Job Name: Budd Inlet

Reference Toxicant: $CdCl_2$

Date Stock Prep.:

Job Number: 55-1583-60-01

Date: 7/11/98

Container	Concentration (mg/l)	Found		Initials
		Alive	Dead	
	Con A	10	0	JA
	Con B	9	0	JA
	0.094 A	7	0	JA
	0.094 B	3	3	JA
	0.188 A	9	0	JA
	0.188 B	6	3	JA
	0.375 A	7	1	JA
	0.375 B	8	2	JA
	0.75 A	4	4	JA
	0.75 B	6	2	JA
	1.5 A	0	10	JA
	1.5 B	0	8	JA

AMPELISCA BIOASSAY DAILY EMERGENCE DATA

Job Name: Budd Inlet Start Date: 7/7/98

Job Number: 55-1583-60-01 End Date: 7/17/98

Container	Ampelisca Visible									
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
A531	0	0	0	0	0	0	0	0	0	0
A515	0	1	0	0	0	1	0	0	1	1
A506	0	0	0	0	1 (DEAD)	0	1	3	3	4
A505	0	0	0	0	0	0	0	1	0	0
A539	0	1	0	0	0	0	1	1	0	1
A534	0	0	0	0	0	0	0	0	1	1
A514	0	0	0	0	0	0	0	0	0	0
A538	0	0	0	1	0	0	0	0	0	1
A533	0	0	0	0	0	0	0	0	0	0
A513	2	3	4	3	1	1	0	0	0	0
A503	0	2	0	0	0	2	2	3	2	0
A508	1	1	2	1	0	2	0	2	1	3
A512	0	0	0	0	0	0	0	0	0	0
A502	0	0	0	1	1	1	0	0	1	1
A511	0	0	0	1	0	0	0	1	1	0
A521	1	1	2	1	2	2	1	3	1	1
A523	2	4	5	4	4	6	2	2	0	0
A507	0	2	1	1	1	1	2	3	1	3
A509	0	1	0	0	0	2	2	2	2	2
A522	0	2	2	1	1	1	0	1	1	1
A504	0	0	0	1	1	1	2	4	5	6
A501	0	2	2	1	0	0	0	0	1	4
A528	1	1	0	0	0	0	0	0	1	0
A527	0	0	0	0	0	0	0	0	0	1
A519	0	0	1	0	0	1	0	0	1	1
A524	0	0	0	0	0	2	2	3	2	2
A516	0	0	1	0	1	0	1	1	0	0
A526	1	1	2	0	0	0	0	0	1	0
Initials	NM	gm	JP, gm	[illegible]	BE	gm	[illegible]	gm	[illegible]	gm

AMPELISCA BIOASSAY DAILY EMERGENCE DATA

Job Name Budd Inlet Start Date 7-7-98

Job Number 55-1583-60-01 End Date 7/17/98

Container	Ampelisca Visible									
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
A532	0	0	0	0	0	1	0	2	2	2
A537	0	2	3	1	0	0	1	2	0	2
A518	0	2	1	0	0	1	0	1	1	0
A517	0	0	0	0	1	0	1	2	1	0
A536	0	0	0	1	1	1	~~2~~ 1	1	2	3
A510	0	0	0	0	0	2	2	2	3	3
A520	0	0	2	3	2	1	0	0	1	1
A530	2	1	1	0	0	1	1	1	2	3
A529	0	0	0	0	0	2	3	3	2	2
A525	0	0	0	0	0	2	~~3~~	0	1	1
A535	0	0	0	0	0	0	0	0	0	0
A540	0	0	0	0	0	0	1	1	1	2
Initials	NM	gm	TPGM	JR	BE	gm	jkm	gm	JR	gm

APPENDIX C

Neanthes arenaceodentata BIOASSAY DATA

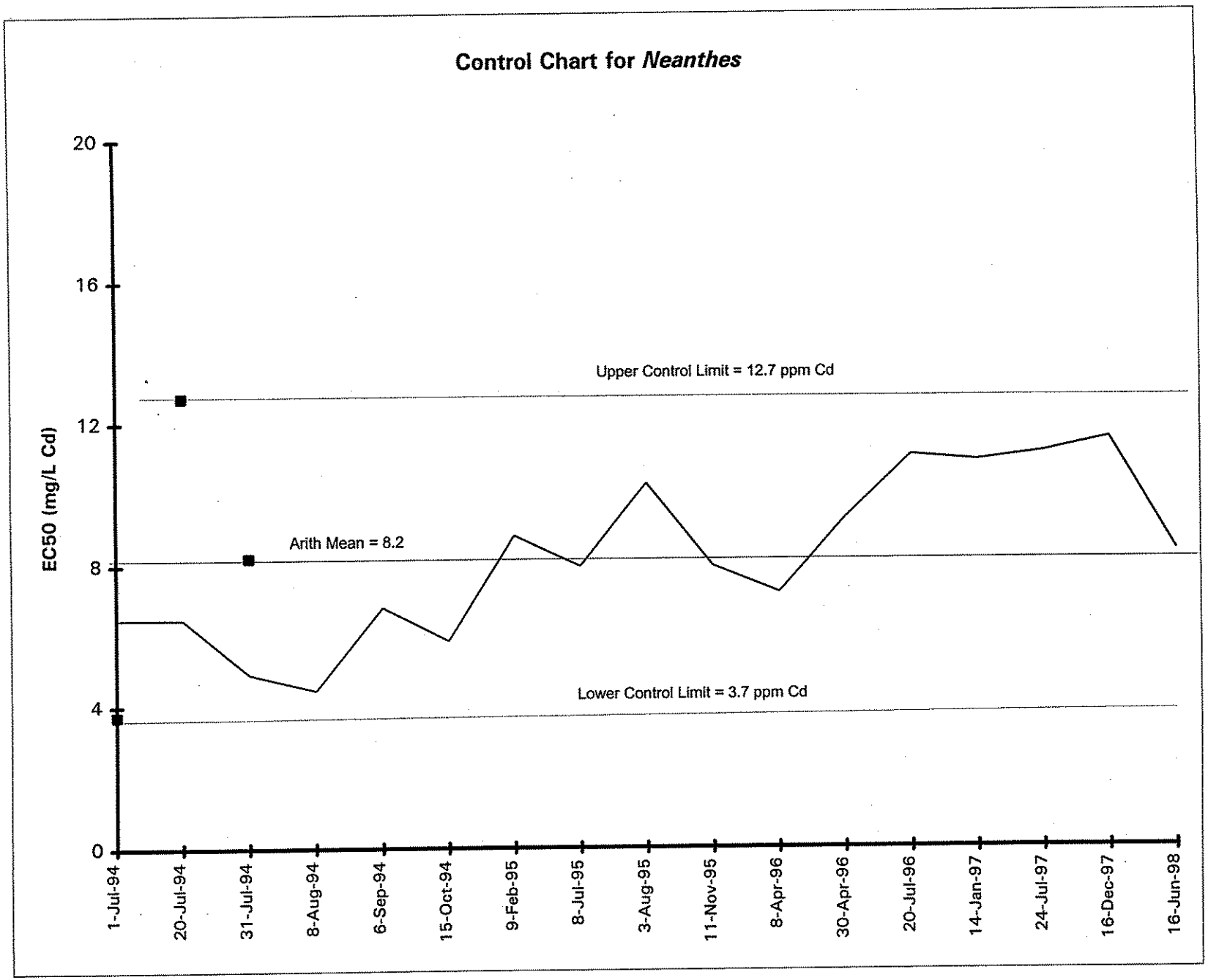
Washington State Department of Ecology - Budd Inlet Sediment Characterization- *Neanthes* bioassay, 16 June - 6 July 1998

Station	Lab I.D.	Alive	Found Dead	Dead	% Mortality	Mean Station % Mortality	Mortality Std. Dev.	Weight of Pan (mg)	Dry Weight of Pan and Worms(mg)	Total Biomass (mg)	Mean Total Biomass(mg)	St Dev Total Biomass	Individual Biomass (mg/org.)	Mean Individual Biomass(mg)	St Dev Individual Biomass	Growth Ratio Endpoint	Mean Growth Ratio*	St Dev Growth Ratio	Control p-Value	Reference p-Value
T initial	1							30.15	32.60	2.45	3.73	1.37	0.5	0.7	0.3					
	2							31.05	34.17	3.12			0.6							
	3							25.69	31.32	5.63			1.1							
248080	N501	5	0	0	0	0	0.00	36.20	102.65	66.45	56.82	6.26	13.3	11.4	1.3	0.63	0.53	0.06	0.385	0.211
	N502	5	0	0	0			33.13	93.33	60.20			12.0			0.56				
	N503	5	0	0	0			37.00	87.84	50.84			10.2			0.47				
	N504	5	0	0	0			37.72	94.98	57.26			11.5			0.54				
	N505	5	0	0	0			40.72	90.05	49.33			9.9			0.46				
248081	N506	5	0	0	0	0	0.00	40.00	88.61	48.61	71.31	14.15	9.7	14.3	2.8	0.45	0.68	0.14	0.052	0.031
	N507	5	0	0	0			40.53	129.40	88.87			17.8			0.85				
	N508	5	0	0	0			48.50	117.64	69.14			13.8			0.65				
	N509	5	0	0	0			41.16	124.67	83.51			16.7			0.80				
	N510	5	0	0	0			41.22	107.64	66.42			13.3			0.63				
248082	N511	5	0	0	0	0	0.00	41.68	70.85	29.17	75.28	26.51	5.8	15.1	5.3	0.25	0.72	0.27	0.105	0.074
	N512	5	0	0	0			44.63	108.64	64.01			12.8			0.60				
	N513	5	0	0	0			47.83	132.95	85.12			17.0			0.81				
	N514	5	0	0	0			36.53	139.66	103.13			20.6			0.99				
	N515	5	0	0	0			35.74	130.73	94.99			19.0			0.91				
248083	N516	5	0	0	0	0	0.00	36.66	100.26	63.60	70.69	4.21	12.7	14.1	0.8	0.60	0.67	0.04	0.018	0.016
	N517	5	0	0	0			37.71	109.24	71.53			14.3			0.68				
	N518	5	0	0	0			32.36	107.50	75.14			15.0			0.71				
	N519	5	0	0	0			35.21	109.66	74.45			14.9			0.71				
	N520	5	0	0	0			35.05	103.78	68.73			13.7			0.65				
248085	N521	5	0	0	0	0	0.00	35.50	57.15	21.65	52.96	17.19	4.3	10.6	3.4	0.18	0.49	0.17	0.424	0.417
	N522	5	0	0	0			36.18	91.77	55.59			11.1			0.52				
	N523	5	0	0	0			35.75	104.77	69.02			13.8			0.65				
	N524	5	0	0	0			38.46	88.99	50.53			10.1			0.47				
	N525	5	0	0	0			37.69	105.69	68.00			13.6			0.64				
248086	N526	5	0	0	0	0	0.00	43.11	102.83	59.72	52.38	3.93	11.9	10.5	0.8	0.56	0.49	0.04	0.331	0.402
	N527	5	0	0	0			40.33	89.26	48.93			9.8			0.45				
	N528	5	0	0	0			42.74	91.81	49.07			9.8			0.45				
	N529	5	0	0	0			38.61	90.95	52.34			10.5			0.49				
	N530	5	0	0	0			36.39	88.21	51.82			10.4			0.48				
248087	N531	4	0	1	20	4	8.00	37.84	85.43	47.59	48.24	12.10	11.9	10.1	2.6	0.56	0.47	0.13	0.308	
(Reference)	N532	5	0	0	0			40.40	107.78	67.38			13.5			0.64				
	N533	5	0	0	0			38.37	67.69	29.32			5.9			0.26				
	N534	5	0	0	0			33.64	80.15	46.51			9.3			0.43				
	N535	5	0	0	0			36.99	87.38	50.39			10.1			0.47				
West Beach	N536	5	0	0	0	0	0.00	37.91	76.02	38.11	54.96	10.46	7.6	11.0	2.1	0.34	0.51	0.10		0.308
(Control)	N537	5	0	0	0			37.68	105.19	67.51			13.5			0.64				
	N538	5	0	0	0			33.65	89.68	56.03			11.2			0.52				
	N539	5	0	0	0			35.58	85.10	49.52			9.9			0.46				
	N540	5	0	0	0			33.16	96.79	63.63			12.7			0.60				

* Control growth rates less than 0.72 mg/day may be approved by the Washington Department of Ecology on a case-by-case basis.

Note: *Neanthes* growth rate in test sediments was not significantly ($p \leq 0.05$) lower when compared to growth of *Neanthes* in reference sediment.

Station	Lab I.D.	Alive	Found Dead	Dead	% Mortality	Mean Station % Mortality	Mortality Std. Dev.	Weight of Pan (mg)	Dry Weight of Pan and Worms(mg)	Total Biomass (mg)	Mean Total Biomass(mg)	St Dev Total Biomass	Individual Biomass (mg/org.)	Mean Individual Biomass(mg)	St Dev Individual Biomass	Growth Ratio Endpoint	Mean Growth Ratio*	St Dev Growth Ratio	Control p-Value	Reference p-Value
Reference Toxicant (CdC12)																				
0.0	A	5	0	0	0	0	0													
	B	5	0	0	0															
1.8	A	5	0	0	0	0	0													
	B	5	0	0	0															
3.0	A	5	0	0	0	0	0													
	B	5	0	0	0															
5.0	A	5	0	0	0	0	0													
	B	5	0	0	0															
8.4	A	3	2	2	40	50	14													
	B	2	3	3	60															
14.0	A	0	5	5	100	100	0													
	B	0	5	5	100															


Control Chart for *Neanthes*
EC50 (mg/L Cd)
20
16
12
8
4
0
Upper Control Limit = 12.7 ppm Cd
Arith Mean = 8.2
Lower Control Limit = 3.7 ppm Cd
1-Jul-94
20-Jul-94
31-Jul-94
8-Aug-94
6-Sep-94
15-Oct-94
9-Feb-95
8-Jul-95
3-Aug-95
11-Nov-95
8-Apr-96
30-Apr-96
20-Jul-96
14-Jan-97
24-Jul-97
16-Dec-97
16-Jun-98

TRIMMED SPEARMAN-KARBER METHOD. MONTANA STATE UNIV

FOR REFERENCE, CITE:
HAMILTON, M.A., R.C. RUSSO, AND R.V. THURSTON, 1977.
TRIMMED SPEARMAN-KARBER METHOD FOR ESTIMATING MEDIAN
LETHAL CONCENTRATIONS IN TOXICITY BIOASSAYS.
ENVIRON. SCI. TECHNOL. 11(7): 714-719;
CORRECTION 12(4):417 (1978).

DATE: 6/16/98 TEST NUMBER: 1 DURATION: 96 HOURS
CHEMICAL: CDCL2 SPECIES: NEANTHES

RAW DATA:

CONCENTRATION(MG/L)	1.80	3.00	5.00	8.40	14.00
NUMBER EXPOSED:	10	10	10	10	10
MORTALITIES:	0	0	0	5	10
SPEARMAN-KARBER TRIM:		0.00%			

SPEARMAN-KARBER ESTIMATES:	LC50:	8.38
	95% LOWER CONFIDENCE:	7.12
	95% UPPER CONFIDENCE:	9.87

20 DAY NEANTHES

(Neathes arenaceodentata)

DATA PACKET

CLIENT: **Washington State Department of Ecology**

PROJECT NAME: **Budd Inlet Sediment Characterization**

PROJECT NUMBER: **55-1583-60-01**

20 DAY NEANTHES SEDIMENT SETUP RECORD SHEET

Project Name: DOE/Budd Inlet

Date: 6/15/98

Project Number: 55-1583-60-01

Station I.D.	Lab I.D.	Interstitial Salinity	Comments	Initials
248080	N501 - 505	30	Strong H_2S smell from	NM
248081	N506 - 510	28	all Sediments.	BE
248082	N511 - 515	30		JM
248083	N516 - 520	28		NM
248085	N521 - 525	30		BE
248086	N526 - 530	30		CT
248087	N531 - 535	30		NM
Control	N536 - 540	26	West Beach Sand	NM

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet

Job Number: 55-1583-60-01

Day: 0 of Test

Date: 6/16/98 Time: 1000

Temp: 20.1 °C

Observer(s): JC

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	7.9	7.4	28	
N501	7.9	7.2	28	
N521	7.8	7.1	28	
N511	7.9	7.4	28	
N516	7.9	7.3	28	
N506	7.9	7.3	28	
N531	7.9	7.2	28	
N536	8.1	7.6	28	
$CdCl_2$ Conc A	7.8	7.3	28	
$CdCl_2$ 1/4 conc A	7.8	7.3	28	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet

Job Number: 55-1583-60-01

Day: 3 of Test

Date: 6/19/98

Time: 1330

Temp: 20 °C

Observer(s): AE JK

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	7.9	7.2	28	
N501	7.9	6.6	28	
N521	7.9	6.7	28	
N511	7.9	7.5	28	
N516	8.0	7.1	28	
N506	8.0	6.7	29	
N531	7.9	6.9	28	
N536	7.9	7.4	28	
CaCl2 Conc A	8.0	7.6	28	
CaCl2 14 mg/L A	8.0	7.6	28	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet
Job Number: 55-1583-60-01
Day: 6 of Test
Date: 6/22/98
Time: 1430
Temp: 20.3 °C
Observer(s): AE, BE

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N- 526	8.2	6.6	30	
N- 501	8.3	6.3	30	
N- 521	8.3	5.9	30	
N- 511	8.4	7.0	30	
N- 516	8.3	6.4	30	
N- 506	8.3	5.6	30	
N- 531	8.3	6.4	30	
N- 536	8.2	7.1	30	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet
Job Number: 55-1583-60-01

Day: 9 of Test
Date: 6/25/98
Time: 0910
Temp: 20.3 °C
Observer(s): Gm

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	7.7	6.4	28	
N501	7.8	6.2	27	
N521	7.9	6.2	29	
N511	8.0	6.5	30	
N516	7.9	6.2	30	
N506	7.9	5.6	30	moved beaker closer to aeration tube
N531	8.0	6.2	30	
N536	7.8	6.7	30	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet
Job Number: 55-1583-60-01
Day: 12 of Test
Date: 6/28/98
Time: 8:30
Temp: 20.8 20.4 °C
Observer(s): SM

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	8.0	7.3	29	DO measurements taken w/out Salinity
N501	8.0	6.9	29	Correction – NM 6/28/98
N521	8.1	7.1	29	
N511	8.1	7.5	29	
N516	8.2	7.4	29	
N506	8.2	7.2	29	
N531	8.2	7.3	29	
N536	8.0	7.7	30	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet
Job Number: 55-1583-60-01

Day: 15 of Test
Date: 7/1/98
Time: 0800
Temp: 19.9 °C
Observer(s): gm

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	8.2	7.0	30	
N501	8.1	6.4	29	
N521	8.2	6.6	30	
N511	8.2	6.9	30	
N516	8.2	6.7	30	
N506	8.3	6.6	30	
N531	8.3	6.6	30	
N536	8.1	6.9	30	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet
Job Number: 55-1583-60-01
Day: 18 of Test
Date: 7/4/98
Time: 8:05
Temp: 20 °C
Observer(s): EM

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	8.0	7.2	29	
N501	7.9	6.7	29	
N521	8.1	6.7	29	
N511	8.0	7.0	29	
N516	8.2	7.0	29	
N506	8.1	6.8	29	
N531	8.1	6.8	29	
N536	7.9	7.0	29	

20 DAY NEANTHES BIOASSAY CHEMISTRY DATA

Job Name: DOE/Budd Inlet
Job Number: 55-1583-60-01

Day: 20 of Test
Date: 7/6/98
Time: 830
Temp: 19.9 °C
Observer(s): JA, GM

Container	Water Quality Parameters			Comments
	pH	D.O.	Salinity	
N526	7.9	7.3	29	
N501	7.7	6.5	29	
N521	8.0	7.0	28	
N511	7.9	7.1	29	
N516	8.1	7.1	29	
N506	8.1	6.8	28	
N531	8.2	6.8	28	
N536	7.9	7.1	29	

20 DAY NEANTHES BIOASSAY BREAKDOWN

Job Name: DOE/Budd Inlet

Date: 7/6/98

Job Number: 55-1583-60-01

Day 20 of Test

Container	Found		Comments	Initials
	Alive	Dead		
N501	5	0	1/2 full	NM
N502	5	0	3/4 full	
N503	5	0	gut full	PE
N504	5	0	1/4 full	
N505	5	0	1/2 Full	
N506	5	0	full	NM
N507	5	0	1/2 full	AE
N508	5	0	full	NM
N509	5	0	Full	NM
N510	5	0	3/4 Full	NM
N511	5	0	1/4 full	
N512	5	0	3/4 full	NM
N513	5	0	1/2 full	AE
N514	5	0	1/2 full	NM
N515	5	0	3/4 Full	NM
N516	5	0	full	NM
N517	5	0	3/4 full	NM
N518	5	0	1/2 full	AE
N519	5	0	1/2 full	
N520	5	0	gut 3/4 full	
N521	5	0	1/2 full	
N522	5	0	full	NM
N523	5	0	full	NM
N524	5	0	1/4 full	
N525	5	0	1/2 full	
N526	5	0	full	NM
N527	5	0	1/2 full	
N528	5	0	1/2 full	
N529	5	0	1/2 full	NM
N530	5	0	1/2 full	
N531	4	0	3/4 full	NM
N532	5	0	3/4 full	NM
N533	5	0	1/2 full	NM
N534	5	0	1/2 Full	NM
N535	5	0	1/2 full	NM
N536	5	0	gut 1/2 full	JCT

20 DAY NEANTHES BIOASSAY BREAKDOWN

Job Name DOE/Budd Inlet

Date 7/6/98

Job Number 55-1583-60-01

Day 20 of Test

Container	Found: Alive	Dead	Comments	Initials
N537	5	0	gut 3/4 full	JA
N538	5	0	gut full	JA
N539	5	0	gut full	JA
N540	5	0	gut 3/4 full	JA

NEANTHES BIOMASS DATA

Job Name DOE/Budd Inlet

Job Number 55-1583-60-01 Date 7/6/98

Day of Test 20

Replicate Number	PAN #	Weight of Pan (mg)	Dry Weight of Pan and Worms (mg)	Dry Weight of Worms (mg)
501	1	36.20	102.65	66.45
502	2	33.13	93.33	60.20
503	3	37.00	87.84	50.84
504	4	37.72	94.98	57.26
505	5	40.72	90.05	49.33
506	6	40.00	88.61	48.61
507	7	40.53	129.40	88.87
508	8	48.50	117.64	69.14
509	9	41.16	124.67	83.51
510	10	41.22	107.64	66.42
511	11	41.68	70.85	29.17
512	12	44.63	108.64	64.01
513	13	47.83	132.95	85.12
514	14	36.53	139.66	103.13
515	15	35.74	130.73	94.99
516	16	36.66	100.26	63.60
517	17	37.71	109.24	71.53
518	18	32.36	107.50	75.14
519	19	35.21	109.66	74.45
520	20	35.05	103.78	68.73
521	21	35.50	57.15	21.65
522	22	36.18	91.77	55.59
523	23	35.75	104.77	69.02
524	24	38.46	88.99	50.53
525	25	37.69	105.69	68.00
526	26	43.11	102.83	59.72
527	27	40.33	89.26	48.93
528	28	42.74	91.81	49.07
529	29	38.61	90.95	52.34
530	30	36.39	88.21	51.82
531	31	37.84	85.43	47.59
532	32	40.40	107.78	67.38
533	33	38.37	67.69	29.32
534	34	33.64	80.15	46.51
535	35	36.99	87.38	50.39
536	36	37.91	76.02	38.11
537	37	37.68	105.19	67.51
538	38	33.65	89.68	56.03
539	39	35.58	85.10	49.52
540	40	33.16	96.79	63.63

NEANTHES BIOMASS DATA

Job Name DOE/Budd Inlet

Job Number 55-1583-60-01 Date 6/16/98

Day of Test 0

Replicate Number	Weight of Pan (mg)	Dry Weight of Pan and Worms (mg)	Dry Weight of Worms (mg)
1	30.15	32.60	2.45
2	31.05	34.17	3.12
3	25.69	31.32	5.63

20 DAY NEANTHES BIOASSAY BREAKDOWN
Positve Control-Reference Toxicant

Job Name DOE/Budd Inlet

Reference Toxicant Cadmium Chloride

Date Stock Prep. _____

Job Number 55-1583-60-01

Date 6/20/98

Container	Concentration (mg/l)	Found Alive	Found Dead	Initials
	Con A	5	0	NM
	B	5	0	
	1.8 A	5	0	
	B	5	0	
	3.0 A	5	0	
	B	5	0	
	5.0 A	5	0	
	B	5	0	
	8.4 A	3	2	
	B	2	3	
	14.0 A	0	5	
	B	0	5	
	PH DO Sal			
Con A	8.1 7.4 30			
14.0 A	8.1 7.4 31			
Temp = 20.6°C				

APPENDIX D

AMMONIA AND SULFIDE TABLES

ORGANISM: *Dendraster excentricus*

PROJECT NUMBER: 55-1583-60 (01)

ANALYSIS: Ammonia

TEST DATES: $T_{Initial}$ 6/18/98
T_{Final} 6/20/98

Lab I.D.	Sample I.D.	$T_{Initial}$ (mg/L)	T_{Final} (mg/L)
E101-105	Control	0.040	0.057
E141-145	248080	0.136	0.105
E146-150	248081	0.262	0.207
E151-155	248082	0.129	0.108
E156-160	248083	0.214	0.166
E161-165	248085	0.022	0.141
E166-170	248086	0.149	0.087
E171-175	248087 (Reference)	0.108	0.080

ORGANISM: *Dendraster excentricus*

PROJECT NUMBER: 55-1583-60 (01)

ANALYSIS: Sulfide

TEST DATES: $T_{Initial}$ 6/18/98
T_{Final} 6/20/98

Lab I.D.	Sample I.D.	$T_{Initial}$ (mg/L)	T_{Final} (mg/L)
E101-105	Control	ND	ND
E141-145	248080	0.014	ND
E146-150	248081	0.011	ND
E151-155	248082	0.011	ND
E156-160	248083	0.010	ND
E161-165	248085	0.016	ND
E166-170	248086	0.015	ND
E171-175	248087 (Reference)	0.006	ND

ND = Not detected

ORGANISM: *Ampelisca abdita*

ANALYSIS: Ammonia

PROJECT NUMBER: 55-1583-60 (01)

TEST DATES: $T_{Initial}$ 7/7/98
T_{Final} 7/17/98

Lab I.D.	Sample I.D.	$T_{Initial}$ (mg/L)	T_{Final} (mg/L)
A501-505	248080	1.17	1.20
A506-510	248081	1.46	0.035
A511-515	248082	0.805	0.027
A516-520	248083	1.07	ND
A521-525	248085	1.20	0.566
A526-530	248086	0.910	0.022
A531-535	248087 (Reference)	1.17	ND
A536-540	Control	1.02	ND

ND = Not detected

ORGANISM: *Ampelisca abdita*

ANALYSIS: Sulfide

PROJECT NUMBER: 55-1583-60 (01)

TEST DATES: $T_{Initial}$ 7/7/98
T_{Final} 7/17/98

Lab I.D.	Sample I.D.	$T_{Initial}$ (mg/L)	T_{Final} (mg/L)
A501-505	248080	ND	ND
A506-510	248081	ND	ND
A511-515	248082	ND	ND
A516-520	248083	ND	ND
A521-525	248085	ND	ND
A526-530	248086	0.003	ND
A531-535	248087 (Reference)	ND	ND
A536-540	Control	ND	ND

ND = Not detected

ORGANISM: *Neanthes arenaceodentata*

ANALYSIS: Ammonia

PROJECT NUMBER: 55-1583-60 (01)

TEST DATES: $T_{Initial}$ 6/16/98
T_{Final} 7/6/98

Lab I.D.	Sample I.D.	$T_{Initial}$ (mg/L)	T_{Final} (mg/L)
N501-505	248080	0.407	2.82
N506-510	248081	0.610	0.960
N511-515	248082	0.313	0.332
N516-520	248083	0.679	0.286
N521-525	248085	0.543	0.530
N526-530	248086	0.375	1.68
N531-535	248087 (Reference)	0.237	0.519
N536-540	Control	0.093	2.81

ORGANISM: *Neanthes arenaceodentata*

ANALYSIS: Sulfide

PROJECT NUMBER: 55-1583-60 (01)

TEST DATES: $T_{Initial}$ 6/16/98
T_{Final} 7/6/98

Lab I.D.	Sample I.D.	$T_{Initial}$ (mg/L)	T_{Final} (mg/L)
N501-505	248080	ND	ND
N506-510	248081	0.006	ND
N511-515	248082	0.003	ND
N516-520	248083	0.003	ND
N521-525	248085	0.004	ND
N526-530	248086	0.003	ND
N531-535	248087 (Reference)	ND	ND
N536-540	Control	ND	ND

ND = Not detected

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Ammonia Media: SW Staff: BE

Organism: ECHINODERM Round #: T1 Date: 6/26/98

Project Name: DOE Test Date: Start Time: 1130

Project Number: End Time: 1245

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit #

001) Specific Ion Probe # Serial # Slope % -59.3 (-56 to -60 mV/decade)

002) Specific Ion Probe # Serial # Slope % (-56 to -60 mV/decade)

Ammonia Standards (SOP #PMX-AN-3)

_____100 ppm (NH_3-N)
X 10 ppm (NH_3-N)
X 1.0 ppm (NH_3-N)
X 0.1 ppm (NH_3-N)
_____0.05 ppm (NH_3-N)
_____0.01 ppm (NH_3-N)
_____See Control Charts (reference)

NBS Standard
Orion Cat. No. 951207 @ 100 ppm
Lot # _____ Date _____

Method Detection Limit = 0.01 ppm NH_3-N
Reporting Limit = 0.1 ppm NH_3-N
Lab Temp: _____°C

Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery	Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery
1130		0.1 ppm							
		1.0 ppm	-SLOPE =	-59.3					
		10.0 ppm							
		0.1 ppm							
		1.0 ppm							
		100 ppm							
		SW	0.0312						
		SW MS	0.941						
	DOE	E101-105	0.040						
	"	E141-145	0.136						
	"	E146-150	0.262						
	"	E151-155	0.129						
	"	E156-160	0.214						
	"	E156-160MS	1.09						
	"	E161-165	0.0215						
	"	E166-170	0.149						
	"	E171-175	0.108						
1245	"	E171-175DUP	0.112						

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____m*l*s sample:_____m*l* SAOB
____m*l*s spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Ammonia Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Ammonia Media: SW Staff: BE

Organism: Echinoderm TF Round #: Date: 7/1/98

Project Name: DOE Test Date: Start Time: 1300

Project Number: End Time: 1600

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit #

001) Specific Ion Probe # Serial # Slope % -58.4 (-56 to -60 mV/decade)

002) Specific Ion Probe # Serial # Slope % (-56 to -60 mV/decade)

Ammonia Standards (SOP #PMX-AN-3)

_____100 ppm (NH_3-N)
__X__10 ppm (NH_3-N)
__X__1.0 ppm (NH_3-N)
__X__0.1 ppm (NH_3-N)
_____0.05 ppm (NH_3-N)
_____0.01 ppm (NH_3-N)
_____See Control Charts (reference)

NBS Standard
Orion Cat. No. 951207 @ 100 ppm
Lot # _____ Date _____

Method Detection Limit = 0.01 ppm NH_3-N
Reporting Limit = 0.1 ppm NH_3-N
Lab Temp: _____ °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery	Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery
		0.1 ppm							
		1.0 ppm	Slope = -58.4						
		10.0 ppm							
		0.1 ppm	0.118						
		1.0 ppm	1.02						
		10.0 ppm	9.88						
		SW	0.0564						
		SW MS	0.847						
		E101-105	0.0571						
		E101-105 Dup	0.0498						
		E141-145	0.105						
		E146-150	0.207						
		E151-155	0.108						
		E151-155 Dup	0.112						
		E156-160	0.166						
		E161-165	0.141						
		E161-165 MS	0.867						
		E166-170	0.0868						
		E171-175	0.0800						

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____m*l*s sample:_____m*l* SAOB
____m*l*s spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Ammonia Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis:	Total Sulfide	Media:	SW	Staff:	BE
Organism:	ECHINODERM Ti	Round #:		Date:	6/24/98
Project Name:	DOE	Test Date:		Start Time:	1435
Project Number:				End Time:	1530

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # 001

001) Specific Ion Probe # 9416BN Serial # ZW1 05806 Slope % -29.1 (-25 to -30 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-25 to -30 mV/decade)

Sulfide Standards (SOP #PMX-AN-2)

0.075
0.75
7.50

Orion Method Detection Limit = 0.003 ppm Sulfide
ASTM Method D4658 Lower Limit 0.04 ppm Sulfide
Reporting Limit 0.5 ppm Sulfide
Lab Temp: 22 °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV	Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV
		0.075ppm									
		0.75 ppm	slope -29.1								
		7.50 ppm									
		0.075ppm	0.085								
		0.750ppm	0.768								
		7.50 ppm	7.62								
		SW	ND								
		SWMS	0.146								
		E141-145	0.0135								
		E146-150	0.0108								
		E146-150DUP	0.0119								
		E151-155	0.0109								
		E156-160	0.0084								
		E156-160MS	0.160								
		E161-165	0.0158								
		E166-170	0.0149								
		E171-175	0.0058								
		E101-105	ND								

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____m*l*s sample:_____m*l* SAOB
____m*l*s spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Sulfide Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis:	Total Sulfide	Media:	SW	Staff:	BE
Organism:	Echinoderm TF	Round #:		Date:	7/6/98
Project Name:	DOE	Test Date:		Start Time:	1300
Project Number:				End Time:	1515

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # 001

001) Specific Ion Probe # 9416BN Serial # ZW1 05806 Slope % -29.3 (-25 to -30 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-25 to -30 mV/decade)

Sulfide Standards (SOP #PMX-AN-2)

0.075 ppm
0.75 ppm
7.50 ppm

Orion Method Detection Limit = 0.003 ppm Sulfide
ASTM Method D4658 Lower Limit 0.04 ppm Sulfide
Reporting Limit 0.5 ppm Sulfide
Lab Temp: _____ °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV	Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV
		0.075 ppm									
		0.75 ppm	Slope	-29.3							
		7.50 ppm									
		0.075	0.0686								
		0.75	0.750								
		7.50	7.32								
		SW	ND								
		SW MS	0.132								
		E141-145	ND								
		E146-150	ND								
		E151-155	ND								
		E151-155 Dup	ND								
		E156-160	ND								
		E161-165	ND								
		E161-165 MS	0.133								
		E166-170	ND								
		E171-175	ND								
		E101-105	ND								

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____mℓs sample:_____mℓ SAOB
____mℓs spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Sulfide Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record — **Parametrix, Inc.**

Analysis:	Ammonia	Media:	SW	Staff:	BE
Organism:	Ampelisca	Round #:	Amp To	Date:	7/14/98
Project Name:	DOE	Test Date:	7/7/98	Start Time:	1000
Project Number:				End Time:	1130

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # _____

001) Specific Ion Probe # _____ Serial # _____ Slope % -59.0 (-56 to -60 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-56 to -60 mV/decade)

Ammonia Standards (SOP #PMX-AN-3)

_____ 100 ppm (NH_3-N)
X 10 ppm (NH_3-N)
X 1.0 ppm (NH_3-N)
X 0.1 ppm (NH_3-N)
_____ 0.05 ppm (NH_3-N)
_____ 0.01 ppm (NH_3-N)
_____ See Control Charts (reference)

NBS Standard
Orion Cat. No. 951207 @ 100 ppm
Lot # _____ Date _____

Method Detection Limit = 0.01 ppm NH_3-N
Reporting Limit = 0.1 ppm NH_3-N
Lab Temp: 22 °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery	Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery
		0.1 ppm							
		1.0 ppm	-SLOPE=	-59.0					
		10.0ppm							
		0.1ppm	0.103						
		1.0ppm	0.969						
		10.0ppm	9.69						
		SW	0.0312						
		SWMS	0.957						
		501-505	1.17						
		506-510	1.46						
		511-515	0.805						
		516-520	1.07						
		516-520MS	1.96						
		521-525	1.20						
		526-530	0.910						
		526-530DUP	0.935						
		531-535	1.17						
		536-540	1.02						

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____m*l*s sample:_____m*l* SAOB
____m*l*s spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Ammonia Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Ammonia Media: SW Staff: BE

Organism: Ampelisca Round #: TF Date: 7/27/98

Project Name: DOE Test Date: Start Time:

Project Number: End Time:

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit #

001) Specific Ion Probe # Serial # Slope % -59.0 (-56 to -60 mV/decade)

002) Specific Ion Probe # Serial # Slope % (-56 to -60 mV/decade)

Ammonia Standards (SOP #PMX-AN-3)

_____100 ppm (NH_3-N)
__X__10 ppm (NH_3-N)
__X__1.0 ppm (NH_3-N)
__X__0.1 ppm (NH_3-N)
_____0.05 ppm (NH_3-N)
_____0.01 ppm (NH_3-N)
_____See Control Charts (reference)

NBS Standard
Orion Cat. No. 951207 @ 100 ppm
Lot # _____ Date _____

Method Detection Limit = 0.01 ppm NH_3-N
Reporting Limit = 0.1 ppm NH_3-N
Lab Temp: _____°C

Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery	Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery
		0.1 ppm							
		1.0 ppm	SLOPE =	-59.0					
		10.0 ppm							
		0.1 ppm	0.0953						
		1.0 ppm	0.959						
		10.0 ppm	9.77						
		SW	ND						
		SW MS	1.12						
		DOE 501-505	1.20						
		DOE 506-510	0.035						
		DOE 511-515	0.027						
		DOE 516-520	ND						
		DOE 516-520 MS	0.910						
		DOE 521-525	0.566						
		DOE 521-525 DUP	0.526						
		DOE 526-530	0.027						
		DOE 531-535	ND						
		DOE 536-540	ND						

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____m*l*s sample:_____m*l* SAOB
____m*l*s spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Ammonia Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Total Sulfide
Organism: Ampelisca
Project Name: DOE
Project Number:

Media: SW
Round #: Amp To
Test Date: 7/7/98

Staff: BE
Date: 7/21/98
Start Time: 1400
End Time:

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # 001
001) Specific Ion Probe # 9416BN Serial # ZW1 05806 Slope % -29.5 (-25 to -30 mV/decade)
002) Specific Ion Probe # Serial # Slope % (-25 to -30 mV/decade)

Sulfide Standards (SOP #PMX-AN-2)

Orion Method Detection Limit = 0.003 ppm Sulfide
ASTM Method D4658 Lower Limit 0.04 ppm Sulfide
Reporting Limit 0.5 ppm Sulfide
Lab Temp: °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV
		.075ppm			
		0.75ppm	slope: -29.5		
		7.50ppm			
		.075ppm	.0792		
		0.75ppm	.753		
		7.50ppm	7.44		
		SW	ND		
		SWMS	.130		
		A501-505	ND		
		A506-510	ND		
		A506-510MS	.130		
		A511-515	ND		
		A511-515DUP	ND		
		A516-520	ND		
		A521-525	ND		
		A526-530	~~ND~~ BE .003		
		A531-535	BE ~~.003~~ ND		
		A536-540	ND		

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____mℓs sample:_____mℓ SAOB
____mℓs spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Sulfide Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis:	Total Sulfide	Media:	SW	Staff:	BE
Organism:	Ampelisca	Round #:	TF	Date:	7/28/98
Project Name:	DOE	Test Date:	7/17/98	Start Time:	1345
Project Number:				End Time:	

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # 001

001) Specific Ion Probe # 9416BN Serial # ZW1 05806 Slope % -29.9 (-25 to -30 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-25 to -30 mV/decade)

Sulfide Standards (SOP #PMX-AN-2)

0.075 ppm
0.75 ppm
7.50 ppm

Orion Method Detection Limit = 0.003 ppm Sulfide
ASTM Method D4658 Lower Limit 0.04 ppm Sulfide
Reporting Limit 0.5 ppm Sulfide
Lab Temp: 22 °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV	Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV
		0.075ppm									
		0.75ppm	slope = -29.9								
		7.50ppm									
		0.075	0.0739								
		0.75	0.739								
		7.50	7.44								
		SW	ND								
		SW MS	0.139								
		A501-505	ND								
		A506-505DUP	ND								
		A506-510	ND								
		A511-515	ND								
		A516-520	ND								
		A521-525	ND								
		A526-530	ND								
		A526-530MS	0.140								
		A531-535	ND								
		A536-540	ND								

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____mls sample:_____ml SAOB
____mls spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Sulfide Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Ammonia Media: SW Staff: BF

Organism: ~~Ampelisca~~/Neanthes Round #: To Date: 6/30/98

Project Name: DOE Test Date: 6/16/98 Start Time: 1610

Project Number: ______ End Time: 1800

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # ______

001) Specific Ion Probe # ______ Serial # ______ Slope % -58.5 (-56 to -60 mV/decade)

002) Specific Ion Probe # ______ Serial # ______ Slope % ______ (-56 to -60 mV/decade)

Ammonia Standards (SOP #PMX-AN-3)

______100 ppm (NH_3-N)
__x__10 ppm (NH_3-N)
__x__1.0 ppm (NH_3-N)
__x__0.1 ppm (NH_3-N)
______0.05 ppm (NH_3-N)
______0.01 ppm (NH_3-N)
______See Control Charts (reference)

NBS Standard
Orion Cat. No. 951207 @ 100 ppm
Lot # ______ Date ______

Method Detection Limit = 0.01 ppm NH_3-N
Reporting Limit = 0.1 ppm NH_3-N
Lab Temp: 22 °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery	Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery
		0.1 ppm							
		1.0 ppm	Slope -58.5						
		10.0 ppm							
		0.1 ppm	0.117						
		1.0 ppm	1.01						
		10.0 ppm	10.0						
		SW	0.0240						
		SWMS	0.985						
	~~A~~ N	501-505	0.407						
		506-510	0.610						
		511-515	0.313						
		511-515 Dup	0.318						
		516-520	0.679						
		521-525	0.543						
		526-530	0.375						
		526-530 MS	1.13						
		531-535	0.237						
	N	536-540	0.0925						
	~~A~~	~~536-540~~	~~0.778~~						

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____mls sample:______ml SAOB
____mls spike @______ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Ammonia Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Ammonia Media: SW Staff: BE

Organism: Neanthes Round #: TE Date: 7/13/98

Project Name: DOE Test Date: Start Time: 1400

Project Number: End Time: 1510

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit #

001) Specific Ion Probe # _____ Serial # _____ Slope % -57.9 (-56 to -60 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-56 to -60 mV/decade)

Ammonia Standards (SOP #PMX-AN-3)

_____100 ppm (NH_3-N)
__X__10 ppm (NH_3-N)
__X__1.0 ppm (NH_3-N)
__X__0.1 ppm (NH_3-N)
_____0.05 ppm (NH_3-N)
_____0.01 ppm (NH_3-N)
_____See Control Charts (reference)

NBS Standard
Orion Cat. No. 951207 @ 100 ppm
Lot # _____ Date _____

Method Detection Limit = 0.01 ppm NH_3-N
Reporting Limit = 0.1 ppm NH_3-N
Lab Temp: _____ °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery	Time (hrs)	Sample I.D.	Lab Sample I.D.	NH_3-N (ppm)	% Recovery
1400		0.1 ppm							
		1.0 ppm	SLOPE =	-57.9					
		10.0 ppm							
		0.1 ppm	0.102						
		1.0 ppm	0.988						
		10.0 ppm	10.0						
	DOE N	SW	ND						
		SW MS	1.02						
		501-505	2.82						
		506-510	0.960						
		511-515	0.332						
		516-520	0.286						
		521-525	0.530						
		521-525 MS	1.46						
		526-530	1.68						
		531-535	0.519						
		536-540	2.81						
1510		536-540 DUP	2.63						

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____m*l*s sample:_____m*l* SAOB
____m*l*s spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Ammonia Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis: Total Sulfide Media: SW Staff: BE

Organism: ~~Amphiascus~~/Neanthes Round #: To Date: 6/24/98

Project Name: DOE Test Date: Start Time: 1540

Project Number: End Time: 1730

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # 001

001) Specific Ion Probe # 9416BN Serial # ZW1 05806 Slope % -29.9 (-25 to -30 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-25 to -30 mV/decade)

Sulfide Standards (SOP #PMX-AN-2)

Orion Method Detection Limit = 0.003 ppm Sulfide
ASTM Method D4658 Lower Limit 0.04 ppm Sulfide
Reporting Limit 0.5 ppm Sulfide
Lab Temp: 22 °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV	Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV
		0.075ppm									
		0.75ppm	Slope	-29.9							
		7.50ppm									
		0.075	0.085								
		0.75	0.768								
		7.50	7.62								
		SW	ND								
		SW MS	0.146								
	N/A/N	501-505	ND								
		506-510	0.0062								
		511-515	0.0085								
		516-520	0.003								
		516-520dup	0.0032								
		521-525	0.0036								
		521-525MS	0.150								
		526-530	0.003								
		531-535	ND								
	~~Amp~~	~~536-540~~	~~ND~~								
	Neon	536-540	ND								

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____mls sample:_____ml SAOB
____mls spike @_____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Sulfide Standard (processed; 28 ppt)
SW = Seawater (0.2 μm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

Laboratory Analysis Record **Parametrix, Inc.**

Analysis:	Total Sulfide	Media:	SW	Staff:	BE
Organism:	Neanthes	Round #:	TE	Date:	7/20/98
Project Name:	DOE	Test Date:	7/6/98	Start Time:	1615
Project Number:				End Time:	1730

Instrument Calibrations Unit 001: Orion Model #720A
Unit 002: Orion Model #250A

Orion Unit # 001

001) Specific Ion Probe # 9416BN Serial # ZW1 05806 Slope % -30.0 (-25 to -30 mV/decade)

002) Specific Ion Probe # _____ Serial # _____ Slope % _____ (-25 to -30 mV/decade)

Sulfide Standards (SOP #PMX-AN-2)

0.075
0.750
7.50

Orion Method Detection Limit = 0.003 ppm Sulfide
ASTM Method D4658 Lower Limit 0.04 ppm Sulfide
Reporting Limit 0.5 ppm Sulfide
Lab Temp: 21 °C

Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV	Time (hrs)	Sample I.D.	Lab Sample I.D.	Sulfide (ppm)	% Recovery	mV
1615		0.075ppm									
		0.750ppm	slope=-30.0								
		7.50ppm									
		0.075ppm	0.0767								
		0.750ppm	0.762								
		7.50ppm	7.56								
		SW	ND								
		SWMS	0.147								
	DOE N	501-505	ND								
	"	501-505DUP	ND								
	"	506-510	ND								
	"	511-515	ND								
	"	516-520	ND								
	"	516-520MS	0.147								
	"	521-525	ND								
	"	526-530	ND								
	"	531-535	ND								
1730	"	536-540	ND								

CS = Calibration Standard
MB = Method Blank (daily with each seawater batch)
DUP = Duplicate (laboratory) (1 in 20)
MS = Spike Analysis (laboratory) (1 in 20)
____mls sample:____ml SAOB
____mls spike @____ppm

SPB = Sample Preservation Blanks
SOW = Synthetic Ocean Water (for standards preparation)
Std = Sulfide Standard (processed; 28 ppt)
SW = Seawater (0.2 µm filtered; UV processed; 28 ppt)
RS = Replicate Sample (field) (1 in 20)

APPENDIX E

CHAIN-OF-CUSTODY FORMS

WASHINGTON STATE DEPARTMENT OF ECOLOGY

REQUEST FOR CONTRACT LABORATORY SERVICES

SIC NO. _____

425-822-8880

Contact: Dayle Ormerod	Project: Budd Inlet	Date: June 11, 1998
Contract Laboratory: Parametrix	Client and Address: WA STATE DEPT. OF ECOLOGY 7411 BEACH DRIVE EAST PORT ORCHARD WA 98366-8204	☐ Enforcement ☐ Return to Client ☐ Dispose
Address: 5808 Lake Washington Blvd. NE Ste 200 Kirkland WA 98033-7350		

ITEM NO.	SAMPLE NO.	PROJECT NAME AND/OR DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL COST
1	248080	These seven (7) sediment sampler were			
	248081	collected 6/9/98 for the following tests:			
	248082	* Amphipod (Ampelisca abdita) - 10 day Static	7	450	3150 *
	248083	Endpoints of mortality, abnormality, effective			
	248085	mortality (mortality + abnormality)			
	248086	* Larval Echinoderm (Dendraster excentricus)	7	450	3150 *
	248084	48-96 hour Static: Endpoints of mortality, abnormality			
		effective mortality (mortality + abnormality)			
		* Juvenile Polychaete (Neanthes arenaceodentata)	7	800	5600 **
		20 day: Endpoints of mortality and growth rate.			
2		Conduct all tests using the procedures			
		specified in the most recent revisions to the			
		Puget Sound Protocols and Ecology's Sediment Management			
		Standards.			

Requested By (Your contact if any questions arise): Stuart Magoon Phone No. 360-871-8813 ~~(206) 895-4737~~

CHAIN OF CUSTODY*

Relinquished By:	Received By:	Yr	Mo	Day	Hr	Min
Will White	[illegible]	9 8	0 6	1 1	1 0	4 5

* Signatures on this part of the form pertain only to the custody of these samples and not to the cost of the analysis.

ECY 050-11 (Rev. 6/91)

REQUEST FOR CONTRACT LABORATORY SERVICES

SIC NO. _____

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Contact	Project Budd Inlet	Date 6/1/98
Contract Laboratory Parametrix Address	Client and Address: WA STATE DEPT. OF ECOLOGY 7411 BEACH DRIVE EAST PORT ORCHARD WA 98366-8204	☐ Enforcement ☐ Return to Client ☐ Dispose

ITEM NO.	SAMPLE NO.	PROJECT NAME AND/OR DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL COST
3		Deliverables as per Sediment Management Standard Marine Bioassays March 1996 Publication No. 96-314 pages 8-9 items 1-6 - Electronic format is not necessary nor are the specific forms outlined in the Appendices			
4		We would like to have as much work completed by June 30, 1998 as possible. It is the end of our fiscal year and we have allocable monies to be spent for this fiscal year. We understand that completion of all tests is not possible However, we wish that you put forth your best effort to commence testing as soon as possible after sample receipt.			
				Total	$11,900

Requested By (Your contact if any questions arise): Stark

Phone No. ~~(206) 895-4737~~

CHAIN OF CUSTODY*

Relinquished By:	Received By:	Yr	Mo	Day	Hr	Min
Will White	Nat Merrill	98	06	17	10	45

* Signatures on this part of the form pertain only to the custody of these samples and not to the cost of the analysis.

ECY 050-11 (Rev. 6/91)

Appendix D

Summary of Physical and Chemical Analysis of Budd Inlet Sediment Samples

Table D1: Summary of Chemicals Detected in Sediments from the Midwest Site.

Location	Midwest Site												
Station	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		Reference
Sample No. 24-	8080		8081		8082		8083		8085		8086		8087
Conventionals (%)													
Percent Solids	29		31		30		31		23		27		33
TOC @ 70°C	3.4		4.4		3.5		3.5		3.8		3.6		2.5
TOC @ 104°C	3.5		4.6		3.7		3.6		4.6		3.9		2
Grain Size													
Gravel (>2mm)	0		0		0		0		0		0		0.3
Sand (2mm-62.5um)	10.8		13.9		10.7		11.1		13.7		9.3		15.8
Silt (62.5-4um)	58.7		60		55.4		55.5		56.9		60.3		50.3
Clay (<4um)	30.6		26.1		33.9		33.4		29.3		30.4		33.6
Metals (mg/kg,dry)													
Arsenic	8.3		9.4		8.6		9.2		7.5		8.6		8.2
Cadmium	0.75		1.4		1.8		1.6		1.6		1.2		0.65
Chromium	36		37		35		37		32		35		42
Copper	70		71		70		72		63		72		40
Lead	15		19		18		20		17		17		14
Mercury	0.18		0.17		0.16		0.18		0.16		0.17		0.11
Nickel	30		29		29		33		24		29		33
Zinc	80		92		86		91		81		87		77
Semivolatiles (ug/kg, dry)													
Acenaphthene	8.2	j	19	j	10	j	100	u	120	u	11	j	92 u
Acenaphthylene	110	u	22	j	14	j	17	j	120	u	15	j	7.5 j
Naphthalene	25	j	84	j	46	j	41	j	24	j	36	j	23 j
Fluorene	15	j	24	j	21	j	17	j	11	j	19	j	3.7 j
Anthracene	35	j	46	j	51	j	57	j	37	j	58	j	11 j
Phenanthrene	53	j	110		87	j	97	j	64	j	99	j	37 j
Sum LPAH	140	j	310	j	230	j	230	j	140	j	240	j	82 j
Fluoranthene	170		260		200		310		170		220		81 j
Benzo(a)anthracene	70	j	92	j	100	u	120	j	78	j	120	u	92 u
Chrysene	85	j	120		110		80	j	96	j	170		43 j
Pyrene	180		290		280		350		210		310		71 j
Benzofluoranthenes	180	j	220	j	270	j	300	j	200	j	300	j	100 j
Benzo(a)pyrene	70	j	72	j	81	j	100	j	70	j	120		26 j
Dibenzo(a,h)anthracene	200	j	190	j	210	u	200	j	220	j	220	j	180 u
Indeno(1,2,3-cd)pyrene	210	j	220	j	230	j	240	j	240	j	250	j	180 j
Benzo(g,h,i)perylene	99	j	120		110		130		110	j	130		85 j
Sum HPAH	1300	j	1600	j	1300	j	1800	j	1400	j	1700	j	590 j
1-Methylnaphthalene	6.1	j	13	j	10	j	10	j	4.2	j	8.3	j	6.4 j
2-Methylnaphthalene	12	j	22	j	19	j	17	j	12	j	16	j	9 j
Dibenzofuran	13	j	24	j	17	j	17	j	10	j	18	j	7.2 j
Carbazole	110	u	100	u	15	j	70	j	120	u	24	j	92 u
2-Methylphenol	110	u	100	u	100	u	51	j	120	u	120	u	92 u
4-Methylphenol	64	j	160		63	j	54	j	76	j	210		92 u
Pentachlorophenol	530	uj	520	uj	520	uj	520	uj	590	uj	590	uj	460 uj
Retene	110		160		100	j	130		110	j	110	j	110
Coprostanol	1300		1300		1100		1000		1300		1500		800 u
Di-n-butyl phthalate	1400		100	uj	100	uj	620	j	1600		3200		210 u
Butylbenzyl phthalate	100	u	520	u	520	u	270	j	590	u	40	J	460 u
Polychlorinated Biphenyls (ug/kg, dry)													
PCB-1254	15	j	26	j	100	u	23	j	19	j	110	u	88 u

j=Estimated concentration

uj=Estimated detection limit

u=Not detected at detection limit shown

Table D1 (cont): Summary of Chemicals Detected in Sediments from Budd Inlet

Location	Hardel Plywood Site				Fiddlehead		Port Dock		West Bay Marina				Indian Moxlie			
Station	Hard1		Hard2		Fido1		PD-1		WB-1		WB-2		IM-1		Reference	
Sample No. 24-	8088		8090		8091		8092		8093		8095		8096		8087	
Conventionals (%)																
Percent Solids	41		38		50		24		32		32		61		33	
TOC @ 70°C	7.6		5.5		4.1		4.3		6.2		6.3		1.8		2.5	
TOC @ 104°C	7.6		5.7		4.5		4.4		6.5		6.7		1.8		2	
Grain Size																
Gravel (>2mm)	10.4		0.3		5.2		0.7		0.8		2		5.2		0.3	
Sand (2mm-62.5um)	51.3		19.6		61.1		17.5		18.5		25.1		66.4		15.8	
Silt (62.5-4um)	25.3		58.8		21.8		58.4		62.8		55.1		22		50.3	
Clay (<4um)	13		21.3		12		23.5		18		17.9		6.4		33.6	
Metals (mg/kg,dry)																
Arsenic	9.2		8.8		5.2		7.8		10		10		5		8.2	
Cadmium	0.86		2.2		1.5		1.7		2.5		2.1		0.5	u	0.65	
Chromium	34		33		31		34		34		32		30		42	
Copper	81		62		89		75		170		130		25		40	
Lead	63		33		72		17		24		26		37		14	
Mercury	0.19		0.26		0.24		0.2		0.25		0.27		0.067		0.11	
Nickel	22		24		21		26		26		27		26		33	
Zinc	120		130		260		100		130		110		88		77	
Semivolatiles (ug/kg, dry)																
Acenaphthene	42	j	63		46	j	87	j	31	j	39	j	75		92	u
Acenaphthylene	26	j	28	j	110		31	j	48	j	50	j	40	j	7.5	j
Naphthalene	190		140		41	j	52	j	62		110		40	j	23	j
Fluorene	53		64		86		110	j	48	j	47	j	110		3.7	j
Anthracene	65		140		390		210		150		140		290		11	j
Phenanthrene	290		400		530		400		240		240		1900		37	j
Sum LPAH	670	j	840	j	1200	j	890	j	580	j	630	j	2500	j	82	j
Fluoranthene	400		750		5500		940		800		780		3400		81	j
Benzo(a)anthracene	44	u	320		1100		530		330		290		800		92	u
Chrysene	150		380		2200		550		590		560		1200		43	j
Pyrene	390		840		4300		1200		1000		1200		2600		71	j
Benzofluoranthenes	210		650		2100		850		830		840		1600		100	j
Benzo(a)pyrene	94		340		600		320		280		280		770		26	j
Dibenzo(a,h)anthracene	93		130		140	u	260		130		140		210		180	u
Indeno(1,2,3-cd)pyrene	130	j	270		470		350		240	j	240	j	580		180	j
Benzo(g,h,i)perylene	91		210		360		190		170		180		470		85	j
Sum HPAH	1600	j	3900		17000		5200		4400	j	4500	j	12000		590	j
1-Methylnaphthalene	45		27	j	19	j	16	j	18	j	20	j	17	j	6.4	j
2-Methylnaphthalene	72		54		37	j	32	j	31	j	37	j	25	j	9	j
Dibenzofuran	75		41	j	42	j	88	j	43	j	52		59		7.2	j
Carbazole	36	j	43		130		49	j	44	j	46	j	220		92	u
2-Methylphenol	14		4.5		1.8	j	7.8	u	51	u	51	u	2.4	u	8.5	
4-Methylphenol	250		120	j	110		65		120		140		22		11	uj
Pentachlorophenol	87	j	86	j	95	j	110	j	130	j	260	uj	57	j	69	j
2-Chorophenol	7.6	j	4.1	u	3.1	u	7.8	u	-		-		2.4	u	8.5	
2,4-Dimethylphenol	8.2		4.8		4.2		7.8	u	-		-		2.4	u	4	
2,4-Dichlorophenol	4.4		3.2	j	3.1	u	7.8	u	-		-		1.8	j	4.9	uj
2,4,6-Trichlorophenol	7.5		4.1	u	3.1	u	7.8	u	-		-		2.4	u	4.9	uj
2,4,5-Trichlorophenol	16		4.1	u	3.1	u	7.8	u	-		-		2.4	u	4.9	uj
1,2-Dichlorobenzene	25	j	43	u	71	u	130	u	51	u	51	u	52	u	92	u
1,4-Dichlorobenzene	44	u	43	u	49	j	130	u	51	u	51	u	52	u	92	u
Retene	370		160		820		100	j	160		130		120		110	
4-Chloroaniline	44	u	43	u	390		130	u	51	u	51	u	52	u	92	u
Coprostanol	420		530		3100		1800		1000		740		950		800	u
Dimethyl phthalate	44	u	43	u	230		130	u	54		160		18	j	92	u
Di-n-butyl phthalate	1000		130	uj	660	uj	3000		120	uj	210	uj	60	uj	210	u
Di-n-octyl phthalate	91		77	j	250		260	u	100	u	100	u	170		180	u
Butylbenzyl phthalate	56	j	77	j	350	j	130	u	260	u	750	u	260		460	u
Bis(2EH)phthalate	490		1400		6700	j	450	uj	340	uj	360	uj	1500		100	uj
Polychlorinated Biphenyls (ug/kg, dry)																
PCB-1242	-		-		88	j	62	u	-		-		25	u	44	u
PCB-1254	-		-		68	j	120	u	-		-		36	u	88	u

-= Not analyzed

j=Estimated concentration

uj=Estimated detection limit

u=Not detected at detection limit shown